GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
(A Corporate Statutory Body Constituted by an Act of the State Legislature)

ALTO BETIM – GOA 403 521

Website:www.gbshse.gov.in email:goaboard@dataone.in Phone (0832) 2417593

GBSHSE/VOC/09/ Date : 17/09/2009

Circular No. 44

To
The heads of all recognized
Higher Secondary Schools
Within the jurisdiction of this Board.

Sub: Proposed (New) curriculum for Std. XI and XII (Vocational)

Sir/Madam,

This Board proposes to introduce revised syllabus in the Technical Based subjects prescribed for following courses under Vocational subjects for Std. XI and XII: -

1) Automobile Engineering Technology
2) Electronic Technology
3) Maintenance and Repairs of Electrical and Electronic Domestic Appliances

The heads of the Institutions are hereby informed to send their representatives to this office to collect a copy of the above material with a letter of authority mentioning the respective courses offered by the Institution.

The above curriculum is also uploaded on the Board's website.

The respective heads of the Institutions are also requested to seek the comments/recommendations, if any, from the concerned subject teachers and forward the same to this office on or before 30/10/2009 so as to initiate further course of action.

Further you are also requested to inform about the **infrastructure available in your Institution and the Estimate of additional equipments if required to be added for each particular course.**

On receipt of your feedback, the Board will initiate action to decide upon the matter of the exact year from which the said revised syllabi is to be introduced.

Yours faithfully,

(D. R. Bhagat)
Secretary

Copy to:-
1) Chairman
2) Joint Secretary (Acad)
3) Heads of all section

AUTOMOBILE ENGINEERING TECHNOLOGY COURSE

REVISED CURRICULUM – STD: XI

Subjects for Std:XI

1. Automobile Engineering I
2. Auto Servicing and Garage Management
3. Mechanical Technology
4. Engineering Maths & Engineering Drawing

AUTOMOBILE ENGINEERING TECHNOLOGY

TEACHING SCHEME AND MARKS (STANDARD XITH

Sr.No.		Lectures		Marks		
	Subjects	Theory	Practicals	Theory	Practical Oral Viva	Total
	COMPULSORY SUBJECTS					
1.	English (Communication Skills)	05	-	70	30	100
2.	General Foundation Course	05	-	70	30	100
3.	Automobile Engineering I	03	05	50	100	150
4.	Auto Servicing and Garage Management	03	05	50	100	150
5.	Mechanical Technology	03	05	50	100	150
6.	Engineering Maths Engineering Drawing	03 -	- 06	50 -	- 100	50 100
	School Assessment Subjects					
7.	ON-THE-JOB TRAINING	06 weeks Industrial Training GRADE				
8.	Physical Education /NSS/NCC/YRC	-	02	Grade is as per General Stream Scheme		
9.	Computer Awareness	-	02	Grade to be given as per the Scheme		
10.	E.V.S.	02	-	Grade to be given as per the scheme		
		24	25	340	460	800

NOTE:

1) Passing- Minimum 25% in theory, minimum 25% in Practical, overall 30% i.e. Grade G
2) Engineering Drawing – Practical – 100 marks
   Engineering Maths - Theory - 50 marks
3) Individual passing in Engineering mathematics and Engineering Drawing subjects.
   Minimum passing in Engineering Mathematics is 25% in Theory and minimum passing in Engineering Drawing in 25% in Practical.
4) Computer Awareness teacher to be taken outside the regular instructions hours.

SCHEME OF INTERNAL ASSESSMENT FOR STD XI

AUTOMOBILE ENGINEERING TECHNOLOGY COURSE

Sr. No.	Subject	First Term Exam					Second Term Exam			Grand Total	Total Average
		Mid Term				Assignment Project					
		Time	Marks	Time	Marks	1st Term	2nd Term	Time	Marks		
1.	English (Communication Skills)	1 Hr	10	2 ½ Hrs	60	30	30	3 Hrs	70	200	100
2.	General Foundation Course	1 Hr	10	2 ½ Hrs	60	30	30	3 Hrs	70	200	100
3.	Automobile Engineering – I (T)	1 Hr	10	2 Hrs.	40	-	-	2 Hrs	50	100	50
	Automobile Engineering – I (P)	-	-	3 Hrs.	50	-	-	3 Hrs	50	100	100
4.	Auto Servicing & Garage Management (T)	1 Hr	10	2 Hrs	40	-	-	2 Hrs	50	100	50
	Auto Servicing & Garage Management (P)	-	-	3 Hrs	50	-	-	3 Hrs	50	100	100
5.	Mechanical Technology (T)	1 Hr	10	2 Hrs	40	-	-	2 Hrs	50	100	50
	Mechanical Technology (P)	-	-	3 Hrs	50	-	-	3 Hrs	50	100	100
6.	Engineering Maths (T)	1 Hr	10	2 Hrs	40	-	-	2 Hrs	50	100	50
	Engineering Drawing (P)	1 Hr	20	3 Hrs	80	-	20	3 Hrs	50	200	100
7.	On Job Training										Grades
8.	Physical Education/NCC/NSS/YRC										Grades
9.	Computer Awareness										Grades
10	EVS										Grades

AUTOMOBILE ENGINEERING I - STD: XI

PERIODS PER WEEK | **MARKING SCHEME**
THEORY: 3 PERIODS PER WEEK | **THEORY: 50 MARKS ((2HRS)**
PRACTICALS: 5 PERIODS PER WEEK | **PRACTICALS: 100 MARKS (3HRS)**

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1. GENERAL INTRODUCTION OF AUTOMOBILE: **Marks: 05 Periods: 10**

1.1. History of Automobile
1.2. Layout of Automobile/chassis
1.3. Different types of layout
1.4. Commercial vehicle chassis-full forward, semi-forward, forward control.
1.5. Engine systems in brief-fuel system, ignition system, cooling system, lubricating system, charging system, starting system.
1.6. Automobile systems-steering system, suspension system, breaks, transmission, chassis etc.
1.7. Bus chassis, engine fitted at the back, engine fitted in the center of chassis – their advantages and disadvantages.
1.8. Wheel base, wheel track, chassis overhang

2. AUTOMOBILE ENGINES **Marks:05 Periods:10**

2.1. Introduction.
2.2. Classification of engines on the following basis-number of cylinders, cylinder arrangement, valve arrangement in cylinder head assembly, cooling methods, fuel used, mechanical cycles, ignition system and lubrication system.
2.3. Four stroke, Otto cycle spark ignition engine
2.4. Valve timing diagram of four stroke Otto cycle engine.
2.5. Pressure volume diagram of four stroke Otto cycle engine.
2.6. Four-stroke diesel cycle compression ignition engine.
2.7. Two stroke cycle engines – petrol and diesel engines
2.8. Advantages and dis-advantages of two-stroke cycle engine over four stroke cycle engine
2.9. Differences between petrol engine and diesel engine
2.10. Single cylinder engine and multicylinder engines-their differences between them
2.11 Engine balancing-Introduction, types of balancing like mechanical balance and power balance, vibration, engine balancing and firing order in one, two, four, six cylinder engines, power overlap

3. ENGINE FUELS **Marks:06 Periods:12**

3.1. Characteristics of fuels
3.2. Fuels used in automobiles – petrol, unleaded petrol, liquefied petroleum gas, compressed natural gas
3.3. Desirable properties of engine fuels
3.4. Properties of petrol fuel
3.5. Various additives added to petrol fuel.

3.6. Combustion chambers used in petrol engines like Hemispherical, squish type, flat-headed type, and inverted tub bath type.
3.7. Properties of Diesel fuel, certain number.
3.8. Combustion chambers used in diesel engines like open combustion chamber, pre-combustion chamber, turbulence combustion chamber, air cell combustion chamber, and energy cell combustion chamber.
3.9. Liquefied petroleum gas-Introduction, comparison of petrol fuel and L.P.G.advantages and disadvantages of L.G.P.
3.10. Compressed natural gas-Introduction, Characteristics of C.N.G advantages and dis-advantages of C.N.G. over other fuels used in automotive engines.
3.11. Alternate fuels used in automobile engines-brief description of fuels like Methyl alcohol, Ethyl alcohol, and Electric vehicle.
3.12. Detonation and Pre-ignition-definitions and their causes and preventive measures in an engine.

4. CONSTRUCTIONAL DETAILS OF ENGINE COMPONENTS

Marks:10 Periods:15

Cylinder block and crankcase, cylinder, oil pan, manifolds, gaskets, cylinders liners-dry liner and wet liner, pistons rings, connecting rod, piston pin, crankshafts, vibration damper, engine bearings, engine valves-popper valve, sleeve valves, rotary valves, valve operating mechanism like straight popper valve mechanism and overhead popper valve mechanism, parts used in valve operating mechanism, mufflers-types of mufflers like baffle type, wave cancellation type, resonance type, absorber type, combined resonance and absorber type mufflers-their functions, material used, construction and working of the above engine components.

5. ENGINE POWER CALCULATIONS **Marks:06 Periods:12**

5.1. System of units,
5.2. Units of measurements,
5.3. Engine measurements-work, energy, power, torque, bore and stroke, T.D.C. & B.D.C, piston displacement or swept volume, clearance volume, compression ratio, volumetric efficiency, brake horse power, indicated horse power, friction horse power, taxable horse power, engine efficiency like thermal efficiency, volumetric efficiency, brake thermal efficiency, rock position, work, indicated mean effective pressure, energy, specific fuel consumption, Valve lead, valve lag, valve overlap-definitions and related calculation on the above topic.

6. ELEMENTRY DYNAMICS **Marks:04 Periods:06**

6.1. Definition of Kinematics, displacement, velocity and acceleration
6.2. Equation of motion with uniform acceleration
6.3. Newton's law of motion
6.4. Acceleration due to gravity

7. CIRCULAR AND ROTATIONAL MOTION **Marks:02 Periods:04**

7.1 Definition of uniform circular motion, Tangential velocity of radial acceleration, centripetal and centrifugal force, banking of road.

7.2. Rotational motion, comparison of linear and rotational motion, torque and angular momentum

8. FRICTION **Marks:04 Periods:06**

8.1. Definition and introduction.

8.2. Origin of friction-adhesive and cohesive forces

8.3. Static and dynamic limit in friction, normal reaction

8.4. Co-efficient of friction

8.5. Wedge friction, screw friction, screw jack.

9. HEAT AND TEMPERATURE **Marks:04 Periods:10**

9.1. Unit to measure heat and temperature

9.2. Different modes of transfer of heat

9.3. Thermal expansion of gas, coefficient of expansion

9.4. Application of transfer of heat in automobile engines as air cooling and water cooling.

9.5. Explanation of expansion of gases in petrol and diesel engines.

10. CURRENT ELECTRICITY **Marks:04 Periods:10**

10.1 Electric circuit, Electrical units, Electron theory, Electric charges, Electrical definition and formulae, Ohm's law, Effect of electric current, Heating effect of current.

10.2 Magnetic terms, Properties of magnet, types and shapes of magnet, Electromagnetism, Electromagnetic induction, Faraday's law of electromagnetic induction, E.M.F. induced in a conductor, Fleming's Right hand and Left hand rules, Self induced E.M.F. self inductance, Mutually Induced E.M.F. and Mutual inductance, Induction coil.

10.3 Conductor and insulator, Types of wires, Types of flexible wires.

10.4 Electrical symbols used in electrical systems, Semiconductor devices.

AUTOMOBILE ENGINEERING I - STD: XI

PRACTICALS **Maximum Marks:100**

1. To study the classification of vehicles with reference to one model of each class
2. To locate and study the different engine systems in automobile vehicle
3. To locate and study the different systems in an automobile
4. To study the working cycle of two stroke single/multicylinder petrol and diesel engines
5. To study the working cycle of four stroke single/multicylinder petrol and diesel engines
6. To study the differences between petrol and diesel engines
7. To study the differences/advantages & disadvantages between single and multicylinder engines
8. To study the differences between two stroke and four stroke engines. (Petrol and diesel combined).
9. List the components, required for the following fuels used in different automobile vehicle. Trace and draw circuit line diagram of:- (a) petrol version, (b) diesel version, (c) liquefied petroleum gas, (d) compressed natural gas.
10. To study the constructional details of various components used in petrol and diesel engines
11. To study the value operating mechanism used in engines like: - a) Overhead popper valve mechanism, (b) Straight popper valve mechanism
12. To study the different types of combustion chambers used in petrol and diesel engines
13. To calculate the cubic capacity, compression ratio, B.H.P: I.H.P: F.H.P: Etc for automobile engines.
14. To find unknown resistance of a given wire using ohms law.
15. To determine Co-efficient of static friction between two surfaces
16. Charging and discharging of Capacitors/Condensers and its applications in ignition system
17. Study of Pascal's law and its application in Hydraulic brakes
18. Study of heart transfer and its application in automobile cooling system
19. Study of Faraday's law and its application in scooter magneto
20. To observe the location of various components of the entire electrical system in an automobile

REFERENCE BOOKS (STD: XI and XII)

1. Automobile Engineering by K.K. Jain and R.B. Asthana (Tata McGraw hill)
2. Automobile Engineering by R.B. Gupta (Satya Prakashan, New Delhi)
3. Automotive Mechanics by S. Srivasan, (Tata McGraw hill)
4. Basic Automobile Engineering by C.P.Nakra (Dhanpat Rai Publishing Companay
5. Automobile Engineering I & II by Dr. Kirpal Singh
6. Automobile Engineering by H.M. Sethi
7. Automobile Electrical Engineering by B.D.Arora (R.B. Publications, Delhi)
8. Automotive Electrical Equipment by P.L. Kohli

MODEL QUESTION PAPER (THEORY)

SUBJECT: **(1) AUTOMOBILE ENGINEERING - I STD: XI**
(2) MECHANICAL TECHNOLOGY

Q. 1.A) Answer the following in one sentence each:-

1) Very short answer (VSA)	1 mark
2) " " "	1 mark
3) " " "	1 mark
4) " " "	1 mark
5) " " "	1 mark
6) " " "	1 mark
B) Essay type	4 marks

Q.2.A) Answer the following in short

1) Short answer type	2 marks
2) " " "	2 marks
3) " " "	2 marks
B) Essay type	4 marks

Q.3.A) Answer the following in short:-

1) Short answer type	2 marks
2) " " "	2 marks
3) " " "	2 marks
B) Essay type	4 marks

Q.4.A) Answer the following in short:-

1) Short answer type	2 marks
2) " " "	2 marks
3) " " "	2 marks
B) Essay type	4 marks

Q.5.A) Answer the following in short:-

1) Short answer type	2 marks
2) " " "	2 marks
3) " " "	2 marks
B) Essay type	4 marks

NOTE: 1) First Terminal Examination (Q.No.1 to Q.4 to be considered)
2) In case of second Terminal Examination (Q.No.1 to 5 to be considered)

BLUE PRINT FOR THEORY EXAMINATION

SUBJECT: **AUTOMOBILE ENGINEERING - I STD: XI**
MARKS: 50 **Time: 2 Hours**

Note: Allocation of marks

1. Topic wise marks are given in the instructional material to be followed
2. Marks and weight age according to objective

	Knowledge	Understanding	Application	Skill
MARKS	15	20	10	05
%	30	40	20	10

3. Marks and weight age according to the type of question

	VSA	SA	E
Marks	06	24	20
%	12	48	40

4. Marks/weight age according to difficulty level

	Easy	Average	Difficult
Marks	10	30	10
%	20	60	20

5. Marks/weight age according to the content area

Sr.No.	Content	Marks	%
01	General Introduction to automobile	05	10%
02	Automobile Engines	05	10%
03	Engine Fuels	06	12%
04	Constructional details of Engine Components	10	20%
05	Engine Power calculations	06	06%
06	Elementary Dynamics	04	04%
07	Circular and rotational motion	02	04%
08	Friction	04	08%
09	Heat and temperature	04	08%
10	Current Electricity	04	08%
	TOTAL:	50	100

6. Number of questions

Type	No of questions	Marks
Very short answer	06	06 x 1 marks = 06
Short answer	12	12 x 2 marks = 24
Essay	05	05 x 4 marks = 20
		TOTAL: 50

BLUE PRINT FOR THEORY EXAMINATION

SUBJECT: **MECHANICAL TECHNOLOGY STD: XI**
MARKS: 50 **Time: 2 Hours**

Note: Allocation of marks

1. Topic wise marks are given in the instructional material to be followed
2. Marks and weight age according to objective

	Knowledge	Understanding	Application	Skill
MARKS	10	20	10	10
%	20	40	20	20

3. Marks and weight age according to the type of question

	VSA	SA	E
Marks	06	24	20
%	12	48	40

4. Marks/weight age according to difficulty level

	Easy	Average	Difficult
Marks	10	30	10
%	20	60	20

5. Marks/weight age according to the content area

Sr.No.	Content	Marks	%
01	Drilling Machines	04	08%
02	Hand tools & its specification, operation & Uses	04	08%
03	Special tool uses and operation	04	08%
04	Dimensional Inspection tools and cutting tools	04	08%
05	Cathie	04	08%
06	Welding	05	10%
07	Ferrous metals/Heat treatment	06	12%
08	Non-Ferrous metals	05	10%
09	Non-Ferrous metal Alloys	04	08%
10	Painting and their application	03	06%
11.	Paint and vanishes	03	06%
12	Synthetic Materials	04	08%
	TOTAL:	50	100

6. Number of questions

Type	No of questions	Marks
Very short answer	06	06 x 1 marks = 06
Short answer	12	12 x 2 marks = 24
Essay	05	05 x 4 marks = 20
		TOTAL: 50

SUB: AUTO SERVICING AND GARAGE MANAGEMENT – STD: XI

Teaching scheme	**Examination Scheme**
THEORY: 3 PERIODS PER WEEK	**THEORY: 50 MARKS ((2HRS)**
PRACTICALS: 5 PERIODS PER WEEK	**PRACTICALS: 100 MARKS (3HRS)**

THEORY	**Periods**	**Marks**
1. BASIC AUTO SERVICING PROCESES	**08**	**04**

1.1 PDI (Pre Delivery Inspection)
1.2 Service under warranty
1.3 Preventive or Regular Maintenance (as per Co. maintenance schedule)
1.4 Break down maintenance
1.5 Trouble shooting process
1.6 Minor overhauling, Major overhauling, Re-conditioning, Replacement of spare parts
1.7 Tune up procedure carried out in Auto Service sector in case of 2 & 4 wheeler vehicles

2. GENERAL CLEANING OF VEHICLE	**06**	**02**

2.1 General cleaning of vehicle
2.2 Methods of cleaning
2.3 Precaution of cleaning
2.4 Advantages of cleaning – to detect leakage of oil, gases, etc.
2.5 Use of Machinery in process of cleaning

3. LUBRICATION SYSTEM	**06**	**02**

3.1 Requirements of lubrication
3.2 Type of lubricants used in Auto workshop
3.3 Process of oiling change from Engine, Gearbox, differential, steering etc.
3.4 Greasing Process – Pneumatic grease gun, hand pump
3.5. Precautions to be followed in process of lubrication

4. INSPECTION OR GENERAL CHECK UP PROCEDURE OF VEHICLE	**14**	**08**

4.1 Inspection and tightening of different types of fasteners as per specified Torque i.e, chassis, engine, suspension.
4.2 Checking the working head lamp, sided indicator, horn and other electrical accessories
4.3 Process of inflate Tyre and rotation of wheels for normal wear of the tyre
4.4 To check Battery connections and maintenance
4.5 Clutch setting, gearbox setting, and Steering adjustments
4.6 Maintenance schedule's of different vehicles.(Car, Jeep, LCV, Two wheeler)
4.7 Removing of broken screws/spoiled headed screws by using convenient methods
4.8 Removing of broken studs by using convenient methods.
4.9 Removing of spoiled/broken nuts and bolts by using convenient methods
4.10 Tapping and dressing the internal and external threads in the assembly

5. ENGINE SERVICING **10** **08**

5.1 Conduct following engine test and analysis the reading to provide proper service to the engine

a. Compression Test
b. Vacuum Test
c. Oil Pressure Test
d. Tachometer
e. Tech II meter

5.2 Engine Tune up process with following systems

a. Fuel system
b. Lubrication system
c. Starting system
d. Ignition system
e. Cooling system

5.3 Engine Decarbonizing process with manual and by machine

5.4 Effects of the deposited carbon on engine performance

5.5 Piston servicing like inspection of piston and cylinder clearance, measuring piston ring end gap and side clearance, selection of piston rings, inspection for Bore wear.

6. RECONDITIONING OF VALVE MECHANISM **07** **05**

6.1 Detection/inspection of valve mechanism for leakage

6.2 Inspection of the components used in O.H.V. and O.H.C. as per valve train.

6.3 Valve reconditioning operation

a. Valve refacing
b. Valve seat cutting
c. Valve lapping

6.4 Replacement of valve guide

6.5 Setting of valve timing and tappet setting

6.6 Assembly procedure, setting of valve and safety precautions

6.7 Inspection of cylinder head for distortion, screeches, etc.

6.8 Tightening procedure of cylinder head bolts

7. MAJOR RECONDITIONING OF AN ENGINE **12** **10**

7.1 Inspection of cylinder bore wear by dial bore gauge and other gauges/methods.

7.2 Selection of cylinder sleeves and replacement procedure (dry and wet)

7.3 Inspection of crankshaft for bent, crack and wear, replacement procedure

7.4 Inspection of engine bearings, precautions taken for engine bearing failure

7.5 Inspection of camshaft for bend, wear, replacement procedure

7.6 Inspection of crank assembly used in single cylinder engine

7.7 Engine assembly procedure, inspection of various tolerance as per manufacturer specifications like engine bearing clearance by dial gauge, feeler gauge, plastic gauge, checking end play of crankshaft, etc.

7.8 Inspection, servicing and replacement of ring gear from flywheel

8. AIR COMPRESSOR CAR WASHER 05 03

8.1 Reciprocating type compressor
8.2 Use of compressed air in Automobile garage
8.3 Car washing machine using compressed air
8.4 Electric car washing machine
8.5 Grease gun using compressed air
8.6 Uses and precautions to handle the machine

9. GARAGE AND SERVICE STATION 08 04

9.1 Location and layout of garages(s) and service station (s)
9.2 Function of garage
9.3 Safety procedure of garage and service station
9.4 Garage procedures-Diagnostic sheet, estimate of repair and costing, Job card, Job loading, Time booking, Inspections, final reports and billing of repairs

10. MAINTENANCE OF SHOP AND FIRST AID 05 04

10.1 Plant/garage maintenance, type of maintenance, elements of maintenance
10.2 Accident-common causes of Accidents means of preventing accidents, Accident proneness, General safety precautions, Safety education and Training.
10.3 Safety ensured by building aspects, M/C and equipments, safety ensured based on human attitude
10.4 Providing First aid to the injured/accident

REFERNCE BOOKS:

1) Automobile Engineering by R.B.Gupta
2) Basic Automobile Engg. By C.P.Nakara
3) Automotive Mechanics by Crouse & Anglin
4) Automobile Engineering by Dr. Kripal Singh Vol. I & II
5) Auto Mechanic- by S.Srinivasan
6) Service Manuals of different companies
7) Automobile Engg. By – Satya Prakashan

SUB: AUTO SERVICING AND GARAGE MANAGEMENT – STD: XI

Teaching scheme	**Examination Scheme**
PRACTICALS: 5 PERIODS PER WEEK	**PRACTICALS: 100 MARKS (3HRS)**

1) To carry out pressurized cleaning and lubrication of two-wheeler
   a) Scooter
   b) Motor cycle
2) To carry out General cleaning of a car and lubricate the chassis, steering joints by using pneumatic grease gun
3) To clean interior of a car by using vacuum cleaner or air blower
4) To carry out regular servicing of a car as per the maintenance scheduled prescribed by the respective car make (Company's)
5) To carry out regular servicing of a jeep or other make as per the prescribed maintenance scheduled.
6) To carryout regular servicing of a scooter as per maintenance scheduled
7) To carryout regular servicing of a motor cycle as per prescribed maintenance scheduled
8) To carryout the job of oil change and replacement of oil filter/strainer in case of motorcycle.
9) To carryout the job at oil change in case of a scooter engine
10) To change the engine oil/top up the engine oil from a car engine also change the oil filter
11) To carryout toping up/or oil change from gear box. Differential unit and steering gear box.
12) To remove the broken stud/bolt by using convenient method(s) from various assemblies.
13) To remove the spoiled headed screw(s) using convenient method(s) from various assembling
14) To remove the nuts/bolts from the assembling which are distorted and threads are spoiled
15) To extract the studs by using stud extractor
16) To conduct the below mentioned test to check the engine performance as per the specification of a car make
    a. Compression test
    b. Vacuum test (Demonstration)
    c. Smoke test (Demonstration)
    d. Take II meter test (Demonstration)
17) To demonstrate the uses of the following instruments/tools
    a. Hydrometer
    b. High rate discharge tester
    c. Piston ring compressor
    d. Piston ring expander
    e. Ring grove scraper

18) To dismount and disassemble a scooter engine and carryout inspection of the following components
    a. Piston for- seizure, wear
    b. Piston rings- for side gap, end gap
    c. Connecting rod – twist, bend
    d. Crank assembly – radial run out, height of webs, lateral run out
    e. Bearings – for wear
    f. Cylinder base – for ovality & taper nest
    g. Cam shaft – bend and lobe wear
    h. Timing chain, gear, strainer – for wear
    i. Cylinder block – fing
19) To dismount and disassemble the motorcycle engine and carry out inspection of the following components. Assembled the engine and set Engine timing.(Repeat components 1-10)
20) To decarbonise the scooter engine and exhaust muffler/silencer
21) To decorbonise the motor cycle engine and silencer
22) To decarbonise the multicylinder engine of a car by using liquid cleaner machine (demonstration)
23) Dismount the cylinder head of a car engine and recondition the valve mechanism by conducting following operations
    a. Valve refacing (demo)
    b. Valve seat cutting/grinding
    c. Valve lapping
24) To overhand the four stroke single cylinder engine and to check different components
25) To change chain spohet assembly of a motorcycle adjustment and lubrication of a chain and spohet
26) To lubricate and adjust the clutch -actuating linkages to set free play adjustment replacement of cable if broken
27) To change the gear cable and set the cable for easy gear shifting
28) To stress throttle cable connection and change the broken cable in case of two wheelers
29) To replace/set the brake cable for efficient working of brakes in two wheelers
30) To remove the wheels from a motor cycle and carryout vulcanization of tube and inflate the same
31) To remove the car wheels for rotation and check for inflation of tyre also provide vulcanization for the tube
32) Sketch the layouts of service station keeping man, machine and material handling procedure

SUB: AUTO SERVICING AND GARAGE MANAGEMENT – STD: XI
Time: 2 hours **Marks – 50**

Q.1	(A)	Very short answer	01 mark
	(B)	Short answer	02 marks
	(C)	Short answer	02 marks
	(D)	Short answer	02 marks
	(E)	Easy type	03 marks
Q.2	(A)	Very short answer	01 mark
	(B)	Short answer	02 marks
	(C)	Short answer	02 marks
	(D)	Short answer	02 marks
	(E)	Easy type	03 marks
Q.3	(A)	Very short answer	01 mark
	(B)	Short answer	02 marks
	(C)	Short answer	02 marks
	(D)	Short answer	02 marks
	(E)	Easy type	03 marks
Q.4	(A)	Very short answer	01 mark
	(B)	Short answer	02 marks
	(C)	Short answer	02 marks
	(D)	Short answer	02 marks
	(E)	Easy type	03 marks
Q.5	(A)	Very short answer	01 mark
	(B)	Short answer	02 marks
	(C)	Short answer	02 marks
	(D)	Short answer	02 marks
	(E)	Easy type	03 marks

BLUE PRINT FOR THEORY EXAMINATION

SUBJECT: **AUTO SERVICING AND GARAGE MANAGEMENT STD: XI**
MARKS: 50 **Time: 2 Hours**

Note: Allocation of marks

1. Topic wise marks are given in the instructional material to be followed
2. Marks and weight age according to objective

	Knowledge	Understanding	Application	Skill
MARKS	10	20	20	
%	20	40	40	

3. Marks and weight age according to the type of question

	VSA	SA	E
Marks	05	30	15
%	10	60%	30

4. Marks/weight age according to difficulty level

	Easy	Average	Difficult
Marks	08	30	12
%	16	60	24

5. Marks/weight age according to the content area

Sr.No.	Content	Marks	%
01	Basic Auto Servicing process	04	08
02	General cleaning of vehicle	02	04
03	Lubrication system	02	04
04	General check up procedure of vehicle	08	16
05	Engine Service	08	16
06	Recon. Valve mach	05	10
07	Maj Recon at an Engine	10	20
08	Air comp car washer	03	06
09	Garage & servicing study	04	08
10	Main of shop safety	04	08
	TOTAL:	50	100

6. Number of questions

Type	No of questions	Marks
Very short answer	05	05
Short answer	15	30
Essay	05	15
	25	50

SUB: MECHANICAL TECHNOLOGY – STD: XI

Teaching scheme	**Examination Scheme**
THEORY: 03 PERIODS	**THEORY: 50 MARKS (2 HRS)**
PRACTICALS: 5 PERIODS PER WEEK	**PRACTICALS: 100 MARKS (3HRS)**

Theory	**Periods**	**Marks**
	07	**04**

1. Drilling Machines

1.1. Introduction
1.2. Types of drilling machines – construction, Function and their uses
1.3. Portable type electrical drilling machine
1.4. Portable type pneumatic machine
1.5. Bench drilling machine
1.6. Universal drilling machine
1.7. Drilling machines operations like Drilling, Reaming, Boring, Counter boring, counter Sinking, Spot facing, Tapping
1.8. Safety precaution's on working on drilling machine

2. Hand tools and its specification, operations and uses

08 **04**

2.1 Spanners – open end, D.E. ring spanners, Tube spanners, sockets
2.2 Screw driver – 2 ways and 4 ways, their sizes and uses
2.3 Pliers-Combination, Nose, Creeper, Circlip, (internal-external)
2.4 Taps and dies, drifts, Punches
2.5 Allen keys, Torque wrench and its settings
2.6 Hammers- ball peen/sledge hammer and its different sizes
2.7 Mallets

3. Special Tool its uses and operations

05 **04**

3.1 Bearing puller
3.2 Piston ring Expander
3.3 Piston ring compressor
3.4 Valve lifter, valve seat cutter, and valve re-facer
3.5 Valve guide extractor, stud extractor
3.6 Magneto puller
3.7 Arbor press
3.8 Universal puller, Trolley Jack
3.9 Pulley jack, mechanical and hydraulic jack

4. Dimensional Inspection tools, and cutting tools

08 04

4.1 Vernier caliper
4.2 Micrometer
4.3 Dial bore gauge
4.4 Feeler gauge, wire gauge
4.5 Bevel gauge
4.6 Height gauge
4.7 Compression and vacuum gauges
4.8 V-Block, Angle block, surface plate, Try-square
4.9 Different types of chisels and its operation and uses
4.10 Different types of files and its uses and filing process
4.11 Scraper
4.12 Hack saw
4.13 Die stock and dieing
4.14 Vices like Bench, Hand, Tool makers, pipe vice

5. Lathe

05 04

5.1 Construction, working of Engine lathe or center lathe and its applications
5.2 lathe attachment
5.3 lathe operations like plain turning, step turning, parting off, taper turning, drilling, boring, threading, knurling, chamfering, spinning
5.4 Step for performing lather operation
5.5 Preparing lathe for operation
5.6 Safety guidelines for working on lathe
5.7 Precautions on lathe operation and care of lathe
5.8 Demonstration on CNC Machine

6. Welding

06 05

6.1 Basic principles of Arc welding and gas welding
6.2 Arc welding machine and equipments
6.3 Application of Arc welding in Automobile like TIG welding, MIG welding, Plasma Arc welding, Arc spot welding
6.4 Gas welding equipment
6.5. Metal inert gas welding
6.6 Spot welding
6.7 Uses above welding in Automobile Industries/workshop
6.8 Different types of welding joints
6.9 Definition of soldering, Principals of good soldering, soldering methods
6.10 Definition, Principle, Operation and procedure of Brazing
6.11 Safety precautions in welding
6.12 Adhesion – used to joint plastics and other engineering materials

7. Ferrous metals

12 06

7.1 Pig iron – Manufacturing from Iron ore, Blast furnace, properties of Pig iron, types of pig iron, their uses in Auto Industry.

7.2 Cast Iron- Manufacture of Cast iron, cupola furnace, Types of cast iron, properties of cast iron, uses of cast iron in Auto Industry.

7.3 Wrought iron – Manufacturing of wrought Iron by puddling processes, compositions, properties and uses of wrought Iron.

7.4 Steel –Composition, classification of Steel example, low carbon, high carbon, medium carbon steels. Properties and uses of steels, Alloy steels with alloying elements like Nickel, Tungsten, Silicon, manganese, Vanadium, molybdenum, chromium, titanium.

7.5 Heat treatment

Definition, purposes and methods of heat Treatment processing like Annealing, Normalizing, Hardening, Tempering, Case hardening, Cyaniding, Nit riding, Induction hardening, flame hardening.

8. Non-Ferrous metals

08 05

8.1 Copper-Physical and chemical properties and their uses in Automobile

8.2 Aluminum-Physical and chemicals properties and their uses in Automobile

8.3 Lead- Physical and chemical properties and their use in Automobile

8.4 Zinc-Physical, chemical properties and use in Automobile

8.5 Tin- Physical, chemical properties and use in Automobile

8.6 Occurrence and Extraction of the above metals from their alloys

9. Non- Ferrous Metal Alloys

06 04

9.1 Composition, properties and uses of following alloys – Brass, Bronze, Aluminum, Babbitt metal

9.2 Alloys with chromium, Tungsten steel, tin and molybdenum

10. Painting and their application

06 03

10.1 Surface preparation of Automobile body for painting
10.2 Brush painting, spray-painting
10.3 Finish painting and decorative painting
10.4 Safety precaution in spray painting
10.5 Electroplating process, electroplating equipments, plating materials, Application of Electroplating in Automobile

11. Paint and varnishes

06 03

11.1 Primer Paint
11.2 Use of strainer for co lour shades of Paints
11.3 Type of paints – Air-drying and oven backed
11.4 Application of Varnishes in Auto Electrical winding
11.5 High glass paint, Metallic Paints
11.6 3D coatings

12. Synthetic Materials

08 04

12.1 Plastic – Definition, Classification and composition of plastic i.e. Thermo plastic, Thermosetting, reinforced plastics, properties of plastic
12.2 Uses of plastic in Automobile
12.3 Rubber- Definition, Classification, Characteristics, such as synthetic rubber
12.4 Properties of Rubber i.e. Neoprene, Nitride, Butyl, Silicon, Volcanisation of Rubber
12.5 Fiber glass – Composition and its application in Automobile
12.6 Asbestos – Definition, properties and uses related to Automobile
12.7 Uses of Cork in gasket
12.8 Ceremic – properties and uses
12.9 Modern composite materials like carbon fiber, nylons, polymer used in Automobile

Reference Books

1. Material Science and processes by S.K.Hazra Chaudary
2. Engineering Materials by Rangwala
3. Work shop Technology Vol.I & II by S.K.Hajra Chaudhari
4. Workshop Technology Vol. I & II by Chapman
5. Production Technology by R.K.Jain
6. Welding Technology by O.P.Khanna

SUB: MECHANICAL TECHNOLOGY
STD: XI (Practical) Marks: 100

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1. To draw the sketches of open end spanners and demonstration their application on job related to torgue **.**
2. To draw the sketches of ring spanners used in Auto workshop and demonstrations their application on vehicle job.
3. To draw the sketches of tube spanner used in Auto shops and demonstration their application on Auto job.
4. To study the uses of socket spanner set and various attachment and demonstration their application on Auto job.
5. To draw the sketches and application of their uses below mentioned different types of pliers.
   (a) Combination pliers (b) Long nose pliers (c) Cutting pliers
   (d) Internal circlip (e) External circlip pliers
6. To conduct one practical comprising to use the following gauges
   (a) Feeler gauge (b) Telescopic gauge (c) Dial gauge
7. To study the uses of bench vices, care and maintenance of vice and draw its sketches
8. To study the use of pipe vice and draw its diagram
9. To demonstrate the use of hacksaw frame, fitting of blade and carry out cutting operation process and draw its sketches.
10. To draw the sketches of the following files and study its application in fitting shops.
    (a) Flat file (b) Round file (c) Triangular file (d) Square file
    (e) Half round file (f) Rough file (g) Smooth file
11. To study the uses and sketches of following tools
    (a) Flat chisel (b) Cross chisel (c) Diamond point chisel
    (d) Side cutting chisel (e) half round scraper (f) Flat scraper
12. To conduct scrapping exercise to learn to remove dust and rust from surface to conduct exercise to remove excess materials etc. from materials surface by chipping method.
13. To study the uses and sketches of the following drilling machine.
    (a) Portable drilling machine (b) Bench grinder (c) Bench drilling machine (d) Twist drill
14. To study and draw sketches of the following marking instrument and their application
    (a) Surface plate (b) Angle plate (c) “V” block (d) Universal scriber.

15. To prepare two fitting jobs by using different types files and hacksaw bladed and demonstration on fitting and cutting operation.
16. To remove the broken stud/bolt from Assembly unit and redressed the internal threads by using taps.
17. To carryout drilling hole and tapping of thread operation on G.I pipe.
18. To learn various safety measures used in welding.
19. To make two jobs with butt and lap welding by electric arc welding machine.
20. To prepare a job involving denting, surface preparation and spray painting.
21. To demonstrate at least two jobs each in plain turning, taper turning, threads cutting, drilling, boring, knurling, chamfering and parting off (field visit).
22. Identification of Ferrous materials in Automobile Components (any ten)
23. Identification of Non-Ferrous metals and alloys in Automobile Components (any ten)

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SUB: ENGINEERING MATHEMATICS – STD: XI

Teaching scheme	**Examination Scheme**
THEORY: 03 PERIODS	**THEORY: 50 MARKS (2 HRS)**

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1. GRAPH: 03 Marks **08 periods**

a) Selection of dependent and independent variables
b) Range of each physical variable
c) Selection of Scale etc.
d) Types of graphs, plotting of different graphs like y=mx, y=mx+h, Logx, sinx, cosx, etc.
e) Calculation of slope

2. LOGATITHM : 04 Marks **08**

Introduction, Laws of Logarithm, common Logarithms, antilogarithms, use of Logarithm to simplify the calculations.

3. QUADRIATIC EQUATIONS: 06 Marks **12**

Introduction, solution of quadratic equation by factorization, completing the square, relation between roots and coefficient, nature of roots, application to problem in workshop calculation.

4. TRIGONOMETRY: 10 Marks **12**

a) Relation between degree and radian and definition
b) Trigonometric ratio of any angle and identities
c) Trigonometric ratio of allied, compound and multiple angles (2A+3A) only.
d) Sum and product formulae
e) Sine and cosine rules
f) Solution of triangles, applied to heights and distances, sec, cosec, tan, cot.

5. DETERMINANTS: 05 Marks **08**

a) Minors and co-factors of a determinant
b) Determinants of second and third order
c) Cramer's Rule
d) Application of determinants in solution of equation and area of a triangle

6. CO-ORDINATE GEOMETRY: 08 Marks **10**

a) Points and co-ordinates
b) Distance and section formulae
c) Area of triangle
d) Various forms of the equation of a straight line
e) Various forms of equation of a circle
f) Center and radius form
g) General form

7. MENSURATION: 08 Marks **10**

a) Volume and surface area of a prism, pyramids, frustum of cone, right cylinder, circular cylinder, cone, sphere

b) Calculation of volume of composites, calculation of volume of solid with part missing

c) Calculation of volume of solid or irregular shapes

8. FUNCTION AND LIMITS: 03 Marks **08**

Function-domain range, composite function, algebraic function, limit of a function, operation of finding limits, algebraic limits, trigonometric limits

9. DIFFERENTIAL CALCULUS: 03 Marks **08**

Introduction of derivative, derivatives of standard formulae, derivate of sum, product and quotient of simple functions.

FORMAT OF MODEL QUESTION PAPER FOR THE THEORY EXAMINATION IN CLASS XI

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SUBJECT: ENGINEERING MATHEMATICS **MAXIMUM MARKS: 50**

Q.1 (A) Answer the following (VSA – 3 question of 1 marks each)	**3 Marks**
(B) Answer the following in brief (SA type-2 question of 2 mks each)	**4 Marks**
(C) Answer the following in details (Essay type)	**3 Marks**
Q.2 (A)Answer the following in short (VSA type-3 question of 1 mks each)	**3 Marks**
(B)Answer the following in brief (SA type-2 question of 2 mks each)	**4 Marks**
(C) Answer the following (Essay type)	**3 Marks**
Q.3(A) Answer the following in Short (VSA type-2 question of 1 mks each)	**2 Marks**
(B) Answer the following in brief (SA type-2 question of 2 mks each)	**4 Marks**
(C) Answer the following (Essay type-1 question)	**4 Marks**
Q.4 (A) Answer the following (SA type-2 question of 1 mks each)	**2 Marks**
(B) Answer the following in brief (SA type-2 question of 2 mks each)	**4 Marks**
(C) Answer the following in details (Essay type)	**4 Marks**
Q.5 (A) Answer the following (SA type-5 question of 2 mks each)	**10 Marks**

Note:

1) **Whenever required option for the student to be given to choose from set question (only for short and long answers)**
2) **Marking Scheme similar to above shall be followed for the midterm test with proportion of marking**
3) **First terminal Examination Q.1 to 4 should be considered**
4) **Incase Second Terminal Examination Question No.1 to 5 should be taken**.

SUB: ENGINEERING DRAWING – STD: XI

Teaching scheme	**Examination Scheme**
(Periods per week)	**Practical 100 Marks**
Practical: 06 Periods	**Time: 3 HOURS**

01 – INTRODUCTION: **02 Periods**

Description of drawing instruments and their correct method of use

02 – PLANNING AND LAYOUT OF DRAWING **02 Periods**

Standard size of drawing sheet and their planning
Per IS-696-1972 (Revised)

03 – LINES, LETTERING AND DIMENSION: **10 Periods**
06 Marks

Different type of lines and their use standard practice of writing
Single stroke capital and lower capital letters and numbers, principle of dimensioning and dimensioning as per I.S.I.

04 – GEOMETRICAL CONSTRUCTION: **12 Periods**
08 Marks

Procedure for drawing regular polygons and circles and tangential construction

05 – ENGINEERING CURVES: **16 Periods**
10 Marks

Meaning of terms like focus, Eccentricity, dictatrix, conic section, parabola, hyperbola, ellipse, involutes, spiral and helix

06- <u>PROJECTION OF POINTS AND LINES</u> (Introduction) **08 Periods**
04 Marks

Third angle method and first angle method Projection

07- <u>PROJECTION METHOD</u> - **08 Periods**
04 Marks

Orthographic projection of plane figures like triangle, square, regular pentagon, regular hexagon and circle

08- <u>PROJECTION OF SOLIDS</u>: **16 Periods**
10 Marks

Orthographic projection of solids like cubes, prism, pyramids, Square, pentagon, hexagon, cones, cylinders etc. with different positions of axis in relation to the reference vertical plane section of solids, Orthographic projection of sections of solids mentioned above procedure to draw the true shape of sectional surface.

09-<u>FASTENERS:</u> **16 Periods**
10 Marks

Meaning, Definitions of pitch, crest root, depth of thread, minor diameter, major diameter of screw threads, sketching of bolts, nuts, hexagonal head, square head, castle nuts, self locking nuts, self-tapping bolts, enlarged view of thread section like BSW, MM, NF, BA, threads, types of washers, spring washers, star washer, plain washer, circlips.(Only free hand sketches).

Riveted joints, studs and setscrews square acme “v” thread sketching of different types of keys and engine foundation bolts.

10- <u>ORTHOGRAPHIC PROJECTION</u>; **16 Periods**
12 Marks

First angle method and third angle method and object with regular curves front, side, top views only-missing views.

11- <u>PICTORIAL DRAWING:</u> **18 Periods**
10 Marks

Isometric drawing and isometric projection-Procedure for drawing Isometric drawing/projection of regular curves.

12- WELDING: **16 Periods**
10 Marks

Symbols as per ISI standard, symbols and conversion to represent surface roughness, machine production method Square ness, out of roundness as per ISI standard.

13- <u>NEED AND TYPE OF FITS, LIMIT, TOLERANCES</u>: **08 Periods**
4 Marks

Their Definition, hole basis, shaft bases system and their introduction on drawing.(Demonstration-Theory)

14- <u>ASSEMBLY DRAWINGS:</u> **20 Periods**
12 Marks

Difference between detailed and assembly drawing, procedure and preparation of drawing of machine parts of I.C. Engine such as piston, piston rings, connecting rod, universal joint, types of gears, universal joint (cross type), Chassis (Box type), Shackles, springs, etc.

ENGINEERING DRAWING
(PRACTICAL) 100 Marks

1. Draw the layout of sheet and learn the use of instruments
2. Sketching and drawing of lines and lettering and dimensioning
3. Drawing of geometrical construction
4. Drawing of Engineering curves
5. Drawing of orthographic projection of lines
6. Drawing of orthographic projection of plane figures
7. Drawing of orthographic projection of solids
8. Drawing of orthographic projection of sectional solids
9. Drawing of orthographic projection of missing views
10. Drawing of views different screw threads with nomenclature
11. Sketching of different types of bolts, nuts, was heirs and locking arrangement. Used in automobile vehicle such as castle nut.
12. Drawing of threads, screws and set screws
13. Drawing of keys in position (square, wood druff) Riveted and welding joints
14. Isometric views of plane figures like circle, square, rectangles resting in vertical and horizontal position
15. Draw isometric object from given orthographic projection
16. Draw free hand sketches of Lap riveted joints
17. Draw free hand sketches of Chain riveted joints
18. To Read the different types of drawing given by the manufacturer as per the latest technology i.e. carburetor, MPI system, three valve engine, etc.
19. Draw and Assembled Drawing of a given Disassembled Automobile components – at least four sheets.

NOTE: 1) The theory and practical content as mentioned in the syllabus is clubbed. The student has to prepare Drawing sheets for the full academic year as per syllabus. The guide line for splitting of marks is as follows:-

a) Practical sheet 20 Marks
b) Practical Examination 80 Marks
Examination time 3 Hours

c) The practical of each drawing sheet work should be continuously evaluated by the teacher based on below described criteria the teacher should also give his/her observation for improvement.

Content	Sketch	Neatness	Dimension	Time	Behavior	Total
Marks	08	03	05	02	02	20

d) The student has to maintain his/her drawing sheets consisting of:

a) Name
b) Date of starting
c) Date of completion
d) Difficulties faced
e) Teacher observations

ON-THE-JOB TRAINING SITES, SYLLABUS AND EVALUATION FOR STD: XI AND STD: XII

I. The trainees will be exposed for on-the-job training in the following training sites:-

1. Authorized service centers of four wheeler
2. Private garages and service centers
3. Government workshops for maintenance of vehicles
4. Manufacturing concerns or automobiles

II. The trainees will be exposed to require work experience in the following areas:-

1. Daily maintenance of vehicles
2. Washing, cleaning and oil changing
3. Servicing and high pressure lubrication of vehicles
4. Programming book keeping, fuelling of vehicles
5. Working in front axle, rear axle, brakes and steering linkages
6. Working in electrical section
7. Working in gearbox, clutch, propeller shaft and differential
8. Working in painting sections
9. Working in spring reassembling and brake-drum skimming
10. Working battery section and electrical wiring section
11. Working in tyre section
12. Working of front axle, front suspension, rear axle and rear suspension
13. Working on the overhaul of carburetor and its proper setting
14. Working on the engine tuner and control of pollution level in the exhaust
15. Practice use of varies tools and instruments and special equipment, in garages
16. Work in the cleaning of air filter and overhaul of fuel
17. Work on the servicing of distributors and develop skills in the repair of C.B. points
18. To overhaul the brakes system
19. To identify various spare parts as per catalogue

III. EVALUATION OF ON-THE-JOB TRAINING (OJT)

Evaluation of the various components of OJT is required to be done by adopting the following techniques:

I. Observation

Since the major emphasis of the OJT programme is on the development of performance skills, work habits and attitudes, observation technique is to be adopted for assessment of the students. The supervisor in consultation with the vocational teacher develops a ratting sheet and records his observation on various criteria.

1. Attitudes, work habits and work ethics

1.1- Willingness to works to work
1.2- Ability to work with others
1.3- Responsibility
1.4- Respect for Authority
1.5- Regularity of attendance
1.6- Punctuality
1.7- Honesty
1.8- Enthusiasm for learning
1.9- Observation of time schedule
1.10- Handling of tools and equipments
1.11- Inventiveness
1.12- Risk taking activities

2. Skills

2.1- General work performance
2.1.1 – Motivated
2.1.2 – Works consistently
2.1.3. - Organic own work area
2.1.4 - Cares for tools equipments
2.1.5 - Receives and follows instructions
2.1.6 - Takes decision in dependently

2.2 Work quantity

2.2.1 – Achieves speed
2.2.2 – Express interest in own productivity
2.2.3- Seeks means to increase output

2.3 Work process

2.3.1- copes with problems faced during the process
2.3.2- Follows safety regulations

3. Interview and Viva - Voce

Occasionally either the supervisor or the Vocational teacher conducts one session with the students to assess his ability to communicate, hiss maturity' self-confidence comprehension and his overall deposition.

4. Report(daily diary Report)

The students should prepare a report to be examined by the supervisor and teacher for the job assigned to him by the supervisor and submit before the Termination of the training.

IV. ON-THE-JOB TRAINING (OJT) Marking Scheme

Marks will be assigned under following heads:- (To be converted into grades) in:-

1. OJT

1) Observation Technique (Skills, work habit, attitude, etc)	25 marks
2) Daily diary Report and Progress Report	25 marks
3) Interview/oral based on O.J.T. Report	10 marks
4) Attendance	15 marks
	TOTAL: 75 marks

2. Fields visits/Industrial visits

1) Enthusiasm for learning	05 marks
2) Discipline during visit	05 marks
3) Viva	10 marks
4) Attendance	05 marks
	TOTAL:25 marks
	Grand Total 100 marks

Sr.No.	Training Periods	Hours	Marks
1.	On- the-Job Training At least 6 weeks duration during Vacation (Winter Vacation/Summer Vacation)	288	75
2.	Field visits/Industrial visits minimum 4 visits in different works sites	192	25
	TOTAL	**450**	**100**

DATA TO BE MAINTAINED ON O.J.T. DIARY/SHEETS

1. Name of the School
   Name of the student
   Name and seal of the Industry/workshop
2. Company profile
3. Onwards (everyday new page containing the following)
    1) Date and day
    2) Reporting and Departure time
    3) Work done during the day (with vehicle make and Reg.No.)
    4) Tools and Equipments used
    5) Consumables required and spares replaced
    6) Supervisors/Manager/Head mechanics/owner signature and seal with remarks
    7) Signature of the visiting staff member

4. Attendance certificate/sheet from the unit (To be prepared by school and filled by unit)
5. OJT Completion certificate by the School/Industry/Workshop

SUGGESTED LIST OF COLLABORATING AGENCIES

The student must be place for O.J.T where either one or more of the activities listed below are performed:-

1. Road Transport Corporation, workshops/divisional workshop/depots (KTC)
2. Dealers service station and workshops
3. Reputed Automobile garages
4. Small workshops/garages/service stations
5. Government organization having Auto section
6. Private garages
7. Manufacturing ferns like Bajaj, Kinetic etc.

LIST OF REFERENCE BOOKS FOR STD: XI AND XII

1. ENGINEERING DRAWING

1) Engineering Drawing- N.D.Bhat
2) Machine Drawing – N.B.Bhat
3) Machine Drawing – G.R.Nagpal
4) Engineering Drawing – R.V.Mali Vrinda Publication

2. ENGINEERING MATHS

1) Mathematics for Polytechnic students-By S.P.Despande
2) ABC of Mathematics Std.XIth and Std:XIIth

LIST OF TOOLS AND EQUIPMENTS for
AUTO ENGINEERING TECHNOLOGY COURSE STD: XI & XII

Description	Qty
01) D.E.SPANNER SET 10-32mm	02
02) D.E. SPANNER SET 06-22mm	02
03) ADUSTABLE SPANNER 8"	01
04) SPARK PLUG SPANNER	01
05) LONG NOOSE PLIER	02
06) CIRCLIP PLIER (INTERNAL n EXTERNAL)	04
07) WIRE BRUSH	01
08) COMBINATION PLIER	03
09) SCREW DRIVER SET	01
10) FEELER GAUGE	01
11) HAMMER BALL PEEN	02
12) OIL CAN	01
13) NYLON HAMMER	01
14) SOCKET SPANNER SET	01
15) ADJUSTABLE SPANNER 20 mm	01
16) SPAK PLUG SPANNER 14mm	01
17) D.E. SPANNER SET 6-32mm	01
18) D.E. SPANNER SET 9-32mm	01
19) SPANNER SOCKET SET OF 8 HANDLE T-BAR SOCKET	01
20) SPANNER T-FLEX FOR SCREWING N UNSCREWING IN ASSESIBLE POSITION	01
21) ALLEN KEY SET (METRIC)	01
22) ALLEN KEY SET (INCHES)	01
23) PIPE WRENCH 90 cms	02
24) VALVE SPRING LIFTER	01
25) VALVE SEAT CUTTING TOOLS LOOP WITH GUIDER PILOT	01
26) STUD EXTRACTOR	01
27) COMPRESSION GAUGE	01
28) PISTON RING EXPANDER n REMOVER	01
29) PRESSURE GAUGE	01
30) FELER GAUGE 10 BLADES	01

31) VERNIER CALLIPER 150mm	**01**
32) TORQUE WRENCH 24-56kg m	**01**
33) BATTERY HYDROMETER	**01**
34) TUBE SPANNERS	**02**
35) FLAT FILE 8" ROUGH	**34**
36) FLAT FILE 8" SMOOTH	**03**
37) FLAT FILE 8" 2nd CUT	**03**
38) SQUARE FILE 6"/8"	**02**
39) ROUND FILE 6"/8"	**02**
40) TRAINGULAR FILE 8" ROUGH	**02**
41) HALF ROUND FILE 10" ROUGH	**02**
42) HACKSAW FRAME 300mm	**03**
43) MARKING TOOL BLOCK UNIVERSAL	**01**
44) MARKING TOOL BLOCK ADJUSTABLE	**01**
45) CENTRE PUNCH 5"	**03**
46) ANGLE PLATE SLOTTED 3"X3"X2.5"	**01**
47) TRI SQUARE 100/150mm	**06**
48) STEEL RULE 12"	**03**
49) MICROMETER SCREW GAUGE 0.25mm	**02**
50) INSIDE CALLIPER 8"	**02**
51) OUTSIDE CALLIPER 8"	**02**
52) DIVIDER 8"	**03**
53) CHISEL 6"X1" n 6"X5/8"	**01**
54) MECHANICAL JACK SCREW TYPE	**01**
55) MULTIMETER (DIGITAL)	**01**
56) ELIMINATOR 5-12V	**01**
57) FOOT PUMP	**01**
58) MAGNET PULLER (BAJAJ, HERO HONDA M80, KINETIC, YAMAHA, TWO LEG)	**01**
59) BEAARING PULLER 8"	**01**
60) DIE SET	**01**
61) BATTERY CHARGER	**01**
62) PORTABLE DRILLING M/C	**01**
63) CROSS WHEEL SPANNER	**01**
64) SCREW SPANNER	**01**
65) PHILIPS SCRE DRIVER 3", 4", 6" 8"	**01**

66) TUBULAR HACKSAW FRAME	**02**
67) WOODEN MALLET	**01**
68) DIAGNOL CUTTING PLIER 6”	**01**
69) WIRE CLIPPER	**01**
70) TAP n DIE SET 6-24mm	**01**
71) CUTTING SHEARS TIN 8”	**01**
72) CAST IRON SURFACE PLATE 12”X12”	**01**
73) WATER PUMP	**01**
74) HYDRAULIC TROLLEY JACK	**01**
75) VACCUM GAUGE	**01**
76) CAR WAHER	**01**
77) BENCH VICE 8”	**01**
78) SELF STARTER	**01**
79) DISTRIBUTOR Assy	**01**
80) S.U.ELECTRICAL PUMP	**01**
81) ELECTRONIC HORN	**01**
82) WIND SCREEN WIPER 12V	**01**
83) SIDE INDICATOR FLASHER	**01**
84) OIL PUMP (GEAR TYPE)	**01**
85) CAR ENGINE	**01**
86) REAR HUB PULLER	**01**
87) COMPRESSIONGAUGE 100-300P.S.I	**01**
88) STROBOSCOPIC LAMP	**01**
89) ARBOUR PRESS 01 Tonne	**01**
90) BENCH GRINDER HEAVY	**01**
91) TORQUE WRENCH 7-30kg/m	**01**
92) BEARING PULLER INTERNAL	**01**
93) EXTENSION BAR 5”	**01**
94) REVERSIBLE RATCHET ½”	**01**
95) HOLLOW PUNCH SET	**01**
96) DISTRIBUTOR SPANNER	**01**
97) WELDING MACHINE	**01**
98) AIR COMPRESSOR	**01**
99) MICROMETER 25-100mm	**01**
100) WIRE FEELER GAUGE	**01**
101) VEHICLE STAND	**04**
102) FIRST AID BOX	**01**
103) ARMA TURE GROWLER TESTER	**01**
104) BATTERY CHARGER	**01**
105) FUEL INJECTIONPUMP TESTER	**01**

106) AIR PRESSURE GAUGE	**01**
107) STEERING GEAR BOX	**02**
108) GEAR BOX	**01**
109) CLUTCH Assy	**02**
110) UNIVERSAL JOINT	**01**
111) FEED PUMP	**01**
112) SHOCK ABSORBER	**02**
113) FUEL PUMP	**01**
114) CYLINDER BLOCK	**03**
115) DRAWING BOARD with TABLES	**25**
116) CHARTS	**17**
117) THREE WHEELER	**01**
118) TWO WHEELER	**03**
119) FOUR WHEELER (DIESEL n PETROL)	**01**
120) BENCH VICE 4”	**12**
121) EXTENSION CORD	**01**
122) M P F I CAN	**01**
123) MOTOR CYCLE (FOUR STROKE ENGINE)	**02**
124) POWER STEERING UNIT	**01**
125) GEAR BOX (CONSTANT MESH)	**01**
126) GEAR BOX (SYNCHRONIZING)	**01**
127) DIFFERENTIAL	**01**
128) MAC PHERSON SUSPENSION SYSTEM	**01**
129) FRONT AXLE (DEAD TYPE)	**01**
130) ENGINE STAND	**01**
131) JEEP ENGINE	**01**
132) DIAPHRAGM CLUTCH	**01**
133) VERO DRIVE UNIT	**01**
134) SCOOTY, ACTIVA, ENGINE	**01**
135) CONSTANT VELOCITY JOINT	**01**
136) SCOOTER ENGINE (FOUR STROKE)	**01**

AUTOMOBILE ENGINEERING TECHNOLOGY COURSE

REVISED CURRICULUM – STD: XII

Subjects for Std:XII

1) Automobile Engineering II
2) Auto Servicing and Garage Management
3) Auto Transmission
4)Auto Electrical

AUTOMOBILE ENGINEERING TECHNOLOGY

TEACHING SCHEME AND MARKS (STANDARD XIITH)

Sr.No.		Lectures		Marks		
	Subjects	Theory	Practical	Theory	Practical Oral/ Viva	Total
	COMPULSORY SUBJECTS					
1.	English (Communication Skills)	05	-	70	30	100
2.	General Foundation Course	05	-	70	30	100
3.	Automobile Engineering II	03	05	50	100	150
4.	Auto Servicing and Garage Management	03	05	50	100	150
5.	Auto Transmission	03	05	50	100	150
6.	Auto Electrical **Field Visit**	03	05	50	100	150
	School Assessment Subjects					
7.	ON-THE-JOB TRAINING	06 weeks Industrial Training		GRADE		
8.	Physical Education /NSS/NCC/YRC	-	02	Grade is as per General Stream Scheme		
9.	Computer Awareness	-	02	Grade to be given as per the Scheme		
10.	E.V.S.	02	-	Grade to be given as per the scheme		
		24	24	340	460	800

NOTE:

1) Passing- Minimum 25% in theory, minimum 25% in Practical, overall 30% i.e. Grade G
2) Engineering Drawing – Practical – 100 marks
   Engineering Maths - Theory - 50 marks
3) Individual passing in Engineering mathematics and Engineering Drawing subjects.
   Minimum passing in Engineering Mathematics is 25% in Theory and minimum passing in Engineering Drawing in 25% in Practical.
4) Computer Awareness teacher to be taken outside the regular instructions hours.

SCHEME OF INTERNAL ASSESSMENT FOR STD XII

AUTOMOBILE ENGINEERING TECHNOLOGY COURSE

Sr. No.	Subject	First Term Exam				Second Term Exam				TOTAL	Average Marks
		Mid Term test				Assignment /Oral Project		Preliminary Exam			
		Time	Marks	Time	Marks	1st Term	2nd Term	Time	Marks		
1.	English (Communication Skills)	1 Hr	10	3 Hrs	70	20	30	3 Hrs	70	200	100
2.	General Foundation Course	1 Hr	10	3 Hrs.	70	20	30	3 Hrs	70	200	100
3.	Automobile Engineering – II (T)	1 Hr	10	2 Hrs.	40	-	-	2 Hrs	50	100	50
	Automobile Engineering – I I (P)	-	-	3 Hrs.	50	-	-	3 Hrs	50	100	100
4.	Auto Servicing & Garage Management (T)	1 Hr	10	2 Hrs	40	-	-	2 Hrs	50	100	50
	Auto Servicing & Garage Management (P)	-	-	3 Hrs	50	-	-	3 Hrs	50	100	100
5.	Auto Transmission (T)	1 Hr	10	2 Hrs	40	-	-	2 Hrs	50	100	50
	Auto Transmission (P)	-	-	3 Hrs	50	-	-	3 Hrs	50	100	100
6.	Auto Electrical (T)	1 Hr	10	2 Hrs	40	-	-	2 Hrs	50	100	50
	Auto Electrical (P)	1 Hr	-	3 Hrs	50	-	-	3 Hrs	50	100	100
7.	On Job Training	Grading Pattern is shown in scheme									Grades
8.	Physical Education/NCC/NSS/YRC	Grading Pattern should be followed									Grades
9.	Computer Awareness	Grading Pattern should be followed									Grades
10	EVS	Grading Pattern should be followed									Grades

NOTE: (1) 20 marks mid-term test question paper must be set and same to be converted in 10 marks

(2) Practical element in four core subjects is evaluated in four separate units, where each unit is carry weight age of 25 marks. First Term-Unit I-25 marks & Unit II-25 marks, Total=50 marks and second term-Unit III-25 marks & Unit IV-25 marks-total 100 marks

AUTOMOBILE ENGINEERING TECHNOLOGY
TRANSCRIPT OF STUDY SCHEME – AET (YEARLY) – STD: XII

Subjects	Theory		Practicals		Total	
	Hours	Marks	Hours	Marks	Hours	Marks
1.English (Communication Skills)						
2. General Foundation Course						
3. Automobile Engineering II	63	50	113	100	176	150
4. Auto Electrical	63	50	113	100	176	150
5. Auto Transmission	63	50	113	100	176	150
6. Auto Servicing & Garage Management	63	50	113	100	176	150
	Field Visit 24					
ON-THE-JOB TRAINING			**288 GRADE**		**288 GRADE**	
Physical Education/NSS/NCC/YRC			**GRADE**		**GRADE**	
Computer Awareness			**GRADE**		**GRADE**	
Environmental Education			**GRADE**		**GRADE**	

NOTE: (1) Computer Awareness lecture(s) to be taken out side the regular instruction hours

(2) Passing-minimum 25% in theory. Minimum 25% in Practical, overall passing 30% i.e. grade G.

AUTOMOBILE ENGINEERING II - STD: XII

TEACHING SCHEME	EXAMINATION SCHEME
THEORY: 3 PERIODS PER WEEK	THEORY: 50 MARKS ((2HRS)
PRACTICALS: 5 PERIODS PER WEEK	PRACTICALS: 100 MARKS (3HRS)

1. PETROL ENGINE FUEL SUPPLY SYSTEMS

MARKS (6) PERIODS (08)

1.1 Purpose of fuel system for process of combustion

1.2 Types of fuel feed system like gravity, pressure, vacuum, pump and fuel injection systems.

1.3 Components of fuel supply system: fuel tank; fuel pumps like A.C. mechanical fuel pump, S.U. electrical fuel pump; Fuel pump testing; air cleaners like heavy duty type air cleaner, light duty type air cleaner, thermostatic control air cleaner; fuel filters; Fuel gauge; Construction and working and material used of the above mentioned components

1.3 Process of carburetion as vapoursation, atomization, and air-fuel ratio.

1.4 Introduction to carburetor-functions of carburetor, requirements of carburetor, Principle, Operation, venture effects, classification of carburetors

1.5 Simple carburetor-its constructional details and working

1.6 Study different carburetor circuits like float circuit, idle speed circuit, low speed circuit, acceleration speed circuit, choke circuit.

2. DIESEL ENGINE FUEL SUPPLY SYSTEMS

MARKS (8) PERIODS (10)

2.1 Introduction, air supply system, fuel supply system, and requirements of fuel injection system, diesel fuel, fuel transfer pump, and fuel filters.

2.2 Methods of fuel injection – air blast injection, airless or solid injection, bleeding of injection, maintenance of injection system

2.3 Fuel injection pump-function, construction and working, calibration of FIP, phasing of injection pump, timing of FIP

2.4 Injector- parts of injector, construction and working, nozzle types, testing and adjusting of injectors, maintenance of injection system.

2.5 Governors-types of governors like mechanical, pneumatic, hydraulic their constructional details and working

2.6 Turbo charges-operations and working

2.7 Superchargers-objects of supercharging, types of superchargers like centrifugal, roots and vane type supercharger

3. PETROL ENGINE FUEL INJECTION SYSTEM

MARKS (6) PERIODS (8)

3.1 Introduction of petrol injection
3.2 Advantages and dis-advantages of petrol injection
3.3 Location of injector-cylinder, port and manifold
3.4 Injection carburetion
3.5 Multi point fuel injection (MPFI)
3.6 Comparison between MPFI and carburetor
3.7 Types of MPFI-D-MPFI; L-MPFI
3.8 Electronic fuel injectors
3.9 Gasoline fuel injection
3.10 Electronic fuel injection
3.11 Throttle body versus port injection
3.12 Throttle body fuel injection
3.13 Port fuel injection

4. L.P.G AND C.N.G FUEL SYSTEM

MARKS (4) PERIODS (6)

4.1 Layout of L.P.G. used in Automobile
4.2 Construction and working of L.P.G. fuel & system
4.3 Layout of C.N.G. used in Automobile
4.4 Construction and working of C.N.G. fuel system

5. LUBRICATION SYSTEM

MARKS (8) PERIODS (10)

5.1 Introduction, objects of lubrication, functions of lubricating oil, properties of lubricants, types of lubricants, viscosity ratings, testing of lubricants, grades of lubricants, additives used in oil, main parts of engine requiring lubrication.

5.2 Systems of engine lubrication like pet roil, splash, pressure and dry sump systems.

5.3 Components of pressure system of lubrication – oil strainer, oil pump, oil filter, oil level indicator, oil pressure gauge, oil pressure warning light, oil cooler, oil strainer, oil seals.

5.4 Types of oil pump-gear pump, crescent type gear pump, rotor pump, and plunger pump vane pump

5.5 Oil filtering systems-by-pass system and full flow system
5.6 Types of oil filters-Cartridge type, Edge (or stack) type, centrifugal type
5.7 Dilution, Crankcase ventilation-breather tube (open system), positive crankcase ventilation (closed system)

6. COOLING SYSTEM MARKS (6) PERIODS (8)

6.1 Necessity, methods of cooling-air and water-cooling: comparison of air and water-cooling.

6.2 Air cooling-advantages and dis-advantages, air-cooling fans-axial flows and radial flow, natural and forced air cooling system, cooling fins.

6.3 Water cooling-systems of water-cooling like thermo siphon water-cooling system and pump circulation system

6.4 Components of water-cooling system-Radiator: Thermostat, types of thermostat like bellows type and pellet type: pressure cap and expansion reservoir; water pump; cooling fans like blower type, suction type, and electric driven type; water jackets; water temperature gauge like mechanical type (Bourdon tube type) and electrical operated type;

6.5 Other types of engine cooling-liquid cooling, steam cooling and closed system of cooling.

6.6. Anti-freeze solutions-requirements, functions, types of anti-freeze mixtures and percentage of additives in cooling water

6.7. Cleaning of the cooling system, radiator flushing draining and filling cooling system, thermostat servicing, pressure cap checking water pump servicing

7. AUTOMOBILE AIR CONDITIONING SYSTEM

MARKS (6) PERIODS (12)

7.1 Introduction; Ventilation system; heating system; heating controls;
7.2 Purpose and principles of air-conditioning
7.3 Operation of air conditioning system
7.4 Air conditioning system components- (i) Compressor-types of compressor like piston compressor, swash plate compressor, rotary type compressor; (ii) Compressor clutch or magnetic clutch; (iii) Condenser;

(iv) Receiver dryer or dehydrator; (v) Expansion valve; (vi) Evaporator;
(vii) Sight glass; (viii) Suction throttling valve.

7.5 Refrigerant and environment;
7.6 Inspection of air conditioner;
7.7 Refrigerant leak detecting methods like Flame (halide) leak detector, Electronic leak detector, and Fluid leak detector

7.8 Types of Control Systems- (a) low side pressure control, (b) Pressure operated bypass, (c) Solenoid operated by-pass, (d) Electromagnetic clutch,(e) Combination of above controls.

7.9 Car and truck air-conditioning
7.10 Trouble Shooting

8.AIR POLLUTION AND EMISSION CONTROL

MARKS (6); PERIODS (12)

8.1 Introduction

8.2 Air pollution, effects of pollutants, controlling the pollution by ant-pollution law-Bhart III and Bhart IV, improvement in design, preventive maintenance

8.3 Complete and incomplete combustion process of combustion; Constituents of exhaust.

8.4 Pollutant formation-carbon monoxide, Nitrogen oxides, Sulphur dioxide,Hydrocarbons, Lead and soot.

8.5 Sources of pollutant in an automobile-fuel tank and carburetor emissions, crankcase emission, tail pipe emission.

8.6 Control approaches for automobile emissions:-

(a) Positive crankcase ventilation, (b) Fuel vapours emission control – (i) Fuel vapor return line, (ii) Charcoal canister; (c) Exhaust gas re-circulation (EGR); (d) Air injection system- (i) aspirator air system, (ii) Thermal reactor; (e) Catalytic converter.

8.7 Changes in cooling and lubrication systems, Exhaust gas analysis.

STD: XII AUTOMOBILE ENGINEERING II (PRACTICALS)

1. To study the constructional details and working of gravity fuel feed system in two wheelers
2. To dismount the carburetor from scooter/motorcycle, trace the different circuit with their constructional features and study the fuel supply in relation with speed and load.
3. To dismount the carburetor from the car, trace the different circuit with their constructional features and study the fuel supply in relation with speed and load.
4. To study the constructional details and working of the fuel feed system used in car.
5. To dismantle the mechanical fuel pump used in petrol fuel system, and carry out the inspection and testing of each component.
6. To demonstrate the constructional details and working of the fuel system used in diesel engine.
7. To dismount the fuel feed pump from the fuel injection pump, dismantle, clean, inspect, and study its components and its workability.
8. To check the condition of fuel lines and list the precautionary points to avoid air and fuel leakages in diesel engine.
9. To dismount the injector nozzle assembly from a diesel engine of a four-wheeler, dismantle and clean, inspect carefully, report on condition of components, and suggest remedial measures, rectify defects, reassemble, and test and check the working condition on the engine.
10. To study the constructional details and working of pneumatically operated governor mechanism of fuel injection pump of multicylinder diesel engine.
11. To study the constructional details and working of mechanically operated governor mechanism of fuel injection pump of multicylinder diesel engine.
12. To study and set the fuel injection pump timing (field visit).
13. To demonstrate the process of calibration of four-cylinder fuel injection pump, bleed the system and check the working condition on engine. (Field visit).
14. To demonstrate the construction and working of petrol engine fuel injection system.
15. To study in detail the MPFI system used in petrol engines

16. To study the construction and working of the petrol oil lubrication system used for two stroke engine as follows:(a) without the use of oil pump; (b) with the use of oil pump.
17. To study the constructional details and working of pressurized lubrication system in multicylinder engines.
18. To dismantle the lubricating oil pumps (any type) used in lubrication system, inspect its various components and re-assemble
19. To study the air-cooling system used in two wheelers as: (a) Natural draft air cooling system; (b) Forced circulation air-cooling system.
20. To study the constructional details and working of pump circulation water-cooling system used in multi-cylinder engine.
21. To carry out reverse flushing of water cooling system in multi-cylinder engine.(Demonstration)
22. To dismount and dis-assemble the water pump repair, inspect, and re-fit on the engine.
23. To inspect the following parts used in water cooling system (a) Pressure cap; (b) Thermostat (bellows or pellet type)
24. To study the procedure for (a) Cleaning the water-cooling system and (b) Draining and filling the cooling system.
25. To study the constructional details and working of air conditioning system of a car.
26. To demonstrate the process for checking the refrigerant leak detecting by various methods in automobile air conditioning system.
27. To study the constructional details and working of Catalytic Converter used in petrol engines.
28. Demonstration on pollution under control (PUC) checks up of petrol and diesel engine.

* * * * *

REFERENCE BOOKS

1) **Automobile engineering by K.K.Jain and R.B.Asthana(Tata Mc Graw Hill)**
2) **Automobile Engineering by R.B.Gupta (Satya Prakashan, New Delhi)**
3) **Automotive Mechanics by S.Srinivasan (Tata Mc Graw Hill)**
4) **Basic Automobile Engineering by C.P.Nakara (Dhanpat Rai Publishing Co.)**
5) **Automobile Engineering I & II by Dr Kirpal Singh**
6) **Automobile Engineering by H.M.Sethi**
7) **Automobile Electrical Enginering by B.D.Arora (R.B.Publications, Delhi)**
8) **Automotive Electrical Equipment by P.L.Kohli.**

SUB: AUTOMOBILE ENGINEERING II – STD: XII

Time: 2 hours **Marks – 50**

Q.1 (A) Answer the following in one sentence each:-

1) V.S.A.(Very short answer)	01 mark
2) V.S.A.	01 mark
3) V.S.A.	01 mark
4) V.S.A.	01 mark
5) V.S.A.	01 mark
6) V.S.A.	01 mark
(B) Essay type	04 marks

Q.2 (A) Answer in short

1) Short answer type	02 marks
2) " " "	02 marks
3) " " "	02 marks
(B) Essay type	04 marks

Q.3 (A) Answer in short

1) Short answer type	02 marks
2) " " "	02 marks
3) " " "	02 marks
(B) Essay type	04 marks

Q.4. (A) Answer in short

1) Short answer type	02 marks
2) " " "	02 marks
3) " " "	02 marks
(B) Essay type	04 marks

Q.5. (A) Answer in short

1) Short answer type	02 marks
2) " " "	02 marks
3) " " "	02 marks
(B) Essay type	04 marks

BLUE PRINT FOR THEORY EXAMINATION

SUBJECT: **AUTOMOBILE ENGINEERING II- STD: XII**
MARKS: 50 **Time: 2 Hours**

Note: Allocation of marks

1. Topic wise marks are given in the instructional material to be followed
2. Marks and weight age according to objective

	Knowledge	Understanding	Application	Skill
MARKS	15	20	10	05
%	30	40	20	10

3. Marks and weight age according to the type of question

	VSA	SA	E
Marks	06	24	20
%	12	48	40

4. Marks/weight age according to difficulty level

	Easy	Average	Difficult
Marks	10	30	10
%	20	60	20

5. Marks/weight age according to the content area

Sr.No.	Content	Marks	%
01	Petrol Engine fuel supply system	06	12%
02	Diesel Engine fuel supply system	08	16%
03	Petrol Engine fuel injection system	06	12%
04	L.P.G.& C.N.G. Fuel System	04	08%
05	Lubrication system	08	16%
06	Cooling System	06	12%
07	Automobile Air Conditioning System	06	12%
08	Air Pollution and Emission Control	06	12%
	TOTAL:	50	100

6. Number of questions

Type	No of questions	Marks
Very short answer	06	06 x 1 = 06
Short answer	12	12 x 2 mks = 24
Essay	05	05 x 4 mks = 20
		50

SUB:AUTO SERVICING AND GARAGE MANAGEMENT - STD: XII

TEACHING SCHEME	EXAMINATION SCHEME
THEORY: 3 PERIODS PER WEEK	THEORY: 50 MARKS ((2HRS)
PRACTICALS: 5 PERIODS PER WEEK	PRACTICALS: 100 MARKS (3HRS)

1. AUTOMOTIVE ENGINES MARKS 08 PERIODS 12

1.1 Review different Engine services like – tune up, minor overhauling, major overhauling as per manufacturer(s) service manual.

1.2 Trouble shooting procedure

1.3 Factors to be considered before re-conditioning an engine and to make study chart

1.4 Conduction of compression test, vacuum test and analysis of result related to the trouble

1.5 Engine timing-valve timing-ignition timing-FIP timing-their setting process

1.6 Trouble shooting procedure followed below mentioned system related with respect to trouble as per specification of vehicle.

(a) Engine does not start but cranks
- Fuel system, ignition system, leakage of combustion gases

(b) Engine does not turn-ignition system, seized engine

(c) Engine backfires – Fuel system, ignition system, mechanical system, engine loading and overheating

(d) Engine does not pick up load/speed – fuel system, ignition system, and poor compression, other causes like brake and tyres, exhaust, wheel alignment, lubrication system.

(e) Engine overheating – Fuel system, ignition system, cooling system, lubrication system, improper line up of engine, other causes, brake binding method.

(f) Engine runs Noisy – diagnosing noise, level of noise (high/low), different types of noise

(g) Engine has poor idle-fuel system, ignition system incorrect ignition pump timing, improper combustion, backfires, and detonation.

(h) Engine starts but stop immediately-starting system, ignition system, fuel system

NOTE: To solve problem follow with the MPFI, CRDL, DITS, Turbo charger system whenever applicable

2. FUEL SYSTEM MARKS 06 PERIODS 06

2.1 Repairing fuel tank, cleaning methods

2.2 Fuel filter service, replacement procedure

2.3 Air cleaner service, cleaning procedure

2.4 Maintenance or diagnosing troubles in fuel system

2.5 A c fuel pump testing, priming on engine, off the engine vacuum, pressure

2.6 Testing of electrical fuel pump

2.7 Servicing of carburetor, trace different circuit as per the troubles, different adjustment of carburetor as per trouble, fuel consumption test.

2.8 Servicing of MPIF system – ECM (PCM), fuel pump relay, fuel pump, fuel injectors

-ECM (PCM)- idle air control, IAC valve intake manifold – Fuel injection control (FIC) – IAT sensor Air cleaner, out let hose-throttle valve (body) TP sensor

2.9 Cleaning diesel fuel system, priming filter, etc.

2.10 Testing and setting of injectors

2.11 Calibration of FIP pump and maintenance of FIP pump-pump timing

2.12 Electronic control system – fuel injection system idle speed control system, fuel pump control system, Radiator fan control system, evaporation immersion control system, A.C. control system, ECM/PCM control system

2.13 LPG and C.N.G – checking, Inspections

2.14 Service and repair super chargers and turbo charge

2.15 Inspection of governor – setting procedure

2.16 Fuel system trouble shooting procedure

i) Excessive fuel consumption – Engine condition, brake and tyre conditions, exhaust gas analysation, wheel alignment, ignition process test, air cleaner service, fuel pump pressure test.

ii) Poor Acceleration and lack of power-Petrol version- Fuel pump test – carburetor service leakage of air from engine's Inspection of carburetor – MPIF, CRDL electronic control. Diesel version-fuel pump testing, fuel filter, air cleaner services, Nozzle test, calibration of FIP Pump Inspection and setting of governor, electronic control.

iii) Engine back finding – carburetor service-Adjustment Nozzle test, pump calibration

iv) Smoky exhaust – Engine condition

v) Stalling of engine – fuel system, engine condition

vi) Fuel starvation – Fuel system, fuel line check for water in fuel tank, check fuel pump check

vii) Excessive knocking – engine condition, fuel system,

viii) Faulty running.

3. COOLING SYSTEM MARKS 04 PERIODS: 06

3.1 Safety precautions and regular maintenance of cooling system

3.2 Cooling system cheeks and test

a) Checking coolant level –preparation of coolant
b) Testing coolant strength
c) Checking/Testing the thermostat, hoses
d) Pressure testing
    i) Radiator cap
    ii) Thermostat valve test
    iii) Checking switch for operating temperature

3.3 cleaning flushing and repair for leaky radiator

3.4 Inspection and replacement procedure to change belt

3.5 Locate and repair leaks in cooling system

3.6 Cooling system trouble shooting

1) Engine overheating
2) Engine worming slowly
3) Cooling system leaky
4) Loss of coolant

4. ENGINE LUBRICATION SYTEM MARKS 03 PERIODS 06

4.1 Lubrication system service
   a) Checking oil level
   b) Changing engine oil
   c) Oil filter service/repair – replace

4.2 Maintenance of oil coolant, oil strainer, relief valve

4.3 Checking/Inspection of oil pumps and indicating devices
   a) Rotor pump
   b) Gear pump
   c) Gear within gear type pump

4.4 Checking methods and areas of internal leakage and trace the area of leakages

4.5 Precaution to be taken to stop sludge formation

4.6 Oil losses through internal leakages and trace the area for leakages

4.7 Lubrication system-External leakages- trace the area for leakages

4.8 Engine Lubrication system trouble shootings
   a) Low oil pressure
   b) High oil pressure
   c) Excessive oil consumption

5. CHASSIS AND TRANSMISSION MARKS :02 PERIODS: 04

(A) CLUTCH

A 5.1 Inspection of clutch and its components related to the trouble(s) in the following types of clutch

- Multiple clutch, simple plate clutch, centrifugal clutch, diaphragm clutch, Vero-drive

A5.2 Maintenance of different types of clutch

A 5.3 Clutch overhaul

A 5.4 Inspection of clutch parts-clutch plate facing, spring tension and repair procedure

A 5.5 Adjustment-clutch linkage adjustment clutch pedal Travel free, clutch release lever

A 5.6 Clutch trouble-shooting procedure
   a) Clutch slip while engaged
   b) Clutch grab or chatters or Judder
   c) Clutch spins or drags
   d) Clutch Noisy/vibration
   e) Clutch pedal free play

(B) TRANSMISSION GEAR BOX MARKS:02 PERIODS: 04

B 5.7 Maintenance of gear boxes and oil change procedure

B 5.8 Inspection of selective mechanism, cleaning and inspect ball/Roller bearing (s)

B 5.9 Gear trouble shooting procedure

a) Transmission Noisy
b) Hard gear shifting
c) Gear shifts out of mesh
d) No power through respective gear of transmission

(C) PROPELLER SHAFT UNIVERSAL JOINT AND DIFFERENTIAL

MARKS: 04 PERIODS: 05

C-5-10 Over handling of propeller shaft, U.Joint, slip Joint

C-5-11 Inspection, checking – propeller shaft, U-Joint, slip joint – Replacement procedure

C-5-12 Overhauling of differential unit

C-5-13 Servicing, checking, adjustment of differential unit by using, dial gauge, red oxide paste, etc.

a) Crown wheel, bevel pinions gear – backlash
b) Sun gear, planet pinion gear – backlash
c) Run out of crown wheel-tooth contact

C-5-14 Trouble shooting procedure

a) Bent propeller shaft
b) Noisy running propeller shaft
c) Drive being not transmitted
d) Noisy differential
e) Growling while taking turn

(D) CHASSIS, SPRING AND SHOCK ABSORBERS AND TYRE

MARKS: 04 PERIODS: 05

D-5-15 Maintenance and Servicing of leaf springs
D-5-16 Inspection of leaf spring, coil spring, shackle, etc
D-5-17 Chassis repair for bent, dent, cracks, accident repair
D-5-18 Chassis defects
D-5-19 Inspection, alignment of chassis
D-5-20 Maintenance of chassis
D-5-21 Inspection and fitting of shock Absorbers
D-5-22 Testing of shock absorbers for its workability
D-5-23 Changing of tyres, disassembly of tyre, precaution to be taken while removing tyres, storing of tyres, rotation of tyres, factors affecting tyre wear, Inspection, care, maintenance of tyre and tube.
D-5-24 Preparation for wheel alignment – computerize
D-5-25 Wheel balance procedure
D-5-25 Trouble shooting procedure

a) Spring noise
b) Hard or rough side
c) Broken spring
d) Road sway, wobble
e) Sagging of spring
f) Steering difficult
g) Wheel bounce
h) Wear of tyre
i) Suspension too flexible

6. STEERING AND FRONT SUSPENSION SYSTEM

MARKS: 05 PERIODS: 08

6.1 Checking axle beam and stub axle for bent
6.2 Checking axle for distortion and twist
6.3 Checking for king-pin-inclination
6.4 Checking eye bushes and beam for distortion and twist, Steering lock with ignition system.
6.5 Adjustment and maintenance of ball joint tie rod drag link
6.6 Hub greasing and adjustment the hub play (Front)
6.7 Over handling of different type steering gear boxes, servicing, checking-Rack and pinion gearbox, worm and roller gearbox, and recalculating steering gear box

6.8 Steering inspection and suspension components
6.9 Computerize E checking (Chat checking)
6.10 Street Assembly check
6.11 Suspension control Arm services, replacement of bushes
6.12 Checking and adjustment wheel alignment and steering geometry-camber, castor, toe-in, toe-out, wheel base, king pin inclination.
6.13 Trouble shooting procedure

a) Hard steering
b) Wander
c) Vehicles pulls to one side
d) Wheel wobble
e) Wheel Tramp
f) Front wheel shimmy
g) Erratic steering when brakes are applied
h) Wheel lash or Excessive back lash in steering mechanism
i) Abnormal tyre wear due to improper steering mechanism, overloading, brake system, suspension system
j) Poor return ability
k) Jerky steering of receiving or road shocks at steering wheel

7. BRAKE MARKS: 03 PERIODS: 06

7.1 Over handling of braking system-hydraulic, disc, Mechanical, drum, servo brakes

7.2 Repair (s) of braking system-brakes shoes, brakes re-facing
7.3 Servicing of disc brake
7.4 Replacement of brake caliper
7.5 Bleeding of hydraulic brake
7.6 Adjustment of brakes
7.7 Brake maintenance
7.8 Brake trouble shooting procedure

a) Insufficient brake
b) Brake drag
c) Spongy brake
d) Noisy brakes
e) Grabbing brakes

GARAGE MANAGEMENT AND MOTOR VEHICLE RULES

8. FACTORS GOVERNING JOB SATISFACTION

MARKS: 02 PERIODS: 04

8.1 Work Base Factor

8.2 Employer base factor

8.3 Employee base factor

9. STORES MANAGEMENT MARKS: 02 PERIODS: 04

9.1 Storage-definition, objectives of store keeping

9.2 Type and functions of stores

9.3 Store systems and procedures, - storage system, issue system, receipt system, common factors to be consider while place ordering, buying tools spare parts as per part number.

10. BASIC INVENTORY CONTROL MARKS: 02 PERIODS: 04

0.1Inventory control in Auto workshop and Auto spare part shop related concepts

11. MOTOR VEHICLE RULE, DRIVING RULES AND TRAFFIC SIGNALS MARKS: 04 Periods: 06

11. 1 Purpose and provision of motor vehicle Act with special reference to air pollution

11.2 Rules related to registration permits

11.3 Rules related to fitness certificate

11.4 Rules related to driving license and safety aspect, number plates in vehicles

a) Light duty vehicle permits
b) Heavy duty vehicle permits

11.5 Minimum spare required for passengers, gang way, floor to ceiling front and rear overhung

11.6 Traffic rules and Regulations, Signaling

11.7 Prescribed forms-driving license, registration, permits, fitness certificate

11.8 Auto Insurance-purpose, types, necessary provision of 3rd party insurance

11.9 Offense and penalties for driving vehicle without

a) Driving license
b) Registration
c) Fitness Certificate
d) Permit
e) Insurance
f) Use of Road signs and signals

Sub: AUTO SERVICING AND GARAGE MANAGEMENT Std.XII (PRACTICALS) – 100 MARKS

LIST OF PRACTICALS

1. To dismount and disassemble the scooter engine is inspected and repair/replace the following engine components to overcome the different engine problems

a) Crank assembly and bearings
b) Piston, Piston rings, cylinder block
c) Valves and valve mechanism
d) Engine casing and bearing
e) Cam shaft and related components
f) Oil pump and pipe line
g) Oil seals, shims, relief valves and control system gadgets
h) Transmission system components

2. To dismount and disassemble the motor cycle engine to inspect and repair/replace the engine components to overcome the different engine problems. Inspect the components listed in Practical No.1 under a to h.

3. To dismount and disassemble the motor cycle engine equipped with latest control system to inspect/replace the engine components to solve the engine troubles from a to h of experiment no.1

4. To dismount and disassemble a car engine (Petrol version) equipped with carburetor to inspect/repair/replace the engine components listed below to solve the engine problems

a) Cylinder head, manifold, muffler
b) Valve train and valve mechanism
c) Car shaft, oil pump, Relief valve
d) Crank shaft-bearing
e) Cylinder block, piston, piston rings
f) Connecting rod and engine bearings
g) Flywheel and related components
h) Valve timing, Ignition timing

5. To dismount and disassemble a car engine- (Petrol version) MPFI system is inspect/repair/replace the engine components and engine emission control system to solve the engine problems from a to h of practical no.4.

6. To dismount and disassemble a car engine (Diesel Version) to inspect/repair/replace the engine components listed below to solve the different engine problems.

a) Cylinder head, manifolds, muffler
b) Valve train and valve mechanism
c) Car shaft, oil pump, relief valve, temp. Sensor
d) Crank shaft-bearing clearance, end play of crank shaft
e) Cylinder block, piston, piston rings
f) Connecting rod, big end and small end bearings
g) Flywheel and related components
h) Valve timing, ignition timing, FIP timing

7. Dismount and disassemble the Diesel engine equipped with Turbo-charger and CRDC system to inspect, repair replace the engine components listed in job no.6 from a to h and to test the engine emission control system.

1) To carry out calibration of FIP – In line and rotor type
2) To carry out nozzle pressure test for better performance

8. To dismount and disassemble the three-wheeler engine to inspect, repair/replace, to overcome the different engine problems listed in job no.1 a to h.

9. To dismount and disassemble the carburetor from scooter/motorcycle/moped to moderate proper fuel supply to get better performance inspect and check/set the carburetor

a) Idle speed
b) Low speed
c) Economic/Normal speed
d) High speed
e) Idle speed and idle mixture adjustment

10. To dismount and dis assemble the carburetor from a car to moderate proper fuel supply and to get better engine performance. Also inspect and check/set the carburetor listed in job no.9 from a to e.

11. To inspect the following components of fuel system
    a) Fuel injector
    b) Delivery pipe
    c) Fuel pressure regulator
    d) EVAP canister
    e) EVAP canister purge valve
    f) Fuel feed line
    g) Fuel return line
    h) Fuel vapor line
    i) Fuel filter
    j) Fuel pump
    k) Fuel pressure
    l) Fuel tank

12. To check the emission control system of car engine and provide appropriate performance.

    a) Idle air control system
    b) Evaporative emission control system
    c) Engine start signal
    d) Control signal
    e) Electric load signal
    f) Transmission range signal

13. To provide necessary service to FIP (Fuel injector pump) inline/rotary type to overcome the below mentioned troubles.

    a) Poor acceleration and lack of power
    b) Engine backfires
    c) Smoking black element
    d) Engine stalling
    e) Excessive knocking (Demonstration)

14. To service multipoint injection (MPFI) system of a car to overcome the troubles mentioned above job no.13 from (a to e).

15. Provide necessary service to the cooling system of multi cylinder engine to over come the troubles and to flushing the cooling system and repair the below mentioned components.

1) Leaky radiator
2) Radiator pressure test
3) Strength of coolant
4) Test thermostat valve
5) Preparation of coolant
6) Fan belt tension
7) Water pump and Horses

16. To service the lubrication system of multi-cylinder engine to overcome troubles from lubrication system.

17. To dismount and disassemble the clutch of scooter to overcome the below mentioned troubles and provide the necessary adjustments and to inspect related cause

a) Clutch slips when engaged
b) Clutch grabs or chatters
c) Clutch spins or drags
d) Clutch Noisy

18. To dismount and disassemble the centrifugal clutch to overcome the below mentioned troubles:-

a) No pick up
b) Noisy running
c) Jerky clutch

19. To service the centrifugal clutch and Vero-drive from a vehicle to overcome the below mentioned troubles:-

a) Noisy transmission
b) Vehicle does not run at high speeds

20. To dismount and disassemble the single plate diaphragm clutch and attend the following troubles and attend the following troubles and provide the necessary adjustments and to inspect related components.

a) Clutch slips when engaged
b) Clutch grabs or chatters
c) Clutch spins or drags
d) Clutch noisy

21. To dismount the constant mesh gear box to overcome the below mentioned troubles and to inspect related components

a) Noisy transmission
b) Hard gear shifting
c) Gear shifter out of mesh

22. To dismount the synchromesh gearbox to overcome the above mentioned troubles in practical no from a to c and to inspect related components.

23. To dismount and adjust the differential unit of a car to overcome the below mentioned troubles
a) Noisy differential
b) Growling while taking turn
c) Drive not being transmitted

24. To dismount and adjust the differential unit of a 3-wheeler to overcome the below mentioned troubles and to inspect related components
a) Noisy differential
b) Drive not being transmitted
c) Growling while taking turn

25. To dismount and disassemble the steering gear box of a car/jeep and its linkages to overcome the below mentioned troubles, also provide necessary adjustments

a) Hard steering
b) Wander
c) Vehicle pulls to one side
d) Wheel wobble
e) Front wheel shimmy
f) Wheel tramp
g) Wheel lash or excessive backlash in steering
h) Abnormal tyre wear due to improper steering mechanism

26. Provide necessary service to the fork assembly of motorcycle to over come the below mentioned troubles and also inspect related components

a) Vehicle pulls to one side
b) Wander
c) Hard steering
d) Uneven tyre wears
e) Road Way

27. Provide necessary service to the fork assembly of scooter to over come the below mentioned troubles

a) Vehicle pulls to one side
b) Wander
c) Hard steering
d) Uneven tyre wears
e) Road way

28. To service the mechanical brakes to overcome the following troubles:-

a) Inefficient brakes
b) Brake drag
c) Noisy brake

29. To service the hydraulic brake system to overcome the following troubles

a) Brake pedal goes to floor
b) Inefficient brakes
c) Spongy brake
d) Noisy brake

30. To service the disc brake used in motorcycle for efficient working

31. To collect the charts of different traffic signs

32. To prepare costing and estimate statement for repair Automobile Job (at least four)

33. Performa to place order of Auto spare parts/materials

34. To fill up various R.T.O. forms for
    - Driving license for learning and permanent
    - Registration of vehicle
    - Permit
    - Tax payment
    - Transfer to ownership of vehicle, etc.
      Forms no. 2,3,4,6,7,8,9,20,21,22,23,46

35. Preparation of Job cards – Service Report

NOTE: 1) The field trip should be conducted in the related establishment as per the availability of equipments by the subject teacher and the job must be written in file/journal.

2) Each student has to maintain his journal/file consisting of

1) Aim
2) Date
3) Tools and materials
4) Procedure
5) Inspection/checking/adjustment
6) Report
7) Safety precautions
8) Sketches if any
9) Teachers observation
10) R.T.O. forms/Traffic sign/sketches/Estimating statement/store registers, etc.

SUB: AUTO SERVICING AND GARAGE MANAGEMENT STD: XII

MODEL QUESTION PAPER

MARKS: 50 **TIME: 2 HOURS**

Q.No.1 (A) Answer the following question

(1) Very short answer type (one sentence)	01 mark
(2) Short type	02 marks
(3) Short Answer type	02 marks
(4) Short Answer type	02 marks
(B) Answer the following	
(1) Essay type	03 marks

Q.No.2 (A) Answer the following question

(1) Very short answer type (one sentence)	01 mark
(2) Short type	02 marks
(3) Short Answer type	02 marks
(4) Short Answer type	02 marks
(B) Answer the following	
(1) Essay type	03 marks

Q.No.3 (A) Answer the following question

(1) Very short answer type (one sentence)	01 mark
(2) Short type	02 marks
(3) Short Answer type	02 marks
(4) Short Answer type	02 marks
(B) Answer the following	
(1) Essay type	03 marks

Q.No4 (A) Answer the following question

(1) Very short answer type (one sentence)	01 mark
(2) Short type	02 marks
(3) Short Answer type	02 marks
(4) Short Answer type	02 marks
(B) Answer the following	
(1) Essay type	03 marks

Q.No.5 (A) Answer the following question

(1) Very short answer type (one sentence)	01 mark
(2) Short type	02 marks
(3) Short Answer type	02 marks
(4) Short Answer type	02 marks
(B) Answer the following	
(1) Essay type	03 marks

BLUE PRINT FOR THEORY EXAMINATION

SUBJECT: **AUTO SERVICING AND GARAGE MANAGEMENT- STD: XII**

MARKS: 50 **Time: 2 Hours**

Note: Allocation of marks

1. Topic wise marks are given in the instructional material to be followed
2. Marks and weight age according to objective

	Knowledge	Understanding	Application
MARKS	10	20	20
%	20	40	40

3. Marks and weight age according to the type of question

	VSA	SA	E
Marks	05	30	15
%	10%	60%	30%

4. Marks/weight age according to difficulty level

	Easy	Average	Difficult
Marks	08	30	12
%	16	60	24

5. Marks/weight age according to the content area

Sr.No.	Content	Marks	%
01	Auto Motive Engines	06	12
02	Fuel System	05	10
03	Cooling System	04	08
04	Engine Lubrication System	03	06
05	Chassis and transmission	12	24
06	Steering & Front Suspension System	05	10
07	Brake	03	06
08	Factors Governess, job satisfaction	02	04
09	Store Management	02	04
10	Basic Inventory Control	02	04
11.	MVR & Traffic Signal	06	12
	TOTAL:	**50**	**100**

6. Number of questions

Type	No of questions	Marks
Very short answer	05	05
Short answer	15	30
Essay	05	15
TOTAL:	**25**	**50**

REFERENCE BOOKS FOR STD: XII
SUB: AUTO SERVICING AND GARAGE MANAGEMENT

1. Auto motive mechanics by crouse and Angline
2. Bassic Autobobile Engineering by C.P. Nakara
3. Automobile Engineering Voc.I, II by Dr. Kripal Singh
4. Industrial Organisation by A.S. Despande
5. Motor vehicle Act amended up its date central Govt of India
6. Industrial Engineering by O.P. Khanna
7. Automobile Engineering Vol.I,II,III,IV by Anil Chhikara
8. **Service Manuals**

1. **BAJAJ**- Platina 125 DTSSI, X CD 125 DTSSI-Discover 135 DTSI
2. **HERO HONDA**-CD DAWN, Splender +, Pasion + Hunk, Karizma Activa DIO, Eterno, Shine, Unicon
3. **MARUTI SUZUKI** – 800, omni, Alto, Swift, Dzive
4. **TATA** – Indica, Safari, Nano, Indiga, Marina. Winger Sumo Victa Tata sumo
5. **SUSUKI**- Acces 125, Zeus 125
6. **TOYATA** – INNOVA
7. **CHEVROLET** – Spark, AVEO, TAVERA
8. **FIAT**- LINea, Palio Stile
9. **FORD**-FIESTA, FUSION, IKON
10. **HINDUSVAN**- Ambassador
11. **HONDA**-Accord, city, CIVIC
12. **HYUNDAI**- I 10, I 20, Accent, GETZ, VERNA SANTRO Xing
13. **MANINDRA** – Logar, Bolero, Scorpio, Xylo
14. **MARUTI**- 800, Alto, A-Star, Omni, Zen, Wagnor, 8WIFT, D-Zire, SX4 Versa Gypsy, Grand Vitara, Ritz
15. **REVA ELECTRICAL CAR CO** – Rena
16. **TVS** – Scooty pep, Apache, RTR 160, EFI model
17. **YAMAHA, Gladiator, Rs**-SS, Fz 16, Yz F1R1 FZS

AUTO-TRANSMISSION -STD: XII

TEACHING SCHEME	EXAMINATION SCHEME
THEORY: 3 PERIODS PER WEEK	THEORY: 50 MARKS ((2HRS)
PRACTICALS: 5 PERIODS PER WEEK	PRACTICALS: 100 MARKS (3HRS)

THEORY CONTENT

1. CLUTCHES **07 Marks 10 Periods**

1.1 Introduction to clutches
1.2 Function of clutch, requirement of clutch
1.3 General Principle of operation
1.4 Types of clutches
1.5 Constructional details, working, advantages and disadvantages of
   a. Single plate clutch with diaphragm spring
   b. Multi plate clutch - Dry and wet type
   c. Centrifugal clutch
   d. Semi-centrifugal clutch
1.6 Types of clutch operation
   a. Mechanically operated
   b. Hydraulic operated
   c. Vacuum clutch
   d. Introduction to Electronically operated clutch
1.7 Introduction to Automatic clutches
   a. Vero drives
   b. Fluid fly wheel

2. TRANSMISSION **06 Marks 10 Periods**

2.1 Introduction, Principles of leverage and Gear torque
2.2 Types of Resistance
2.3 Function/purpose of Gearbox
2.4 Requirements of Gear box
2.5 Types of gears used in gearbox
   a. Spur type
   b. Helical type
2.6 Types of gearbox, their construction, working, advantages and disadvantages
   a. Constant mesh used in two wheelers and four wheelers
   b. Synchromesh gear box
2.7 Introduction to automatic transmission system with Planetary/Epicyclic Gears
2.8 Introduction to Torque converter
2.9 Overdrive mechanism-Introduction, need, construction, working, advantages and disadvantages
2.10 Introduction to Auxiliary gear box (Transfer box) – its purpose, construction and working

3. DRIVE LINES 04 Marks 08 Periods

3.1 Introduction to the layout of Power transmission, advantages and disadvantages of
   a. Front wheel drive
   b. Rear wheel drive
   c. Four wheel drive

3.2 Propeller shaft – Introduction, functions

3.3 Propeller shaft, its construction and working

3.4 Universal joint and their types with its functions, construction, working, advantages and disadvantages

   a. Variable velocity joint like Hooke's type
   b. Constant velocity joint

3.5 Slip joint and its function

3.6 Types of drive with its function, construction and working of Hotchkiss drive

4. DIFFERENTIAL AND REAR AXLE 05 Marks 06 Periods

4.1 Differential
   a. Introduction and principle of differential
   b. Functions
   c. Construction details and working of differential

4.2 Real axle
   a. Loads acting on rear axle
   b. Types of rear axles, their construction, advantages and disadvantages
      i. Semi floating
      ii. Three quarter floating
      iii. Fully floating

4.3 Axle casing and its advantages and disadvantages

5. WHEELS AND TYRES 03 Marks 07 Periods

5.1 Wheels
   a. Requirements of Road wheel
   b. Types of wheels and constructional details
      i. Split type disc
      ii. Pressed disc
      iii. Wire and spokes wheels
      iv. Alloy wheels

5.2 Tyres
   a. Requirements of tyre
   b. Types of tyres and their construction
      i. Pneumatic tube tyre
      ii. Tubeless tyre
      iii. Cross ply tyre
      iv. Radial ply tyre
      v. Belted bias tyre
   c. Tyre material
   d. Specification (size) of tyres

6. AUTOMOTIVE CHASSIS AND BODY 04 Marks 07 Periods

6.1 Frame and chassis construction
6.2 Function of a car body, load on the chassis
6.3 Types of chassis and frame channel section, I-section, Box type, unit construction of body
6.4 Mounting of units and sub-units on the frame
6.5 Placement of engine at rear or front end, methods used to damp down the engine vibrations at idle and high speed (Engine foundation method)
6.6 Effect of stream lining on vehicle performance (Arodynamic)
6.7 Material used in body construction and types of bodies
6.8 Protective and anti corrosive treatments, painting procedure
6.9 Safety devices – air bags, central locking, seat belt
6.10 Sun control, filming to the glasses

7. AUTOMOTIVE SPRING & SUSPENSION 07 Marks 12 Periods

7.1 Introduction to Suspension system
7.2 Function of spring and suspension system
7.3 Requirement of suspension system
7.4 Characteristics of suspension system
7.5 Types of spring and their uses such as coil, laminated leaf, types of leaf spring and torsional bar
7.6 Types of suspension system, its construction, working, advantages and disadvantages
   a. Conventional suspension sytem – Rear and front
   b. Independent suspension – Rear and front
      i. Wishbone suspension
      ii. MacPherson strut
      iii. Trailing link
   c. Air suspension
   d. Hydragas suspension
   e. Hydro elastic suspension
7.7 Shock absorber function, construction, working, purpose
7.8 Anti roll bars, stabilizer

8. FRONT AXLE & STEERING SYSTEM 08 Marks 12 Periods

8.1 Front axle – Introduction, function, Construction, types-Dead and live axle

8.2 Types of attachments on front axle

a. Elliot
b. Reverse Elliot
c. Lamoine
d. Reverse Lamoine

8.3 Steering system – Introduction and function and types

8.4 Different types of steering gear boxes, their construction, working, advantages and disadvantages

a. Worm and roller
b. Worm and recirculating ball
c. Rack and pinion
d. Cam and peg
e. Power steering – Introduction, its type like Hydraulic and electrical

8.5 Ackerman type of steering linkage, various components of linkages, their function.

8.6 Steering geometry or wheel alignment and their purposes and adjustment

a. Camber angle
b. Castor angle
c. Toe-in
d. Toe-out on turn
e. Steering axis or king pin inclination
f. Wheel base

9.BRAKES 06 Marks 12 Periods

9.1 Introduction, Principle of braking – Pascal Law, Application in hydraulic brake

9.2 Need of brakes and efficiency of brakes

9.3 Disc brake and Drum brake – Introduction, construction, working, advantages and disadvantages

9.4 Types of braking system and their construction, working, advantages and disadvantages of

a. Mechanical brakes
b. Hydraulic brakes
c. Vacuum servo brakes
d. Power brakes (Pneumatic brakes)

9.5 Properties of Hydraulic fluid and their specification

9.6 Concept and working of antilock braking system

9.7 Parking/hand brake and its mechanism

AUTO-TRANSMISSION (PRACTICALS) STD: XII

1A) To study the constructional details with material use and working of single Plate Diaphragm type clutch

B) To dismantle the Single plate Diaphragm clutch, clean inspect the components and write the report on its condition

2A) To study the constructional details and working of multiplate wet clutch used for motor cycles/scooters

B) To dismantle the multiplate wet clutch used for motor cycle and scooters. Inspect the components and write the report on its condition.

3A) To study the constructional details and working of Centrifugal clutch

B) To dismantle and service the centrifugal clutch used in two wheelers, inspect the components for wear and write the report on its condition.

4) To study the constructional details and working of Vero drive.(field visit)

5A) To study the constructional details and working of Constant mesh gear box

B) To dismantle the Constant mesh gear box of scooter and motor cycle, clean, inspect and write the report on its condition

6A) To study the constructional details and working of Synchromesh gear box

B) To dismount and disassemble the synchromesh gear box from a car and clean, inspect and write the report on its condition

7A) To study the constructional details, function, material used and working of Propeller shaft in Hotchkiss drive and cross type of universal joint.

B) To dismount the propeller shaft from a car, inspect for bent and wear of the slip joint, overhaul cross type of universal joint, inspect its components for wear and tear, write the report on its condition.

8) To study different types of drives like front wheel drive, rear wheel drive and four wheel drive, and its difference

9A) To study the constructional details and arrangement for different types of rear axle like full floating axle, semi floating axle and three quarter floating axle.

B) Servicing of hub, greasing.

10A) To study the constructional details, function, working and material used for Differential unit used in four wheelers (Car)

B) To dismount and disassemble a Differential unit of a three wheeler and inspect it for wear, carryout the following adjustments and also check the tooth contact.
   a. Backlash of sun and star (Planetary) gear
   b. Backlash between crown wheel and bevel pinion
   c. Check run out of crown wheel (Field visit)

C) To dismount and disassemble a Differential unit of a four wheeler (car) and inspect it for wear, carryout the following adjustments and also check the tooth contact.
   a. Backlash of sun and star (Planetary) gear
   b. Backlash between crown wheel and bevel pinion
   c. Check run out of crown wheel (Field visit)

11A) To study constructional details of different types of wheel such as disc wheel, spoke wheel and Alloy wheel

B) To check run out of wheel and also remove wheel after inspecting and do necessary repairs.

12A) To Study different types of tyres such as tube tyre, tubeless tyre, radial ply tyres used in the vehicles.

B) To check the condition of tyres and remove it for checking the tube, also remove puncture if any.

13A) To study the constructional details and material used for the different types of chassis and their attachment

B) To check alignment of chassis and demonstration on accidental repairs of chassis and frame.(Demonstration – field visit)

14A) To study constructional details, arrangement and function of conventional type suspension system used with a leaf spring and shackle.

B) To dismount the leaf spring from a car for replacement of leafs, cambering purpose. Inspect the components of springs, shackles for wear.

15A) To study the constructional details, function, material used and working of Wishbone type independent suspension system.

B) To carry out servicing and overhauling of independent suspension system inspect its components for wear and provide necessary repair, write the report on its condition. (Demonstration-field visit)

16) To study the constructional details, function, material used and working of MacPherson suspension system.

17. To study the Air suspension system.(Demonstration – Field visit)

18A) To study the constructional details, function and working of Telescopic type of shock absorber

B) To dismount the shock absorber from a two wheeler and testing its working conditions, also carry out the visual inspection and write its report.

19A) To study the Front axle (dead) and its attachments.(Demonstration-field visit)

B) To overhaul the front axle (dead) used in four wheelers. (Demonstration – field visit)

20) To study the steering front end geometry and demonstrate the setting of wheel alignment in car (caster, camber, toe-in, toe-out, king pin inclination and checking wheel base). (Demonstration – field visit)

21) To study the constructional details and working of steering mechanism/system in four wheeler

22A) To study different types of steering gear used is automobile for its constructional details, function and working.

a. Worm and roller steering gear box
b. Recirculating ball, screw and nut steering gear box
c. Rack and pinion
d. Power assisted steering gear box (Demonstration-field visit)

B) To dismount and carry out overhauling, inspect different components for wear & tear and assemble it.

a. Worm and roller steering gear box
b. Recirculating ball, screw and nut steering gear box
c. Rack and pinion
d. Power assisted steering gear box (Demonstration-field visit)

Also provide the following adjustments for better performance after assembly

1. Centre or mid position
2. End play of cross shaft
3. End play of worm shaft
4. Check backlash and wheel lash

23A) To study constructional details, function, working and material used in mechanical brake in two wheelers and hand brake.

B) To carry out overhauling of mechanical brake system and hand brake used in two wheeler

24A) To study the constructional details, function, material used and working of Hydraulic braking system

B) To carry out overhauling of Hydraulic braking system and their components of different units like wheel cylinder, master cylinder for their condition, demonstration of the bleeding operation of the system after service.

25A) To study the constructional details, function, material used and working of Disc brakes. (Demonstration-field visit)

B) To overhaul Disc brakes and inspect its components for wear and tear (Demonstration-field visit)

26) To study the constructional details and working of Air braking system (Demonstration-field visit)

27) To study the constructional details and working of Vacuum brake. (Demonstration field visit)

NOTE: 1) The practical marked as field visit/demonstration should be conducted in the related establishment as per the availability if equipments by the subject teacher. This must be written in Journal.

2) Each student is required to maintain his journal/file consisting of

a. Aim
b. Date
c. Constructional details
d. Material used/tools required
e. Procedure/requirement of operation report
f. Observation report
g. Precautions
h. Sketch/diagram
i. Observation teacher

REFERENCE BOOKS

1) Automotive Technology by H.M.Sethi
2) Automobile Engineering – I by Kirpal Singh
3) Automobile Engineering by C.P.Nakhra
4) Automotive Mechanics by Srinivasan

MODEL QUESTION PAPER

SUB: AUTO TRANSMISSION– STD: XII

Time: 2 hours **Marks – 50**

Q.1. A Answer the following in one sentence each:-

i. Very short answer	01 Mark
ii Very short answer	01 Mark
iii. Very short answer	01 Mark
iv. Very short answer	01 Mark
v. Very short answer	01 Mark
vi. Very short answer	01 Mark
B. Essay type	**04 Marks**

Q.2.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

Q.3.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

Q.4.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

Q.5.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

BLUE PRINT FOR THEORY EXAMINATION

SUBJECT: **AUTO TRANSMISSION STD: XII**
MARKS: 50 **Time: 2 Hours**

Note: Allocation of marks

1. Topic wise marks are given in the instructional material to be followed
2. Marks and weight age according to objective

	Knowledge	Understanding	Application	Skill
MARKS	10	15	15	10
%	20	30	30	20

3. Marks and weight age according to the type of question

	VSA	SA	E
Marks	06	24	20
%	12	48	40

4. Marks/weight age according to difficulty level

	Easy	Average	Difficult
Marks	10	30	10
%	20	60	20

5. Marks/weight age according to the content area

Sr.No.	Content	Marks	%
01	Clutches	07	14
02	Transmission	06	12
03	Drive lines	04	08
04	Differential and Rear axle	05	10
05	Wheels and tyre	03	06
06	Automotive Chassis and Body	04	08
07	Automotive Spring and Suspension	07	14
08	Front Axle and Steering system	08	16
09	Brakes	06	12
	TOTAL:	50	100

6. Number of questions

Type	No of questions	Marks
Very short answer	06	06
Short answer	12	24
Essay	05	20
	23	**50**

SUB: AUTO-ELECTRICALS STD: XII

Teaching scheme	Examination scheme
(Periods per week)	Theory: 50 marks.
Theory: 03 periods	Practical: 100 marks.
Practical: 05 periods	Duration: 2 hours (theory)
	4 hours (practical)

THEORY CONTENT

(1) **Battery: 12 Periods 08 marks**.

1.1 Construction of lead acid battery.
1.2 Different parts, materials and their functions.
1.3 Chemical reactions in battery between + ve, - ve plate and electrolyte
1.4 Battery rating i.e. cold, 20 hrs, 25 Amp etc
1.5 Battery specifications and capacity
1.6 Battery efficiency.
1.7 Battery charging methods and precautions
1.8 Battery tests i.e. hydrometer, open volt, high discharge and cadmium tip test
1.9 Battery troubles
1.10 Care and maintenance of lead acid battery.
1.11 Maintenance free battery
1.12 Battery for electric two wheelers.

2) GENRRATOR & MAGNETOR: 08 periods. 04marks

2.1 Magnetic principle, law of Magnetism, field induction.
2.2 Location and function of Magneto
2.3 Construction and working of Magneto
2.4Testing of magneto coils for continuity, earthing, short, output voltage and current using multimeter
2.5 Circuit diagram for magneto charging the battery in two wheelers

3) ALTERNATOR: 09 periods 05 marks

3.1 Location, function and drive for alternator.

3.2 Construction, working and materials of different parts
3.3 3 phase system in Alternator
3.4 Rectification and use of diodes.
3.5 Alternator output test
3.6 Testing of stator, rotor, diodes & brushes
3.7 Trouble shooting in alternator.

4) REGULATOR 06 periods 03 marks

4.1 Principle of regulation.
4.2 Need for regulator in Magnetor and alternator
4.3 Construction and working of Regulator rectifier unit in two wheeler
4.4 Testing of R.R. unit and it's replacement
4.5 Electronic regulator of alternator
4.6 Testing of electronic regulator by replacement method

5) STARTER MOTOR: 10 periods 06 marks

5.1 Location and layout of starter motor
5.2 Working principle of starter motor & solenoid switch
5.3 Various parts, material and functions of motor
5.4 Construction and working of drive units
i.e. (i) Over running clutch (ii) Bendix & (iii) Folo Thru drive
5.5 Test on motor i.e.(i) idle or no load (ii) Full load and stall torque test
5.6 Testing of motor parts i.e. armature, field, crushes and solenoid switch.
5.7 Growler test on motor armature.
5.8 Trouble shooting in starter motor.

6) IGNITION SYSTEM: 14 Periods 10 marks

6.1 Requirements of ignition system
6.2 Types of ignition system (i) Magneto (ii) Battery
6.3 Construction and working of magneto Ignition system with electronic Ignition

6.4 Layout of Battery Ignition system with CB point and with electronic Ignition components

6.5 Ignition system for MPFI engine used in multycylinder Engine
6.6 Introduction to computerized Ignition system.

6.7 Testing of various parts as Ignition coil, spark plug, source coil, charging coil, C.B. point condenser & Ignition coil.

6.8 Testing of Electronic components by replacement method i.e. CDI unit
6.9 Maintenance of spark plug and distributor
6.10Trouble shooting in Ignition system

7) SWITCHES LIGHTING 10 periods 06 marks

7.1 Types of switches, namely normal, electromagnetic, pneumatic/ hydraulic, with their construction and working.

7.2 Working of following electromagnetic switches

a. Head lamp relay
b. Horn
c. Tell-tale
d. Overdrive solenoid
e. Current limit relay
f. Electro thermal flasher unit

7.3 Head lamp assembly of following types

a. Conventional type with filament bulb
b. With Halogen/Xenon bulb
c. Sealed Beam type

7.4 Other lights like, parking, side, reversing, Instrument, number plate and interior lights and fog lamp.

7.5 Aiming of headlight in 2 and 4 wheeler.
7.6 Head light with prismatic reflector and plain lens
7.7 Introduction of L.E.D lighting

8) ACCESSORRIES AND GAUGES: 12 periods 8 marks

8.1 Construction and working of following accessories:

a. Wind screen wiper
b. Wind screen washer
c. Wind screen defroster
d. Electronic Horn

8 (E) POWER OPERATED WINDOWS

8.1 Power operated near view mirror
8.2 Layout of central locking system
8.3 Circuit diagram and working of following gauges
   a. Fuel gauges
   b. Oil pressure gauge
   c. Water temperature gauge
8.4 Working of speedometer and odometer
8.5 Introduction to electronic and digital instrument panel
8.6 Circuit diagrams, wiring co lour coke and training of following main circuits
   a. Charging
   b. Starting
   c. Headlights
   d. Ignition
8.7 Introduction to installation of CD players, Amplifiers, speaker and LCD screen in car.
8.8 Layout & tracing the circuit related to emission control system.

BOOKS REFERRED

1) Automotive Electrical Technology by P.L.Kohli
2) Automotive Electrical Equipments by B.D.Arora
3) Automobile Engineering by R.B.Gupta
4) Automobile Engineering Vol.II by Dr. Kripal Singh
5) Automotive Engineering by Crouse and Auglin
6) Automobile Engineering by C.P. Nakra

STD XII

AUTO-ELECTRICALS PRACTICALS

1) To study the constructional details and working of lead acid battery.
2) To carry out regular maintenance of lead acid battery.
3) To carry out the following tests to check the conditions of acid battery.
    a. High rate discharge Test
    b. Hydrometer Test
    c. Open volt test
4) To carry out changing of lead acid battery, topping up of battery and to identify the faults preparation of electrolyte and rectify the same
5) To study different switches used in car
6) To study different Gauges used in car
7) Demonstration of turning down the slip rings
8) To dismount the alternator from vehicle and identify the construction and working of alternator
9) To carry out inspection and testing of alternator parts
10) To study the construction and working of following regulators units.
    a. Voltage regulator
    b. Regulator Rectifier unit
    c. Electronic regulator
11) Demonstration on setting of electromagnetic regulators and testing of electronic regulator by replacement method
12) Identify and rectify the faults from charging system like low out put, excessive out put.
13) To dismount and disassemble the working motor, study the constructional details and working of components carry out testing of each components and layout testing of each component.
14) To disassemble the 2 wheeler Magneto study its components and layout testing of each components.

15) To identify and rectify the probable faults on problem engine do not crank.
16) To study out the growler test for motor armature to test
a. Armature short circuit
b. Coil ground test
17) To test the construction and working of magneto ignition system
18) To study the components of magneto ignition system and to rectify the ignition circuit for (1) No spark (2) Uneven spark (3) Weak spark
19) To study the constructional and working of battery ignition system used in multi cylinder engine.
20) To dismount the distributor and to study vacuum advance and centrifugal advance mechanism.
21) To study the constructional details and working of distributor assembly L.T. circuit and H.T.circuit
22) To test the various components of battery ignition system
23) To demonstrate the ignition timing setting using by timing light/TDC finder
24) To study construction and aiming of headlight in car
25) To study the working of lighting system in automobile
26) To trace the important circuits in Automobile.

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SUB: AUTO ELECTRICALS STD: XII

MODEL QUESTION PAPER

MARKS: 50 **TIME: 2 HOURS**

Q.1. A Answer the following in one sentence each:-

i. Very short answer	01 Mark
ii Very short answer	01 Mark
iii. Very short answer	01 Mark
iv. Very short answer	01 Mark
v. Very short answer	01 Mark
vi. Very short answer	01 Mark
B. Essay type	**04 Marks**

Q.2.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

Q.3.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

Q.4.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

Q.5.A. Answer in short

i. Short answer	02 Marks
ii. Short answer	02 Marks
iii. Short answer	02 Marks
B. Essay type	**04 Marks**

BLUE PRINT FOR THEORY EXAMINATION

SUBJECT: AUTO ELECTRICALS **STD: XII**
MARKS: 50 **Time: 2 Hours**

Note: Allocation of marks

1. Topic wise marks are given in the instructional material to be followed
2. Marks and weight age according to objective

	Knowledge	Understanding	Application	Skill
MARKS	10	20	10	10
%	20	40	20	20

3. Marks and weight age according to the type of question

	VSA	SA	E
Marks	06	24	20
%	12	48	40

4. Marks/weight age according to difficulty level

	Easy	Average	Difficult
Marks	22	20	08
%	44	40	16

5. Marks/weight age according to the content area

Sr.No.	Content	Marks	%
01	Battery	08	16
02	Generator and Magneto	04	08
03	Alternator	05	10
04	Regulator	03	06
05	Starter motor	06	12
06	Ignition system	10	20
07	Switches and lights	06	12
08	Accessories and Gauges	08	16
	TOTAL:	50	100

6. Number of questions

Type	No of questions	Marks
Very short answer	06	06
Short answer	12	24
Essay	05	20
		50

LIST OF TOOLS AND EQUIPMENTS for
AUTO ENGINEERING TECHNOLOGY COURSE STD: XI & XII

Description	Qty
01) D.E.SPANNER SET 10-32mm	02
02) D.E. SPANNER SET 06-22mm	02
03) ADUSTABLE SPANNER 8"	01
04) SPARK PLUG SPANNER	01
05) LONG NOOSE PLIER	02
06) CIRCLIP PLIER (INTERNAL n EXTERNAL)	04
07) WIRE BRUSH	01
08) COMBINATION PLIER	03
09) SCREW DRIVER SET	01
10) FEELER GAUGE	01
11) HAMMER BALL PEEN	02
12) OIL CAN	01
13) NYLON HAMMER	01
14) SOCKET SPANNER SET	01
15) ADJUSTABLE SPANNER 20 mm	01
16) SPAK PLUG SPANNER 14mm	01
17) D.E. SPANNER SET 6-32mm	01
18) D.E. SPANNER SET 9-32mm	01
19) SPANNER SOCKET SET OF 8 HANDLE T-BAR SOCKET	01
20) SPANNER T-FLEX FOR SCREWING N UNSCREWING IN ASSESIBLE POSITION	01
21) ALLEN KEY SET (METRIC)	01
22) ALLEN KEY SET (INCHES)	01
23) PIPE WRENCH 90 cms	02
24) VALVE SPRING LIFTER	01
25) VALVE SEAT CUTTING TOOLS LOOP WITH GUIDER PILOT	01
26) STUD EXTRACTOR	01
27) COMPRESSION GAUGE	01
28) PISTON RING EXPANDER n REMOVER	01
29) PRESSURE GAUGE	01
30) FELER GAUGE 10 BLADES	01

31) VERNIER CALLIPER 150mm	**01**
32) TORQUE WRENCH 24-56kg m	**01**
33) BATTERY HYDROMETER	**01**
34) TUBE SPANNERS	**02**
35) FLAT FILE 8" ROUGH	**34**
36) FLAT FILE 8" SMOOTH	**03**
37) FLAT FILE 8" 2nd CUT	**03**
38) SQUARE FILE 6"/8"	**02**
39) ROUND FILE 6"/8"	**02**
40) TRAINGULAR FILE 8" ROUGH	**02**
41) HALF ROUND FILE 10" ROUGH	**02**
42) HACKSAW FRAME 300mm	**03**
43) MARKING TOOL BLOCK UNIVERSAL	**01**
44) MARKING TOOL BLOCK ADJUSTABLE	**01**
45) CENTRE PUNCH 5"	**03**
46) ANGLE PLATE SLOTTED 3"X3"X2.5"	**01**
47) TRI SQUARE 100/150mm	**06**
48) STEEL RULE 12"	**03**
49) MICROMETER SCREW GAUGE 0.25mm	**02**
50) INSIDE CALLIPER 8"	**02**
51) OUTSIDE CALLIPER 8"	**02**
52) DIVIDER 8"	**03**
53) CHISEL 6"X1" n 6"X5/8"	**01**
54) MECHANICAL JACK SCREW TYPE	**01**
55) MULTIMETER (DIGITAL)	**01**
56) ELIMINATOR 5-12V	**01**
57) FOOT PUMP	**01**
58) MAGNET PULLER (BAJAJ, HERO HONDA M80, KINETIC, YAMAHA, TWO LEG)	**01**
59) BEAARING PULLER 8"	**01**
60) DIE SET	**01**
61) BATTERY CHARGER	**01**
62) PORTABLE DRILLING M/C	**01**
63) CROSS WHEEL SPANNER	**01**
64) SCREW SPANNER	**01**
65) PHILIPS SCRE DRIVER 3", 4", 6" 8"	**01**

66) TUBULAR HACKSAW FRAME	**02**
67) WOODEN MALLET	**01**
68) DIAGNOL CUTTING PLIER 6”	**01**
69) WIRE CLIPPER	**01**
70) TAP n DIE SET 6-24mm	**01**
71) CUTTING SHEARS TIN 8”	**01**
72) CAST IRON SURFACE PLATE 12”X12”	**01**
73) WATER PUMP	**01**
74) HYDRAULIC TROLLEY JACK	**01**
75) VACCUM GAUGE	**01**
76) CAR WAHER	**01**
77) BENCH VICE 8”	**01**
78) SELF STARTER	**01**
79) DISTRIBUTOR Assy	**01**
80) S.U.ELECTRICAL PUMP	**01**
81) ELECTRONIC HORN	**01**
82) WIND SCREEN WIPER 12V	**01**
83) SIDE INDICATOR FLASHER	**01**
84) OIL PUMP (GEAR TYPE)	**01**
85) CAR ENGINE	**01**
86) REAR HUB PULLER	**01**
87) COMPRESSIONGAUGE 100-300P.S.I	**01**
88) STROBOSCOPIC LAMP	**01**
89) ARBOUR PRESS 01 Tonne	**01**
90) BENCH GRINDER HEAVY	**01**
91) TORQUE WRENCH 7-30kg/m	**01**
92) BEARING PULLER INTERNAL	**01**
93) EXTENSION BAR 5”	**01**
94) REVERSIBLE RATCHET ½”	**01**
95) HOLLOW PUNCH SET	**01**
96) DISTRIBUTOR SPANNER	**01**
97) WELDING MACHINE	**01**
98) AIR COMPRESSOR	**01**
99) MICROMETER 25-100mm	**01**
100) WIRE FEELER GAUGE	**01**
101) VEHICLE STAND	**04**
102) FIRST AID BOX	**01**
103) ARMA TURE GROWLER TESTER	**01**
104) BATTERY CHARGER	**01**
105) FUEL INJECTIONPUMP TESTER	**01**

106) AIR PRESSURE GAUGE	**01**
107) STEERING GEAR BOX	**02**
108) GEAR BOX	**01**
109) CLUTCH Assy	**02**
110) UNIVERSAL JOINT	**01**
111) FEED PUMP	**01**
112) SHOCK ABSORBER	**02**
113) FUEL PUMP	**01**
114) CYLINDER BLOCK	**03**
115) DRAWING BOARD with TABLES	**25**
116) CHARTS	**17**
117) THREE WHEELER	**01**
118) TWO WHEELER	**03**
119) FOUR WHEELER (DIESEL n PETROL)	**01**
120) BENCH VICE 4”	**12**
121) EXTENSION CORD	**01**
122) M P F I CAN	**01**
123) MOTOR CYCLE (FOUR STROKE ENGINE)	**02**
124) POWER STEERING UNIT	**01**
125) GEAR BOX (CONSTANT MESH)	**01**
126) GEAR BOX (SYNCHRONIZING)	**01**
127) DIFFERENTIAL	**01**
128) MAC PHERSON SUSPENSION SYSTEM	**01**
129) FRONT AXLE (DEAD TYPE)	**01**
130) ENGINE STAND	**01**
131) JEEP ENGINE	**01**
132) DIAPHRAGM CLUTCH	**01**
133) VERO DRIVE UNIT	**01**
134) SCOOTY, ACTIVA, ENGINE	**01**
135) CONSTANT VELOCITY JOINT	**01**
136) SCOOTER ENGINE (FOUR STROKE)	**01**

(1)ELECTRONIC TECHNOLOGY COURSE

(2) MAINTENANCE AND REPAIRS OF ELECTRICAL AND ELECTRONIC DOMESTIC APPLIANCES COURSE

(Subjects for Std: XI is common for both the Courses i.e.1) ETC and 2) MREEDA)

REVISED CURRICULUM – STD: XI

Subjects for Std:XI

1) Physics
2) Mathematics and Computers
3) Basic Electrical Engineering and Workshop Practice
4) Basic Electronics and Electronic Drawing

TEACHING SCHEME AND MARKS (STANDARD XITH ET/MREEDA)

Sr. No.	Subjects	MARKS		LECTURES	
		Theory	Practicals/ Oral/Viva	Theory	Practicals/ Oral/Viva
COMPULSORY SUBJECTS					
1.	English (Communication Skills)	70	30	5	-
2.	General Foundation Course	70	30	5	-
3.	Physics	50	100	3	5
4.	Mathematics and computers	50	100	3	5
5.	Basic Electrical Engineering & Workshop Practice	50	100	3	5
6.	Basic Electronics & Electronic Drawing	50	100	3	5
SCHOOL ASSESSMENT SUBJECTS					
7.	On the job training	Grades (6 weeks industrial training)			
8.	Physical Education	Grades as per general stream scheme			2
9.	Computer Awareness	Grades as per general stream scheme		3*	
		340	460	22	20

(* To be taken outside the regular instructional hours)

Passing: Minimum 25 % in theory
Minimum 25 % in practicals
Overall passing 35 %

SCHEME OF EXAMINATION (STANDARD XITH ET/MREEDA)

Sr. No.	Subjects	Marks		Total	Remarks
		Theory	Practicals		
1	English (Communication Skills)	70	30	100	
2	General Foundation Course	70	30	100	
3	Physics	50	100	150	
4	Mathematics & Computers	50	100	150	
5	Basic Electrical Engineering & Workshop Practice	50	100	150	
6	Basic Electronics & Electronic Drawing	50	100	150	

TRANSCRIPT OF STUDY SCHEME (E.T. / MREEDA)

CLASS: XI TH						
Subjects	Theory		Practicals		Total	
	Hours	Mark	Hours	Mark	Hours	Mark
English (Communication Skills)	70	70	30	30	100	100
General Foundation Course	70	70	30	30	100	100
Physics	60	50	50	100	150	150
Mathematics & Computers	60	50	100	100	160	150
Basic Electrical Engineering & Workshop Practice	70	50	50	100	120	150
Basic Electronics & Electronic Drawing	70	50	100	100	170	150
On the job training	---	---	288	Grade	288	Grade
Physical Education	---	---	30	Grade	30	Grade
Computer Awareness	---	---	30	Grade	30	Grade

SCHEME OF INTERNAL ASSESSMENT FOR STD. XI (E.T. & MREEDA)

Sr. No.	Subject	First Term					Second Term			Total	Avg. Marks
		Mid Term Test		First Term			Assignment/ Oral/Project	Second Term			
		Time	Marks	Time	Marks	Project /Oral		Time	Marks		
1.	Communication Skills	1 Hr.	10	3 Hrs.	70	20	30	3 Hrs.	70	200	100
2.	General Foundation Course	1 Hr.	10	3 Hrs.	70	20	30	3 Hrs.	70	200	100
3.	Physics (Theory) Physics (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	10 --	2 Hrs. 3 Hrs.	40 100	100 200	50 100
4.	Mathematics (Theory) Computer (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	10 --	2 Hrs. 3 Hrs.	40 100	100 200	50 100
5.	B.E.E. & W.P. (Theory) B.E.E. & W.P. (Pract.)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	10 --	2 Hrs. 3 Hrs.	40 100	100 200	50 100
6.	B.E. & E.D. (Theory) B.E. & E.D. (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	10 --	2 Hrs. 3 Hrs.	40 100	100 200	50 100
7.	On Job Training	Grading pattern is shown in scheme									
8.	Physical Education	Grading pattern to be followed as in general stream									
9.	Computer Awareness	Grading pattern to be followed as in general stream									

PHYSICS (THEORY) MARKS: 50

1. Introduction & Basic Measurements **(5 Marks)**
   1) Basic relationship Physics to Engineering
   2) Units of measurements
   3) System of Units
   4) Study of Vernier Calliper, Micrometer, Screw Gauge & Spherometer
   5) Dimensions and dimension equations
2. Vectors and Scalars **(1.5 Marks)**
   1) Definition: - Vectors, Scalars, with examples
   2) Addition, Subtraction of vectors, Triangle Law of vector addition and law of Parallelogram of Vectors.
3. Elementary Dynamics **(4.5 Marks)**
   1) Definitions of Kinematics, displacement, velocity and acceleration
   2) Equations of motion with uniform acceleration
   3) Newton's laws of motion
   4) Acceleration due to gravity
   5) Friction and its types

4. Mechanics of Solids and Fluids (**7.5 Marks)**
   1) Introduction to Atoms, Nuclei and molecules
   2) Solids: Types crystalline and amorphous
   3) Elasticity, stress, strain and its types, Youngs modules, Bulk Modules, Shearing modules and application of Elasticity.
   4) Fluids: meaning of fluids, properties of liquids, Surface tension, angle of contact and rise of liquid in capillary tube, effect of temperature on S.T.
   5) Pascal's law, buoyancy, viscosity, coefficient of viscosity
   6) Gases: properties of gasses, gas laws

5. Circular and rotational motion **(4.5 Marks)**
   1) Definition of uniform circular motion, tangential velocity and radial acceleration
   2) Rotational motion, comparison of linear and rotational motion (only concept)
   3) Torque and angular momentum, conservation of angular momentum with examples.
   4) Definition of centripetal and centrifugal force

6. Waves and Oscillations **(6 Marks)**
   1) Introduction
   2) Simple Harmonic Motion, Simple pendulum
   3) Wave concept of wave motion, definition of amplitude, time period, frequency, phase and wavelength, relationship between velocity, frequency and wavelength.
   4) Types of wave motions, Sound as longitudinal waves
   5) Equation of progressive waves (non-mathematical treatment), stationary waves and Beats

7. Electrostatics **(5 Marks)**

1) Introduction to electric flux, electric field, unit charge.
2) Electrostatic potential and its relation with electric field
3) Relation between potential and potential energy
4) Electrostatic properties of Conductors
5) Capacitors and Capacitance, combination of capacitors in series and parallel

8. Magnetism, Heating & Chemical effects of electric current **(7.5 Marks)**

1) Heating effects of current, current carrying conductor and application
2) Electrochemical effect – electrolysis, Faradays law, Electrolytic conduction and application
3) Thermoelectricity – Thermocouple, Seeback effect and magnetism
4) Magnetic effect – Oesterd's experiment, Right Hand Rule, force of moving charge, force between two parallel wires carrying current, solid in perpendicular electric and magnetic field
5) Magnetism

9, Electrons and protons **(5 Marks)**

1) Introduction, discharge through gases at low pressure
2) Cathode rays, X-rays – properties and uses
3) Free electrons in metals, concept of quantum energy
4) Photoelectric effects, photons, photocell, thermionic emission

9. Optics **(3.5 Marks)**

1) Laws of reflection and refraction, refractive index of materials of prism
2) Light as a transverse electromagnetic wave

Reference Books: ABC of Physics Std. XIth and Std. XIIth PHYSICS (PRACTICALS)

MARKS: 100

1. Determination of volume of solid cylinder using vernier calliper
2. Determination of radius of wires using micrometer screw gauge
3. Determination of thickness of glass plate using Spherometer
4. Law of parallelogram
5. Determination of coefficient of static friction between two surfaces (horizontal plane)
6. Determination of refractive index of material of prism (deviation curve method)
7. Determination of unknown frequency of tuning fork using resonance tube & measure velocity of sound.
8. Determination of acceleration due to gravity using simple pendulum
9. Determination of frequency of vibration of tuning fork using sonometer
10. Determination of unknown resistance using Whetstone's Bridge
11. Verify the principle of potentiometer by graphical method
12. Study of refraction and lateral displacement of a ray of light passing through glass slab of different thickness
13. Compare e.m.f. of cells using potentiometer
14. Study of laws of resistances in series and parallels (ohms law)

Reference Book: 1) Instruction manual of Physics Practicals --- By Pathak
2) ABC in Physics Practicals

SUB: MATHEMATICS THEORY: 50 Marks

1. **GRAPH:** Selection of dependent and independent variables, range of each physical variable, selection of scale, etc. types of graphs, plotting of different graph like f (x), 1/x, log X, sin X, cos X, etc., calculations of slope **(3)**

2. **LOGARITHM:** Introduction, logarithmic formulae, common logarithms, antilogarithm, use of logarithms to simplify the calculations. **(5)**

3. **QUADRATIC EQUATIONS:** Identify equations, solutions of quadratic equations by factorization and formulae methods, solution of quadratic equation by completing the squares, relation between roots and coefficient, nature of roots. **(5)**

4. **TRIGNOMETRY:** Definition of radians, relation between degree and radian, Trigonometric ratios of any angle and identities, Trigonometric ratios from tables, Trigonometric ratios of any angle of any size, sum and difference of two angles, sum and product formulae. **(7)**

5. **DETERMINANTS:** Minors and cofactors of determinants, determinants of second and third order, Cramer's rule, applications of determinants in solutions of simultaneous equations and area of triangle **(5)**

6. **CO-ORDINATE GEOMETRY:** Co-ordinate system in a plane, the graph of a condition, distance formulae, area of a triangle, condition for co-linearity of three points, section formula, centroid and in-centre of a triangle, parallel and perpendicular lines, intercepts of a line on the co-ordinate axes. **(7)**

7. **FUNCTIONS AND LIMITS:** Function, domain and range, composite function, algebra of function, limit of a function, operation of finding limits, algebra of limits, trigonometric limits. **(5)**

8. **DIFFERENTIAL CALCULUS**: Introduction of a derivative, derivates of standard formulae, derivative of sum – products and quotient of simple functions **(5)**

9. **INTEGRATION:** Rules of integration, standard formulae, integration by substitution, integration of sin x, cos x, etc., definite integrals **(5)**

10. **MATRICES:** Definition of a matrix, types of matrices, algebra of matrices, elementary transformations, the inverse, solutions of linear equations **(3)**

Reference Book: ABC of Mathematics, Std. XIth and Std. XIIth

COMPUTERS (PRACTICALS) MARKS: 100

1. **MS DOS Commands**
   a. dir, md, cd, rd, type, print, copy, delete, format, cls, ver, date, time, chkdsk, tree, edit, move, label, etc.
   b. Renaming files, view structure of the directory, check computer memory, disk space, etc.
2. **Windows**
   a. Create, delete, move, rename, copy file/folder
   b. Create shortcut
   c. Find files
   d. Use of calculator
   e. Paintbrush
   f. Notepad and wordpad
   g. Use of explorer
3. **Word**
   a. Create, save, open, close files
   b. Format font: Font type, font size, colour, Underline, Bold, Italics, colour fonts
   c. Format paragraph: align, bullets, borders, shading, columns, line/paragraph spacing, etc.
   d. View options: tool bars, rulers, header/footers, page layout, etc.
   e. Page setup: margins, paper size, paper layout,
   f. Edit options: find, replace, cut, copy, paste, go to,
   g. Insert: page numbers, page breaks, date /time, picture, files,
   h. Tools: spell checker, mail merge, auto correct, protect file, etc.
   i. Table: insert, add/merge/split/delete/format row & columns
   j. Print & preview
4. **Excel**
   a. Create, save, open, close worksheets
   b. Entering: Text, Data, Date, Time, formulas, etc in cells
   c. Formatting & aligning cells, columns, rows, etc.
   d. Inserting and deleting columns/rows
   e. Using references of cells in formulas
   f. Creating graphical representations of data, formatting the chart
   g. Exercise on creating Salary sheet, Currency denominations & Mark sheets

5. **PowerPoint**
   a.Create, save, open, close presentations
   b.Simple text slides with bullets, cliparts, etc.
   c.Inserting and deleting slides
   d.Visual effects and slide shows

6.Email and Internet

a) Use of outlook express
b) Offline email typing and saving
c) Forwarding and receiving emails
d) Offline and online internet browsing

BASIC ELECTRICAL ENGINEERING & WORKSHOP PRACTICE (THEORY)

Marks: 50

1. Fundamentals of electricity **(6 Marks)**
    1) Modern electron theory, matter, molecule, atom and atomic structure, flow of electric current, electric circuits and its types, definition of basic electric terms and units.
    2) Direct current & alternating current, Ohms law, Specific resistance and Kirchoff's laws

2. Cell and Battery **(3 Marks)**
    1) Classification of cells, primary and secondary cells, principles, care and maintenance
    2) Difference between emf and potential difference of a cell, difference between cell and battery.
    3) Lead acid battery, Nickel – Iron and Nickel – cadmium cells (in brief)

3. Transformers and capacitors **(5 Marks)**
    1) Working principle of transformers, types of transformers according to core construction
    2) Construction details of transformers with comparison
    3) Transformation ratio, emf equation, transformer losses
    4) Step up and step down transformers, ideal transformer
    5) Auto transformer – construction and uses

4. Single and polyphase AC circuits **(6 Marks)**
    1) Comparison between AC and DC
    2) Fundamental AC related terms: cycle, frequency, amplitude, rms value, peak factor, average value, phase, out of phase, phase angle, leading and lagging quantity
    3) Study of inductance & capacitance: reactance, impedance, impedance triangle, power factor - its determination and importance
    4) LCR Circuits and resonance
    5) Comparison between single and poly-phase systems
    6) Definition of fundamental terms
    7) Star and delta connection
    8) Relation between line current and voltage with phase current and phase voltage

5. Single phase motors **(3 Marks)**
    1) Types and Classification of single phase motors
    2) Construction of single phase motors, working and application

6. Safety precaution and shock treatment **(3 Marks)**
    1) Shop layouts
    2) Shop discipline, safety practice and causes of electric fire and electric shock
    3) Treatment for electric shocks and burns

7. Common hand tools **(4 Marks)**
    1) Different types of tools
    2) Their applications, limitations and their adjustments
8. Soldering techniques **(4 Marks)**
    1) Soldering materials, fluxes and tools
    2) Types of soldering, procedures and precautions
    3) Faults in soldering and soldering equipments
9. Electrical accessories **(4 Marks)**
    1) Plugs, sockets, lamps, holders, fuses, switches, and cables, cable core system, etc
    2) Relays & contactors- types, uses and applications
    3) MCB's and ELCB's
10. House wiring and earthing **(4 Marks)**
    1) House wiring, single plug point, staircase wiring, fan wiring & tube light wiring
    2) Test board wiring, power point wiring & precautions
    3) Difference between earth and ground
    4) Types of earthing

12. Magnetism and electromagnetism **(8 Marks)**
    1) Classification of magnets, methods of magnetism, molecular theory of magnetism, properties of magnets, fundamental magnetic terms, classification of magnetic materials, electromagnetism, determination of direction of magnetic field around a current carrying conductor.
    2) Solenoid – its field and polarity, magnetization curve and hysterisis, magnetic material for permanent and temporary magnets, electromagnetic induction, Faradays laws of electromagnetic induction, Flemings right hand rule, lenzs law, self and mutual induction.

Reference Books:
1) Basic Electrical Engg. Vol I & II -- By P. S. Dhogal
2) Electrical Trade Theory -- By M. L. Ghosh
3) Electrical Engg. Theory -- By V. K. Mehta
4) Workshop Practice – I -- By Tatpuje
5) Workshop Practice – II -- By Tutpuje

LIST OF PRACTICALS IN BASIC ELECTRICAL ENGINEERING AND WORKSHOP PRACTICE

1. Safety precautions to be observed in laboratory while handling Electrical/electronic equipments
2. Study and use of Hand tools.
3. Study of multimeter (Analogue & Digital)
4. Soldering & Desoldring Practice (Both on tag boards & PCB) using Copper wire and electronic components.
5. Verification of ohms law in AC Circuits
6. Power measurements in resistive loads by VI method.
7. Wiring of single point, Staircase, fan, tube light(regular & CFL) and test board, Mercury vapor and sodium Vapor lamp, mains connection.
8. Wiring of Public Adress system, connecting of microphones and Loudspeaker in an amplifier and testing for normal operation.
9. Study of electrical Accessories: plug, socket, lamp, holder relay, switches, wattmeter.
10. Testing of Transformer(Single Phase), Transformation Ratio, OC and SC tests.
11. Characteristics of AC circuits (pure resistive, capacitive, inductive).
12. Determination of impedance, resistance and inductance of choke.
13. Determination of capacitive reactance (Voltage-Current method).
14. Study of Oscilloscope- Operation and Control, Measurement of Voltage and Time period on C.R.O., Calculation of frequency.

Reference Books:
1) Electronics through practicals -- By P.S. Jakahar & J. S. Jakahar
2) Electrician Ist Year -- By C.I.M.I., Chennai.
3) Electronic Project for Bbeginners –by A.K. Mani.

SCHEME FOR PRACTICAL EXAMINATION

STD. XITH E. T. / MREEDA

Subjects: Physics and Basic Electrical Engg & Workshop Practice

Major Experiment:	50 Marks	
Minor Experiment:	30 Marks	
Journal:	10 Marks	
Viva:	10 Marks	

Subject: Basic Electronics & Electronic Drawing

Major Experiment:	50 Marks	
Drawings:	30 Marks	(20 Marks – to be examined) (10 Marks – Prepared sheets)
Journal:	10 Marks	
Viva:	10 Marks	

Subject: Computer

Basic knowledge of commands:	20 Marks
Application of commands:	20 Marks
Completion has given Exercise:	30 Marks
Final presentation/printout of result:	10 Marks
Journal:	10 Marks
Viva:	10 Marks

DATA TO BE MAINTAINED ON O.J.T. DIARY / SHEETS

1) OJT Completion certificate by the school

2) Company profile

3) Name of Student along with the following on every page (taken fresh per day of OJT)

    1) Date and day
    2) Reporting and Departure time
    3) Work done during the day
    4) Knowledge acquired
    5) Skill acquired
    6) Supervisors Signature and Seal with Remarks
    7) Teachers Signature

MODALITIES FOR CONDUCTING ON THE JOB TRAINING

The students must be placed for OJT where either one or more of the activities listed below are performed:

1. Electronic/Electrical Assembling Unit

2. Electronic/Electrical Repair Unit

3. Electronic appliance company/manufacturing unit

4. Electrical wiring contractors

5. Motor re-winders/repairers

6. Consumer electronic service centers

7. Electronic/electrical dealers providing after sales service

8. Consumer appliance servicing unit

CRITERIAN FOR GRADING/MARKING OF O.J.T.

The following criteria is to be adopted for allotment of marks (to be converted into grades) in OJT

Sr. No.	Description	Marks
1.	Efforts made by the student to acquire new knowledge	25
2.	Efforts made by the student to acquire new skill and strengthen his practical base	25
3.	Performance, punctuality & attendance during the training	20
4.	Interviews & viva based on report/journal/diaries & training	20
5.	Daily reports / Journal / Maintenance of daily diary	10
	Total out of	100

Note: Marks/grades given to the individual students should be made available to the auditor in the above format.**FORMAT OF MODEL QUESTION PAPER FOR THE THEORY EXAMINATION IN CLASS XITH**

First Terminal

Subjects: **Physics**
Mathematics and Computers
Basic Electronics & Electronic Drawing
Basic Electrical Engineering & Workshop practice

MARKS: 40

Q.1.	Q.1. A]Fill in the blanks (2 questions 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.2.	A] Define the terms (2 definitions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.3.	A] Answer in one/two words: (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in short (1 questions: 3 Marks each)	**(3 Marks)**
	C] Answer the following in detail (1 Question: 5 Marks)	**(5 Marks)**
Q.4.	A] Answer the following in brief (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (1 questions: 3 Mark each)	**(3 Marks)**
	C] Answer the following in details (1 Question: 5 Marks)	**(5 Marks)**

Note: 1) Wherever required, options for the students be given to choose from set of questions (only for short and long answer type questions)

2) Marking Scheme similar to the above shall be followed for the Mid-term test with proportionate Marking.

BLUE PRINT FOR THE THEORY EXAMINATION IN CLASS XITH

SECOND TERMINAL EXAMINATION **Marks 50**

Subjects: **Physics**
Mathematics and Computers
Basic Electronics & Electronic Drawing
Basic Electrical Engineering & Workshop practice

Allocation of Marks

1) Topic-wise marks are given in the Instructional Material to be followed
2) Marks for Domains

Knowledge	20 %	10 Marks
Understanding	35 %	17.5 Marks
Application	25 %	12.5 Marks
Skill	20 %	10 Marks
Total	100 %	50 Marks

3) Types of Questions

Objective	20 %	10 Marks
Short Answers	60 %	30 Marks
Essay Type	20 %	10 Marks
Total	100 %	50 Marks

4) Types of Questions (Difficulty wise)

Easy	20 %	10 Marks
Average	60 %	30 Marks
Difficult	20 %	10 Marks
Total	100 %	50 Marks

5) Number of Questions

Objective	2 Fill in the blanks without alternatives	1x 2 =	2
	2 Fill in the blanks without alternatives	1 x 2 =	2
	2 Answer in one/two words	1 x 2 =	2
	2 Fill in the blanks without alternatives	1 x 2 =	2
	2 Answer in one/two words or definitions	1 x 2 =	2
		Total	10

Short Answers	6 Questions of 3 Marks each	3 x 6 =	18
	6 Questions of 2 Marks each	2 x 6 =	12
		Total	30

Essay Type Answers	2 Questions of 5 Marks each with a choice from the same topic	5 x 2 =	10
		Total	10

FORMAT OF MODEL QUESTION PAPER FOR THE THEORY EXAMINATION IN CLASS XITH
Second Terminal Examination

Subjects: **Physics**
Mathematics and Computers
Basic Electronics & Electronic Drawing
Basic Electrical Engineering & Workshop practice

MARKS: 50

Q.1.	A] Fill in the blanks (2 questions 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.2.	A] Define the terms (2 definitions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.3.	A] Answer in one/two words: (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in short (1 questions: 3 Marks each)	**(3 Marks)**
	C] Answer the following in detail (1 Question: 5 Marks)	**(5 Marks)**
Q.4.	A] Answer the following in brief (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (1 questions: 3 Mark each)	**(3 Marks)**
	C] Answer the following in details (1 Question: 5 Marks)	**(5 Marks)**
Q.5.	A] Answer in one/two words (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (4 questions: 2 Mark each)	**(8 Marks)**

ELECTRONIC TECHNOLOGY COURSE

REVISED CURRICULUM – STD: XII

Subjects for Std:XII

1) Digital Electronics & Computers
2) Electronic Materials & Workshop Practice
3) Applied and Consumer Electronics
4) Industrial Electronics & Instrumentation

TEACHING SCHEME AND MARKS (STANDARD XIITH E.T.)

Sr. No.	Subjects	MARKS		LECTURES	
		Theory	Practicals/ Oral/Viva	Theory	Practicals/ Oral/Viva
COMPULSORY SUBJECTS					
1.	English (Communication Skills)	70	30	5	-
2.	General Foundation Course	70	30	5	-
3.	Digital Electronics & Computers	50	100	3	5
4.	Electronic Materials & Workshop Practice	50	100	3	5
5.	Applied and Consumer Electronics	50	100	3	5
6.	Industrial Electronics & Instrumentation	50	100	3	5
SCHOOL ASSESSMENT SUBJECTS					
7.	On the job training	Grades (6 weeks industrial training)			
8.	Physical Education	Grades as per general stream scheme			2
9.	Computer Awareness	Grades to be given as per the scheme			3*
		340	460	22	20

(* To be taken outside the regular instructional hours)

Passing: Minimum 25 % in theory
Minimum 25 % in practicals
Overall passing 35 %

TRANSCRIPT OF STUDY SCHEME (E.T.)

CLASS: XII TH						
Subjects	Theory		Practicals		Total	
	Hours	Mark	Hours	Mark	Hours	Mark
English (Communication Skills)	70	70	30	30	100	100
General Foundation Course	70	70	30	30	100	100
Digital Electronics & Computers	50	50	100	100	150	150
Electronics Materials & Workshop Practice	50	50	100	100	150	150
Applied & Consumer Electronics	50	50	100	100	150	150
Industrial Electronics & Instrumentation	50	50	100	100	150	150
On the job training	---	---	288	Grade	288	Grade
Physical Education	---	---	30	Grade	30	Grade
Computer Awareness	---	---	30	Grade	30	Grade

SCHEME OF EXAMINATION (STANDARD XIITH ET/MREEDA)

Sr. No.	Subjects	Marks		Total	Remarks
		Theory	Practicals		
1	English (Communication Skills)	70	30	100	
2	General Foundation Course	70	30	100	
3	Digital Electronics & Computers	50	100	150	
4	Electronics Materials & Workshop Practice	50	100	150	
5	Applied & Consumer Electronics	50	100	150	
6	Industrial Electronics & Instrumentation	50	100	150	

SCHEME OF INTERNAL ASSESSMENT FOR STD. XII (E.T.)

Sr. No.	Subject	First Term					Second Term			Total	Avg. Marks
		Mid Term Test		First Term			Assignment/ Oral/Project	Preliminary Examination			
		Time	Marks	Time	Marks	Project /Oral		Time	Marks		
1.	English (Communication Skills)	1 Hr.	10	3 Hrs.	70	20	30	3 Hrs.	70	200	100
2.	General Foundation Course	1 Hr.	10	3 Hrs.	70	20	30	3 Hrs.	70	200	100
3.	D.E. & C. (Theory) D.E. & C. (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
4.	E.M. & W.P. (Theory) E.M.& W.P. (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
5.	A. & C. E. (Theory) A. & C. E. (Practical)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
6.	I. E. & I. (Theory) I. E. & I. (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
7.	On Job Training	Grading pattern is shown in scheme									
8.	Physical Education	Grading pattern to be followed as in general stream									
9.	Computer Awareness	Grading pattern to be followed as in general stream									

Note: As there is no change in the curriculum/syllabi of class XIIth E. T., the current syllabi, modalities and evaluation pattern is to be followed

Goa Board of Secondary & Higher Secondary Education

DIGITAL ELECTRONICS AND COMPUTERS
MARKS: 150 (THEORY: 50, PRACTICAL: 100)

1. NUMBER SYSTEMS AND CODES (5 marks)

Binary number system; importance of binary number system; binary to decimal conversion; decimal to binary conversion; octal number system; Decimal to Octal conversion; octal to decimal conversion ; Hexadecimal number system; hexadecimal to decimal conversion; decimal to hexadecimal conversion; binary addition; binary subtraction ; 1's complement to 2's complement representation , ASCII code, BCD numbers.

2. ARITHMETIC AND LOGIC CIRCUITS (10MARKS)

OR gate, AND gate (DRL, RTL); Not gate (RTL); NAND gate and NOR gate (RTL, DTL,); X-OR gate & X-NOR gate (Using gates); Half adder, Full adder, Binary adder, Bubbled AND gate, Bubbled OR gate, De Morgans theorems (first and second).

3. MULTIVIBRATORS AND FLIP-FLOPS (8 marks)

Working of Transistorized Astable , Monostable, Bistable multivibrators, Schmitt trigger, R-S flip flop, Clocked R-S flipflop, D flip flop, Edge triggered D flip flop, J-K flip flop, J-K master slave flip flop.

4. REGISTERS AND COUNTERS (8 marks)

Buffer register, Shift register, Shift Left and Shift right register, Serial loading, parallel loading, 4 bit synchronous counter (ripple counter), ring counter, modulus of counter, mod-10 counter, 4 bit asynchronous counter, multiplexer, demultiplexer, encoder and decoder.

5. COMPUTER FUNDAMENTALS (7marks)

Block diagram of computer, CPU, importance of CPU, function of CPU, super computer, functions of super computer, block diagrams of microprocessor, 8080A and 8085 microprocessor (pin diagram and functions of pins), comparison between 8080A and 8085 microprocessor, applications of microprocessor.

6. MEMORY AND I/O DEVICES (8 marks)

Volatile and non-volatile, ROM, RAM, PROM, EPROM, CACHE memory , magnetic storage devices (magnetic tape, floppy disc, mini and micro floppies, hard disk), peripherals, VDU (mono, RGB, coloured), Keyboard, printers, impact printers(dotmatrix printers), Non impact printers(laser and inkjet printers), Mouse, Scanner, Plotter, Pen drive, light pen, CD ROM, Joystick, touch screen.

7. D to A and A TO D CONVERSION

Binary ladder, D to A converter, Accuracy., Resolution, A to D converter, Counter method, Accuracy and Resolution.

REFERENCES BOOKS

1. Digital Computer Electronics by Malvino
2. Principles of Electronics by V.K. Mehta
3. Instructional material by Goa Board

DIGITAL ELECTRONICS AND COMPUTERS
(PRACTICALS: 100marks)
COURSE: E.T./MREEDA. STD: XII (Vocational)

LIST OF PRACTICALS

UNIT I **(25 marks)**

1. Assembling of NOT, OR, AND, NOR NAND gates using RTL logic.
2. Verification of De Morgan's Theorems(first and second)
3. Testing of digital IC's (74XX series), (7400, 7402,7404, 7408, 7432, 7486).
4. Study of NOR and NAND as universal gates using 74 series IC's.

UNIT II **(25 marks)**

1. Astable Multivibrator using transistors.
2. Astable Multivibrator using IC555.
3. Monostable multivibrator using IC555.
4. Bistable Multivibrator using transistors.
5. Bistable Multivibrator using IC 555.

UNIT III **(25 mark)**

1. R-S Flip flop using NOR gates.
2. D Flip flop.
3. J-K Flip flop using gates.
4. Schmitt trigger using transistors.
5. Divide by 16 counter using IC 7493.

UNIT IV **(25 marks)**

1. Study of half adder.
2. Study of full adder.
3. Study of BCD to Seven segment decoder.
4. D to A converter using Binary Ladder.

LIST OF EQUIPMENTS PER LABORATORY

Sr. No.	Name of equipments	Quantity	Rate per Piece	Amount
1.	Variable power supply (30 volts)	5 nos.	7000.00	35,000.00
2.	Function Generator (digital)	3 nos.	7000.00	21,000.00
3.	Cathode Ray Oscilloscope	2 nos.	20000.00	40,000.00
4.	Soldering Irons(25 watts)	5 nos.	350.00	1750.00
5.	Analog Multimeters	5 nos.	1000.00	5000.00
6.	Digital Multimeters with Frequency meter.	5 nos.	6000.00	30,000.00

The revised syllabus of EMWP
Sub :- (Electronic Material & workshop practice)
Std. XII ET (Vocational Course)
Theory : (Max, Marks 50)

1) Conducting Materials (7 marks)

i) Classification of materials into conductors, semiconductors and insulators based on energy band theory.
ii) Low resistiveity conducting materials and their properties, Properties and applications of copper, aluminum and silver.
iii) High resistivity conducting material and their properties. Properties and applications of tungsten, michrome, Eureka, Selenium and Carbon.

2) Semi Conducting Materials (8 Marks)

i) Elemental semi conductor : Germanium and Silicon, its advantages, properties and applications.
ii) Semi conductors crystal growth and purification method.
a) Horizontal Bridgman method (technique)
b) The (Zochralski technique (method)
c) Zone refilling or zone melting method.
d) Liquid phase expitaxy (growth) LPE

3) Insulating Materials (5 marks)

i) Definitions of dielectrics (break down) strength, dielectrics, constant, Dielectric loss, insulation resistance, breakdown voltage.

iii) Properties and applications of insulating materials such as paper, plastic coated paper, PVC, Mica, Porcelain, insulating tapes, sleeves, varnishes and paints.

4) Magnetic Materials : (5 marks)

i) Definition of Magnetestriction, Retentivity, coercivity and hysteresis loss.
i) Labelled diagram of B – H Curve (Hyseteresis loops)
ii) Classification of magnetic materials as non- retentive (soft magnetic material), retentive (hard magnetic materials) and special alloy materials.
iv) The properties and application of some of the common magnetic materials such as Mild steel, silicon steel, mumetal & Alnico.

5) Study of various type of workshop (7 marks)

i) Assembly shop, Definition, rules and method of sequential dismantle and assembly of equipment, personal safety, machine safety and place safety.

ii) Testing and Quality Control: Definition different faults and their testing

a) Open circuit by line tester, test lamp, series test lamp.
b) Short circuit: Definition and its causes short circuit by test lamp.
c) Earth fault definition and its causes.
d) Measurement of resistance by voltmeter, Ammeter method

iii) Repair shop: Definition essential rules and method required for repairing, Necessity of overhauling and surviving of a motor or appliance, steps of overhauling of a motor.

iv) Winding shop : Definition, types of winding wires used in winding shop, cleaning of slot.

Necessary arrangement for upkeeping of various shops i.e. Assembly / Repairs /Testing / Winding Shop.

6) Study of Tools & Materials required in various workshops (5 Marks)

i) Tools
   a) Electrical hand tools : Plier, Screw drivers and testing tools.
   b) Mecahnical hand tools, spanners & hammers.
   c) Cutting tools, Files, Chisels, Hacksaw.
   d) Holding tools, Vice , Pullers.

ii) Materials
   a) Lubricants and Materials of Lubrication.
   b) Raw materials required indifferent shops.

7) Special Purpose Devices (6 marks)

a) Bimetallic relay
b) General Purpose relay
c) General Purpose relay
d) Dry reed relay
e) Mercury wetted reed relay and
f) Thermocouple.

8) Printed Circuit Boards (7 marks)

Introduction to Printed Circuit Boards,
Advantages of PCB, Classification of Laminators, Manufacturer of Cu clad laminate types of laminates.

Manufacturing Process of PCB

i) Photo resist printing.
ii) Screen Printing

Artwork

i) Ink drawing artwork
ii) Black taping on transport base foil etching and etchants.

Solders and Soldering Techniques.

i) Soft Solders and Hard Solders.
ii) Mass soldering of PCB's
   a) Dip Soldering
   b) Drag soldering and
   c) Wave Soldering

Components mounting on PCB
Multilayer boards and its advantages
Flexible printed circuits.

Weightage (Marks Distribution)

Topic	Marks
1) Conducting materials	7
2) Semi-Conducting materials	8
3) Insulating materials	5
4) magnetic Materials	5
5) Study of various types of workshops	7
6) Study of tools & materials required in various workshop	5
7) Special purpose devices	6
8) Printed circuit boards	7
Total :	50 AMrks

Reference Books:-

1) Electronic Materials and Components
   By P.C. Rao & D.V. Sutrawe.

2) Electronic materials & components
   BY D.G. Jochi, P.C. Rao & D.V. Sutrawe

3) Electrical Engineering materials
   By N. Alagappan and N.T Kumar

4) Materials and workshop practice - I
   By Dipak U. Tatpuje
5) Electronic Devices, COmponents & Fabrication
   By Mrs. Anusuya Kalavar

6) Electronic Components & Materials
   By Madhuri A. Joshi.

LIST OF EXPERIMENTS

STD: XII ET
SUB.; EM & WP.

1) Drawing layouts of :
   - Assembly shop
   - Repair shop
   - Testing Laboratory
   - Winding Shop

   Drawing – 10X4 = 40 marks
   Dimensions – 2.5 each X 4 = 10 marks.

2) Wiring of control panel using print - Optional
   Layout of front panel – 10marks
   Tracing as per blue print - 20 marks
   Connections-20 marks.
3) Preparation of cable harness.
4) Study of different displays – only viva.
5) Speed control of DC meter
6) To find conductivity and resistivity of different solutions using conductivity meter.
7) To form two identical solenoids using insulated copper and aluminum wire of same gauge and same number of turns and compare their resistance and field strengths.
8) To make coils of Nichrome and Eureka wires of equal resistance and measure current, DC power at a given voltage.
9) To identify different insulating materials – only viva.
10) To identify different magnetic materials – only viva.
11) To plot characteristics of thermocouple.
12) To study application of bimetallic relay to control temperature.
13) Study of different motor starters – optional – only – viva.
14) To study the use of high voltage breakdown tester on various coils and windings.
15) To design and prepare a PCB for a circuit of not less than 10 components, assembling and testing of the same.

   - Design a PCB i.e. artwork from given circuit.
   - Transfer of artwork on cu-clad board.
   - Etch and drill a painted / printed clad board.
   - Assemble and test the circuit.

16) Project – Assembly of one electronic project.
MREEDA - Assembly of an electronic project of not less than 50 points.
ELECTRONIC TECHNOLOGY - Assembly of two band transistor kit.

Subject : Applied & Consumer Electronics.

STD: XII

Sr. no.	Topic	marks allotted
1.	Electronic components and Devices	(08)
2.	Radio communication	(10)
3.	Television Receiver	(10)
4.	Disc Recording Systems	(05)
5.	Audio Cassette Player	(05)
6.	Public Address System	(05)
7.	Cell Phone Technology	(07)

CONTENTS

1. Elecctronic components and Devices ---------(marks) (10)

a) Fabrication of different diodes

* Rectifier diode
* Zener diode
* LED (lighting emitting diode)
* Point contact diode (Detector diode)
* Photo diode

b) Fabrication technique of transistors and Integrated Circuits (Monolithic & Hybrid)

* Grown junction
* diffussion process
* Epitaxial Layer growth process.

c) Introduction of OP-AMP, Block diagram, Op-amp as inverter/Summing amplifier / adder. Op-amp parameters, op-amp applications & advantages.

d) Classification / Advantages / Applications ICs.

IC packages:-

1) To style **2)** Flat pack **3)** DIP. Advantages/Applications.

Radio Communication ----------(marks) ---------(10)

Concept of radio communication, properties of radio waves, paths of propagation of radio waves, modulation of radio waves, amplitude modulation, frequency modulation, waveform diagram of AM wave & FM wave . De-modulation.

Block diagram of principle of radio transmission, characteristics of Radio receivers (Selectivity, Sensitivity, Fidelity.)

Superhetrodyne radio receiver (Am & FM). Block diagram of Superhetrodyne radio receiver.

AGC, tone control, pre-emphasis & de-emphasis.

3) Television Receiver. ---------(marks) ----------(10)

Introduction to television system difference between audio & video signals, scanning (progressive, interlaced).

Composite video signal. Definition of blanking and synchronizing pulses. Concept of SMPS.

Types of Camera tubes(Vidicon, plumbicon & Othicon)

Working principle & construction of TV camera tubes Difference between monochrome and colour television.

TV Channels & Standards

Block diagram of B/W TV receiver.

Types of TV antennas. (dipole, single pole and yagi antenna) Elements of TV antenna (parasitic elements) Transmitting & receiving antenna.

Introduction o to DTH. Satellite System

Introduction to TFT/LCD Monitors.

4) Audio cassette player. ----------(05)

Characteristics of musical sound, factors affecting loudness of sound.

Block diagram of cassette tape Recorder. (Mono/Stereo).

Principle of magnetic recording and erasing.

Introduction to Digital Home Theatres.

5) Disc Recording System----------(05)

a) CD player.

Concept of mechanical disc recording and playback, Compact disc recording Advantages of Storing information in digital format on CD. Types of CD's , Electrical & Mechanical adjustment in CD Players.

Servo System in CD player. Block diagram of CD player.

a) DVD.

Working principle of DVD. Optical lens assembly

Methods of Cleaning Optical Lens.

b) MP3

What are MP3 Players? How it works?

Block diagram of MP3 Player.

Parts of MP3 Player.

6) Public address system.

a) Types of amplifiers.

b) Types of loud speaker (woofer, tweeter).

c) Types of microphone (condenser, moving coil,
crystal, carbon).

d)Impedance matching of speakers, amplifiers and microphones.

e) Mixer circuit.

7) Cell Phone Technology ----------(marks)-----(07)

Introduction to cordless & mobile phone.

Mobile communication.(transmitting & Receiving Concept)

Definition of Cells, Frequency re-use, Hand-off capability, MTSO. Sim card, Dual band, Dual mode.

Limitations of Mobile Systems.

Advantages of cellular mobile systems.

Physical size of a cell (Macrocell, Microcell and picocell).

Introduction to WAP, GPRS, EDGE, 3G, BLUE TOOTH.

Definition of CDMA, TDMA, GSM.

SUB: APPLIED AND CONSUMER ELECTRONICS

LIST OF PRACTICALS STD: XII

1) Study of operational amplifier
   a) Pin configuration
   b) Study of block diagram
   c) Details of each block

2) Assembly and testing of inverting amplifier using IC741

3) Assembly and testing of Non-Inverting amplifier using IC741

4) Assembly and testing of summing/voltage Adder using IC741

5) Construction and testing of adjustable voltage regulator using ICLM317
   a) Perform Load regulation test
   b) Perform line regulation test

6) Study of switch mode Power supply (SMPS)
   a) Measurement of voltages at different test points
   b) General servicing of SMPS based on simple faults

7) Study of AM type radio receiver using block diagram. Detail study of each block.

8)Fault finding in a radio receiver
   1. RF section
   2. Audio section including detector
   3. Power supply section
   4. Measurement of voltages at various sections

9) Study of cassette tape recorder using block diagram. Detail study of each block.

10) Fault finding in a cassette tape recorder

a) Head alignment

b) Motor control circuit

c) Audio amplifier circuit

d) Cassette tape mechanism servicing

5. Power supply testing and servicing
6. Measurement of voltages at different points on the circuit board

11) Study of TV receiver, using Block diagram (Black and white). Detail study of each block.

12) Study of colored T.V. receiver using Block diagram. Detail study of each block

13) Fault finding and servicing of a T.V. receiver

a) Measurement of voltages of different IC's

b) Location of faults using visual methods

c) Location of faults using symptoms

d) General servicing of different sections such as tuner, video, IF, synch and sound section.

14) Fault finding of T.V. power supply

a) TV SMPS testing and servicing using measurement test at various test points

b) Testing of EHT power supply and associated test points

15) Study of DTH system

a) Basic Block diagram of DTH system

b) DTH receiver operations

c) Installation and Alignment of Dish assembly

16) Study of a CD/DVD player using block diagram

17) Servicing and testing of basic CD player

18) Study of TFT LCD monitor using block diagram

19) Study of TFT monitor power supply using block diagram and study of each block in detail

20) Disassembly and servicing of TFT monitor.

* * *

Revised Syllabus

Subject – Industrial Electronic and Instrumentation

Topic 1
Electronic and Electronic Devices and Components **4marks**

a. Construction, Working Properties, Characteristics and Application of Photoelectric cells (LDR, Photo tube,
photodiode, photo transistor, photo voltaic cell). Thermistor, Triac, SCR UJT, Zener diode, Infra red LED
Piezo electric crystal, Hall effect device
b. Construction, Working, Properties, Characteristics and Application of Transformer, coils, solenoids, relays

Topic 2
Power supplies 6marks

a. Basic AC to DC conversion concept with Full wave rectification, half wave rectification
b. Concepts ans circuits of Voltage regulators, use of Zener diode, transistor as voltage regulators,
IC 723 IC 317 and ICs 78xx and 79xx regulators
c. SMPS – Basic concept, Advantages over conventional DC supplies, Working principle, circuit
diagram and applications
d. Converters and Inverters – DC to AC Converter, DC to DC converter, Practical sample Inverter
circuits, Working blocks diagram of UPS. Circuits of Battery Charges.

Topic 3
Power Control Switches **2marks**
Construction, Properties and uses if SCR, Triac for various high load industrial Controls.

Topic 4
Cathode Ray Oscilloscope **4marks**
CRT and it's control circuits- blocks diagram of CRT
CRO – Block diagram and working principle
Vertical and Horizontal deflection systems, Vertical amplifier, input attenuator, synchronization sweep
Uses of CRO – AC DC measurements
Amplitude, Time period, frequency and phase difference measurements

Topic 5
Meters **3marks**
Analog and Digital
Moving Coil Galvanometer, Voltmeter, ammeter, Ohmmeter, Multimeter
Sensitivity of MCG
Digital Voltmeter, Ammeter, Ohmmeter, Multimeter
Resolution and accuracy

Topic 6 **6marks**
Transducers
Concept and definition of transducer
Classification of transducer
Detailed study of various transducer like 1) Strain gauge 2) Electromagnetic transducers like LVDT, speedometer 3) piezoelectric transducer 4) Photo electric transducer 5) pressure transducer like carbon pads 6) Capacitor transducer

Topic 7
Electronic Timers **7marks**
Basic concepts, time delay relay, Detail of capacitor as timing elements, Analog and digital timers
Timers IC 555- Blocks diagram, features, properties and circuits in Astable, Monostable and Square wave generator mode.
IC 741 as timer
Applications of timers – practical example

Topic 8
Instrumentation 5marks
Concept of electronic instrumentation, Block diagram
Study of bridges as processing unit in instrumentation- Wheatstone's bridge
Study of instruments like (Block diagram and working principle) – Weighing machines, Temperature gauge, speedometers, light intensity meters, metal detectors, tong tester, sound level meter.

Alarms, indicator and detectors – Burglar alarm, smoke detector, water level indicator

Topic 9
Signal generators **3marks**
Details of various electrical wave forms like Sine wave, Triangular wave.
Oscillators- AF and RF circuits and frequency formulae
Concept of Signal Generator
AF and signal generators- block diagrams and working principle

Topic 10
Display Devices 3marks

LED 7 segment display devices, Decoder and driver circuits for LED 7 segment devices.
Liquid crystal display- What is liquid crystal, it's electrical properties and Basic structure of the LCD display unit

Topic 11 7marks
Motors Devices

Basic working principle of a motors
Classification of motors into DC and AC types
Classification of DC motors
Classification of AC motors
Starters for DC and AC motors
Speed control circuits for DC and AC motors
Application of different type of motors
Three phase AC motors basic concept only

Practical Experiment Suggestions

- The experiments should be based on the theory part of the subject
- The stress should be given on designing, assembling and trouble shooting the electronic circuits

The experiments for the subject of Industrial Electronic and Instrumentation could be done in three Level (This can be applied to other subjects too)

Level 1

- These experiments are designed to familiarize the students with the working and characteristic
  of various components like diodes, capacitors, LDR, Relay, ICs etc
- The experiments will involve studying one concept at the time
- This will help the students to understand he function of a particular components in a complex circuit

List of experiments for level 1

1. Study of MCG based meters
2. Study of Digital multimeters
3. Study of Resistors as voltage divider
4. Study of variable resistors (as current limiters and as variable voltage dividers)
5. Study of Capacitors as timing device(calculating the RC time Constant)
6. Study of Capacitors as Filter
7. Study of Capacitors as AC coupling device
8. Study of PN junction diode as electronic valve

9. Study of Transistor biasing
10. Study of transistor as switch
11. Study of transistors as amplifier
12. Study of Photo cells like LDR, Photodiode and Phototransistor as light sensors
13. Study of Thermistor.

Level 2

- These experiments are designed to study some standard circuits used in industrial processes and in instrumentation.
- The experiments will involve assembling the circuit by referring to given diagram and testing the working of the assembled circuit and collecting the data in tabulated format.

List of experiments for Level 2

1. Assembling and testing DC power supply
a. Unregulated
b. Regulated.

2. Assembling and testing battery charger.
3. Assembling and balancing the Wheatstones bridge
a. With variable resistor in one arm.
b. With LDR in one ard

4. Assembling and testing oscillators
a. Phaseshift
b. Weinbridge
c. Collpitt's
d. Hartley's

5. Assembling and testing timer in Astable mode using Transistors(with LED and relay simultaneously at the output)
6. Assembling and testing timer in Astable mode using IC555(with LED and relay simultaneously at the output)
7. Assembling and testing timer in Monostable mode using IC555(with LED and relay simultaneously at the output)
8. Assembling and testing timer in Square wave generator mode using IC555(with LED and relay simultaneously at the output)
9. Assembling and testing timer in Astable mode using IC741 (with Led and relay simultaneously at the Output.
10. Using LDR to trigger the IC 555 based timer in Monostable mode.
11. Assembling and testing simple photo relay using LDR and transistor.
12. Assembling and testing speed control circuit for DC motors
13. Assembling and testing speed control circuit for AC motors.

Level 3

- This set is designed to introduce students to designing simple circuits using the theoretical and practical knowledge gained during the course.
- A student has to design any 4 experiments (with the help of teacher) and assemble any one from the 4 designed.

List of experiments for level three

1. Simple weighing machine
2. Simple remote control circuit
3. Simple water level indicator
4. simple emergency lamp
5. simple fire alarm
6. water level indicator
7. Burglar alarm
8. Practical counter
9. Simple inverter
10. Simple electronic thermometer.

More such experiments can be included

Evaluating the Practical Skills.

The weightage can be
25% for Level 1 experiments
25% for level 2 experiments
50% for level 3 experiments

FORMAT OF MODEL QUESTION PAPER FOR THE THEORY EXAMINATION IN CLASS XIITH

Subjects: EMWP, DEC, EEM, DCA, ACE, IE & I

MARKS: 50

Q.1.	A] Fill in the blanks (4 questions with choices: ½ Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.2.	A] Match the pairs (4 pairs with 7 choices: ½ Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.3.	A] Fill in the blanks (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in short (1 questions: 3 Marks each)	(**3 Marks**)
	C] Answer the following in detail (1 Question: 5 Marks)	**(5 Marks)**
Q.4.	A] Answer the following in brief (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (1 questions: 3 Mark each)	**(3 Marks)**
	C] Answer the following in details (1 Question: 5 Marks)	**(5 Marks)**
Q.5.	A] Answer the following in one or two words (1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (4 questions: 2 Marks each)	**(8 Marks)**

Note: 1) Wherever required, options for the students be given to choose from set of questions (only for short and long answer type questions)

2) Marking Scheme similar to the above shall be followed for the Mid-term test with proportionate Marking.

3) Internal options to be provided for Five Mark Questions.

BLUE PRINT FOR THE THEORY EXAMINATION IN CLASS XIITH

Subjects: EMWP, DEC, EEM, DCA, ACE, IE & I MARKS: 50

Allocation of Marks

6) Topic-wise marks are given in the Instructional Material to be followed

7) Marks for Domains

Knowledge	20 %	10 Marks
Understanding	35 %	17.5 Marks
Application	25 %	12.5 Marks
Skill	20 %	10 Marks
Total	100 %	50 Marks

8) Types of Questions

Objective	20 %	10 Marks
Short Answers	60 %	30 Marks
Essay Type	20 %	10 Marks
Total	100 %	50 Marks

9) Types of Questions (Difficulty wise)

Easy	20 %	10 Marks
Average	60 %	30 Marks
Difficult	20 %	10 Marks
Total	100 %	50 Marks

10) Number of Questions

Objective	2 Fill in the blanks without alternatives	1x2=	2
	2 definations	1 x2 =	2
	2 Answer in one/two words	1 x 2 =	2
	2 Fill in the blanks without alternatives	1 x 2 =	2
	2 Answer in one/two words or definitions	1 x 2 =	2
		Total	10

Short Answers	6 Questions of 3 Marks each	3 x 6 =	18
	6 Questions of 2 Marks each	2 x 6 =	12
		Total	30

Essay Type Answers	2 Questions of 5 Marks each with a choice from the same topic	5 x 2 =	10
		Total	10

MAINTENANCE AND REPAIRS OF ELECTRICAL AND ELECTRONIC DOMESTIC APPLIANCES COURSE

REVISED CURRICULUM – STD: XII

Subjects for Std:XII

1) Digital Electronics & Computers
2) Electronic Materials & Workshop Practice
3) Electronic & Electrical Measurements
4) Domestic and Consumer Appliances

TEACHING SCHEME AND MARKS (STANDARD XIITH MREEDA)

Sr. No.	Subjects	MARKS		LECTURES	
		Theory	Practicals/ Oral/Viva	Theory	Practicals/ Oral/Viva
COMPULSORY SUBJECTS					
1.	English (Communication Skills)	70	30	5	-
2.	General Foundation Course	70	30	5	-
3.	Digital Electronics & Computers	50	100	3	5
4.	Electronic Materials & Workshop Practice	50	100	3	5
5.	Electronic & Electrical Measurements	50	100	3	5
6.	Domestic and Consumer Appliances	50	100	3	5
SCHOOL ASSESSMENT SUBJECTS					
7.	On the job training	Grades (6 weeks industrial training)			
8.	Physical Education	Grades as per general stream scheme			2
9.	Computer Awareness	Grades to be given as per the scheme			3*
		340	460	22	20

(* To be taken outside the regular instructional hours)

Passing: Minimum 25 % in theory

Minimum 25 % in practicals

Overall passing 35 %

TRANSCRIPT OF STUDY SCHEME (MREEDA)

CLASS: XII TH						
Subjects	Theory		Practicals		Total	
	Hours	Mark	Hours	Mark	Hours	Mark
English (Communication Skills)	70	70	30	30	100	100
General Foundation Course	70	70	30	30	100	100
Digital Electronics & Computers	50	50	100	100	150	150
Electronics Materials & Workshop Practice	50	50	100	100	150	150
Electronic & Electrical Measurements	50	50	100	100	150	150
Domestic and Consumer Appliances	50	50	100	100	150	150
On the job training	---	---	288	Grade	288	Grade
Physical Education	---	---	30	Grade	30	Grade
Computer Awareness	---	---	30	Grade	30	Grade

SCHEME OF EXAMINATION (STANDARD XIITH MREEDA)

Sr. No.	Subjects	Marks		Total	Remarks
		Theory	Practicals		
1	English (Communication Skills)	70	30	100	
2	General Foundation Course	70	30	100	
3	Digital Electronics & Computers	50	100	150	
4	Electronics Materials & Workshop Practice	50	100	150	
5	Electronic & Electrical Measurements	50	100	150	
6	Domestic and Consumer Appliances	50	100	150	

SCHEME OF INTERNAL ASSESSMENT FOR STD. XII (MREEDA)

Sr. No.	Subject	First Term					Second Term			Total	Avg. Marks
		Mid Term Test		First Term			Assignment/ Oral/Project	Preliminary Examination			
		Time	Marks	Time	Marks	Project /Oral		Time	Marks		
1.	English (Communication Skills)	1 Hr.	10	3 Hrs.	70	20	30	3 Hrs.	70	200	100
2.	General Foundation Course	1 Hr.	10	3 Hrs.	70	20	30	3 Hrs.	70	200	100
3.	D.E. & C. (Theory) D.E. & C. (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
4.	E.M. & W.P. (Theory) E.M.& W.P. (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
5.	E. & E. M. (Theory) E. & E. M. (Practical)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
6.	D. & C. A. (Theory) D. & C. A. (Practicals)	1 Hr. --	10 --	2 Hrs. 3 Hrs.	40 100	-- --	-- --	2 Hrs. 3 Hrs.	50 100	100 200	50 100
7.	On Job Training	Grading pattern is shown in scheme									
8.	Physical Education	Grading pattern to be followed as in general stream									
9.	Computer Awareness	Grading pattern to be followed as in general stream									

Note: As there is no change in the curriculum/syllabi of class XIIth MREEDA, the current syllabi, modalities and evaluation pattern is to be followed

Goa Board of Secondary & Higher Secondary Education

DIGITAL ELECTRONICS AND COMPUTERS
MARKS: 150 (THEORY: 50, PRACTICAL: 100)

1. NUMBER SYSTEMS AND CODES (5 marks)

Binary number system; importance of binary number system; binary to decimal conversion; decimal to binary conversion; octal number system; Decimal to Octal conversion; octal to decimal conversion ; Hexadecimal number system; hexadecimal to decimal conversion; decimal to hexadecimal conversion; binary addition; binary subtraction ; 1's complement to 2's complement representation , ASCII code, BCD numbers.

2. ARITHMETIC AND LOGIC CIRCUITS (10MARKS)

OR gate, AND gate (DRL, RTL); Not gate (RTL); NAND gate and NOR gate (RTL, DTL,); X-OR gate & X-NOR gate (Using gates); Half adder, Full adder, Binary adder, Bubbled AND gate, Bubbled OR gate, De Morgans theorems (first and second).

3. MULTIVIBRATORS AND FLIP-FLOPS (8 marks)

Working of Transistorized Astable , Monostable, Bistable multivibrators, Schmitt trigger, R-S flip flop, Clocked R-S flipflop, D flip flop, Edge triggered D flip flop, J-K flip flop, J-K master slave flip flop.

4. REGISTERS AND COUNTERS (8 marks)

Buffer register, Shift register, Shift Left and Shift right register, Serial loading, parallel loading, 4 bit synchronous counter (ripple counter), ring counter, modulus of counter, mod-10 counter, 4 bit asynchronous counter, multiplexer, demultiplexer, encoder and decoder.

5. COMPUTER FUNDAMENTALS (7marks)

Block diagram of computer, CPU, importance of CPU, function of CPU, super computer, functions of super computer, block diagrams of microprocessor, 8080A and 8085 microprocessor (pin diagram and functions of pins), comparison between 8080A and 8085 microprocessor, applications of microprocessor.

6. MEMORY AND I/O DEVICES (8 marks)

Volatile and non-volatile, ROM, RAM, PROM, EPROM, CACHE memory , magnetic storage devices (magnetic tape, floppy disc, mini and micro floppies, hard disk), peripherals, VDU (mono, RGB, coloured), Keyboard, printers, impact printers(dotmatrix printers), Non impact printers(laser and inkjet printers), Mouse, Scanner, Plotter, Pen drive, light pen, CD ROM, Joystick, touch screen.

7. D to A and A TO D CONVERSION

Binary ladder, D to A converter, Accuracy., Resolution, A to D converter, Counter method, Accuracy and Resolution.

REFERENCES BOOKS

1. Digital Computer Electronics by Malvino

2. Principles of Electronics by V.K. Mehta

3. Instructional material by Goa Board

DIGITAL ELECTRONICS AND COMPUTERS
(PRACTICALS: 100marks)
COURSE: E.T./MREEDA. STD: XII (Vocational)

LIST OF PRACTICALS

UNIT I **(25 marks)**

1 Assembling of NOT, OR, AND, NOR NAND gates using RTL logic.
2 Verification of De Morgan's Theorems(first and second)
3 Testing of digital IC's (74XX series), (7400, 7402,7404, 7408, 7432, 7486).
4 Study of NOR and NAND as universal gates using 74 series IC's.

UNIT II **(25 marks)**

1 Astable Multivibrator using transistors.
2. Astable Multivibrator using IC555.
3. Monostable multivibrator using IC555.
4. Bistable Multivibrator using transistors.
5. Bistable Multivibrator using IC 555.

UNIT III **(25 mark)**

1.R-S Flip flop using NOR gates.
2.D Flip flop.
3.J-K Flip flop using gates.
4.Schmitt trigger using transistors.
5.Divide by 16 counter using IC 7493.

UNIT IV **(25 marks)**

1.Study of half adder.
2.Study of full adder.
3.Study of BCD to Seven segment decoder.
4.D to A converter using Binary Ladder.

LIST OF EQUIPMENTS PER LABORATORY

Sr. No.	Name of equipments	Quantity	Rate per Piece	Amount
1.	Variable power supply (30 volts)	5 nos.	7000.00	35,000.00
2.	Function Generator (digital)	3 nos.	7000.00	21,000.00
3.	Cathode Ray Oscilloscope	2 nos.	20000.00	40,000.00
4.	Soldering Irons(25 watts)	5 nos.	350.00	1750.00
5.	Analog Multimeters	5 nos.	1000.00	5000.00
6.	Digital Multimeters with Frequency meter.	5 nos.	6000.00	30,000.00

The revised syllabus of EMWP
Sub :- (Electronic Material & workshop practice)
Std. XII MREEDA (Vocational Course)
Theory : (Max, Marks 50)

1)Conducting Materials (7 marks)

1. Classification of materials into conductors, semiconductors and insulators based on energy band theory.
2. Low resistiveity conducting materials and their properties, Properties and applications of copper, aluminum and silver.
3. High resistivity conducting material and their properties. Properties and applications of tungsten, michrome, Eureka, Selenium and Carbon.

2) Semi Conducting Materials (8 Marks)

1. Elemental semi conductor : Germanium and Silicon, its advantages, properties and applications.
2. Semi conductors crystal growth and purification method.
    i. Horizontal Bridgman method (technique)
3. The (Zochralski technique (method)
4. Zone refilling or zone melting method.
5. Liquid phase expitaxy (growth) LPE

3) Insulating Materials (5 marks)

1) Definitions of dielectrics (break down) strength, dielectrics, constant, Dielectric loss, insulation resistance, breakdown voltage.

2) Properties and applications of insulating materials such as paper, plastic coated paper, PVC, Mica, Porcelain, insulating tapes, sleeves, varnishes and paints.

4) Magnetic Materials : (5 marks)

i) Definition of Magnetestriction, Retentivity, coercivity and hysteresis loss.
i.))Labelled diagram of B – H Curve (Hyseteresis loops)
ii.)Classification of magnetic materials as non- retentive (soft magnetic material), retentive (hard magnetic materials) and special alloy materials.
iv) The properties and application of some of the common magnetic materials such as Mild steel, silicon steel, mumetal & Alnico.

5)Study of various type of workshop (7 marks)

i) Assembly shop, Definition, rules and method of sequential dismantle and assembly of equipment, personal safety, machine safety and place safety.
ii) Testing and Quality Control: Definition different faults and their testing

a)Open circuit by line tester, test lamp, series test lamp.
b)Short circuit: Definition and its causes short circuit by test lamp.
c)Earth fault definition and its causes.
d)Measurement of resistance by voltmeter, Ammeter method

iii) Repair shop: Definition essential rules and method required for repairing, Necessity of overhauling and surviving of a motor or appliance, steps of overhauling of a motor.

iv) Winding shop : Definition, types of winding wires used in winding shop, cleaning of slot.

Necessary arrangement for upkeeping of various shops i.e. Assembly / Repairs /Testing / Winding Shop.

5.Study of Tools & Materials required in various workshops (5 Marks)

1. Tools

aElectrical hand tools : Plier, Screw drivers and testing tools.
bMecahnical hand tools, spanners & hammers.
c)Cutting tools, Files, Chisels, Hacksaw.
d)Holding tools, Vice , Pullers.

i.Materials

a)Lubricants and Materials of Lubrication.
b)Raw materials required indifferent shops.

7) Special Purpose Devices (6 marks)

a) Bimetallic relay
b) General Purpose relay
c) General Purpose relay
d) Dry reed relay
e) Mercury wetted reed relay and
f) Thermocouple.

8) Printed Circuit Boards (7 marks)

Introduction to Printed Circuit Boards,
Advantages of PCB, Classification of Laminators, Manufacturer of Cu clad laminate types of laminates.

Manufacturing Process of PCB

iii) Photo resist printing.
iv) Screen Printing

Artwork

iii) Ink drawing artwork
iv) Blac taping on transport base foil etching and etchants.

Solders and Soldering Techniques.

i)Soft Solders and Hard Solders.
ii)Mass soldering of PCB's
a)Dip Soldering
b)Drag soldering and
c)Wave Soldering

Components mounting on PCB
Multilayer boards and its advantages
Flexible printed circuits.

Weightage (Marks Distribution)

Topic	Marks
1) Conducting materials	7
2) Semi-Conducting materials	8
3) Insulating materials	5
4) magnetic Materials	5
5) Study of various types of workshops	7
6) Study of tools & materials required in various workshop	5
7) Special purpose devices	6
8) Printed circuit boards	7
Total :	50 AMrks

Reference Books:-

1) Electronic Materials and Components
By P.C. Rao & D.V. Sutrawe.

2) Electronic materials & components
BY D.G. Jochi, P.C. Rao & D.V. Sutrawe

3) Electrical Engineering materials
By N. Alagappan and N.T Kumar

4) Materials and workshop practice - I
By Dipak U. Tatpuje
5) Electronic Devices, COmponents & Fabrication
By Mrs. Anusuya Kalavar

6) Electronic Components & Materials
By Madhuri A. Joshi.

LIST OF EXPERIMENTS

STD: XII MREEDA
SUB.; EM & WP.

1) Drawing layouts of :
   - Assembly shop
   - Repair shop
   - Testing Laboratory
   - Winding Shop

   Drawing – 10X4 = 40 marks
   Dimensions – 2.5 each X 4 = 10 marks.

2) Wiring of control panel using print - Optional
   Layout of front panel – 10marks
   Tracing as per blue print - 20 marks
   Connections-20 marks.
3) Preparation of cable harness.
4) Study of different displays – only viva.
5) Speed control of DC meter
6) To find conductivity and resistivity of different solutions using conductivity meter.
7) To form two identical solenoids using insulated copper and aluminum wire of same gauge and same number of turns and compare their resistance and field strengths.
8) To make coils of Nichrome and Eureka wires of equal resistance and measure current, DC power at a given voltage.
9) To identify different insulating materials – only viva.
10) To identify different magnetic materials – only viva.
11) To plot characteristics of thermocouple.
12) To study application of bimetallic relay to control temperature.
13) Study of different motor starters – optional – only – viva.
14) To study the use of high voltage breakdown tester on various coils and windings.
15) To design and prepare a PCB for a circuit of not less than 10 components, assembling and testing of the same.

   - Design a PCB i.e. artwork from given circuit.
   - Transfer of artwork on cu-clad board.
   - Etch and drill a painted / printed clad board.
   - Assemble and test the circuit.

16) Project – Assembly of one electronic project.
MREEDA - Assembly of an electronic project of not less than 50 points.
ELECTRONIC TECHNOLOGY - Assembly of two band transistor kit.

ELECTRONIC AND ELECTRICAL MEASUREMENTS

STD XII MREEDA
THEORY

TOPIC I

1. **Types of Instruments:**
   Indicating, Integrating and Recording Instruments.

2. Essentials of Measuring Instruments:
   a) Deflecting Torque b) Controlling Torque and c) Damping Torque.
   Deflecting Torque - 1) Physical effect
   2) Chemical Effect
   3) Magnetic Effect
   4) Heating Effect
   5) Electrostatics Effect
   Controlling Torque – 1) Spring Control Method
   2) Gravity Control Method
   Damping Torque - 1) Air friction damping device
   2) Fluid friction damping device
   3) Eddy Current damping device.

3. Classification of Indicating Instruments:
   Principle, Construction, working, advantages and disadvantages of
   1) Permanent Magnet moving coil (PMMC)
   2) Moving Iron Instrument
   3) Electrodynamometer type of Instrument
   4) Rectifier type of Instrument

4. Classification of Integrating Instruments: (3 Marks)
   Study of Single Phase Energy meter.

5. Study of Induction type Wattmeter and comparison with Energy meter.

6. Study of Recording Instruments: (3 Marks)
   Electrocardiogram (ECG)

7. Study of Single Phase Power Factor Meter.

Topic II

1. Study of Cathode Ray Oscilloscope (CRO): (5 marks)

Block diagram of CRO, Front panel of CRO, Study of CRT , Time base Generator, Measurement of Amplitude, Frequency, Voltage(AC/DC), Phase difference using CRO, Study of CRO Probc.

2. Study of Digital Maters: (3 marks)

Digital Multimeter and Digital frequency meter.

3. **Signal Generators:** **(3 Marks)**
   Audio frequency (AF), Radio Frequency (RF) and function generator principle, working with block diagram, applications.

4. **Calibration of DC Instruments:** **(2marks)**
   Ammeter and Voltmeter.

TOPIC III

1. **Study of Megger:** **(3marks)**
   Hand driven type and digital type-Principle, Construction, Working, Precautions and Applications.

2. **Study of the following meters:** **(12 Marks)**
   A) Tachometer – a) DC Tachometer b)m AC tachometer c) Drag Cup Rotor and d) Photelectric Tachometer.
   B) Analog Frequency Meter – a) Reed type and b) Inductor Type.
   C) PH Meter.
   D) Output Power Meter.
   E) Current Transformer (Tong Tester)
   F) High Voltage Breakdown Tester(HVBT)
   G) Temperature Indicator (Digital)
   H) Anemometer.

TOPIC IV **(3 Marks)**

1. **LCR Bridges:**
   Wheatstone bridge, De sautys bridge, Maxwell Bridge and Hays Bridge – principle , Construction, working and application.

2. **Transducers:** **(7 Marks)**
   a) Classification of Transducers – Active and Passive.
   b) Selection of a Transducer
   c) Force Summing Members
   d) Types of Transducers – 1) Resistance
      2) Inductance
      3) Capacitance
      4) Voltage/ Current
   e) Digital Transducer
      Principle, Construction, Working and applications.

Marks Distribution

TOPIC I - 12
TOPIC II - 13
TOPIC III -15
TOPIC IV -10

PRACTICALS

1. Range extension of Voltmeter.
2. Range extension of Ammeter.
3. Calibration of Wattmeter.
4. Calibration of Single phase energy meter with help of standard wattmeter and stop watch.
5. Measurement of power and Power factor in RLC series circuit.
6. Measurement of frequencies of various waveforms generated by a function generator with the help of CRO.
7. To study various measurement with a digital multimeter.
8. Measurement of Voltage (AC & DC), frequency, Lissajous figures and phase difference with the help of CRO.
9. To study (NTC and PTC) thermistor characteristics.
10. To measure the current consumption of various gadgets by using Tong tester.
11. To measure RPM of a speed controlled motor using tachometer.
12. To plot the characteristics of Thermocouple.
13. Measurement of Insulation Resistance of Armature and field coil using Megger.
14. Measurement of LCR with the help of LCR meter.
15. To study Phototransistor Characteristics.
16. To study LDR Characteristics.
17. To measure air velocity using Anemometer.
18. Measurement of Power of an amplifier by using output power meter.
19. To study the high voltage breakdown tester.

SYLLABUS

STD: XII MREEDA SUB.: DOMESTIC AND CONSUMER APPLIANCES
THEORY :- 50 MARKS PERIODS: 03
PRACTICAL : 100 MARKS PERIODS: 05

THEORY

TOPIC I: HEATING APPLIANCES MARKS 10

1) Electrical iron – introduction working principle and construction, operation, operation of ordinary and automatic iron.
2.Electric stove- Introduction, working principle and construction, operation of coil type and hot plate.
3.Electric cooking range and grill /oven; Introduction, working principle and construction operation.
4.Electric toaster - Introduction, working principle and construction operation of ordinary and automatic.
5.Immersion heater: Introduction, working principle and construction.
6.Electric geyser: Introduction, working principle and construction and installation of pressure and non-pressure type.
7.Electric kettle : Introduction, working principle and construction of swan neck type and cylindrical type.
8.Microwave oven: Introduction, working principle and construction operation.

TOPIC II : Motorized appliances marks:10.

1. Electric room heater: Introduction, working principle and construction of blower type room heater.
2. Electric fan : introduction , working principle construction speed control method and different accessories.
3.Electric Mixer grinder, juicer: Introduction, working principle and construction, speed control method and different accessories.
4. Electric washing machine and dryer: Introduction, working principle and construction of semi automatic agitator type, panel; controls And brief introduction of other type.
5. Hair dryer : Introduction, working principle and construction speed control method.
6. Vacuum cleaner : Introduction, working principle and construction of upright type and tank type.
7. Electric grain grinder: Introduction, working principle and construction of upright type and tilting type.
8. Electric hand drills: Introduction, working principle and construction.

Topic III: Electrical and electronic appliances marks 10

1 Electric gas lighter: Introduction, Working Principal, Construction.
2 Electric bell and buzzer: Introduction, Working Principal, Construction.
3 Emergency light: Introduction, Working Principal, Construction, with block diagram, bulb and florescent lamp types.
4 Voltage Stabilizers: Introduction, Working Principal, Construction with block diagram of servo type and relay type, UPS.
5 Battery Charger: Introduction, Working Principal, Construction.
6 Solar Voltaic cell: Working, types, modules, panels, arrays and applications

Topic IV: Visual electronic appliances marks 15

Introduction, Study of block diagram, working principal and different sections of

1. AM/FM transistor receiver
2. Audio cassette player/recorder
3. CD player
4. B/W Television
5. Mobile.
6. Introduction and installation of DTH.

Topic V: Preventive Maintenance marks 5

Precautions handling and maintenance for all types of electrical and electronic domestic appliances in this subject

Note: Common defects, testing methods, repairing procedures, and trouble shooting charts are to be covered under practicals.

List of Practicals for the subject Domestic and Consumer Appliances:

1. Dismantling and reassembling of ordinary and automatic iron
   Testing and repair of ordinary and automatic iron
2 Dismantling and reassembling of electric stove and hot plate
   Testing and repair of electric stove and hot plate
3. Dismantling and reassembling of cooking range/electric oven
   Testing and repair of cooking range/electric oven
4. Dismantling and reassembling of non automatic and automatic electric toaster
   Testing and repair of non automatic and automatic iron electric toaster.
5. Dismantling, assembling and testing of immersion heater and installation of geyser.
6. Dismantling, assembling and repair of electric kettle
7. Dismantling, assembling, testing and repair of microwave oven.
8. Testing, faultfinding, repair and overhauling of blower type room heater.
9. Testing, faultfinding, repair and overhauling of electric fan
10. Testing, faultfinding, repair and overhauling of electric mixer
11. Testing, faultfinding, repair and overhauling of non automatic agitator type washing machine
12. Testing, faultfinding, repair and overhauling of hair dryer
13. Testing, faultfinding, repair and overhauling of vacuum cleaner
14. Testing, faultfinding, repair and overhauling of grain grinder
15. Testing, faultfinding, repair and overhauling of hand drill
16. Dismantling, assembling, testing and repair of electric gas lighter
17. Testing, faultfinding and repairs of electric bell and buzzer
18. Testing, faultfinding and repair of emergency light.
19. Testing, faultfinding and repair of stabilizer and UPS
20. Dismantling, assembling and repair of battery charger
21 To measure voltages at various test points of two band transistor receiver, public address system, black and white TV.
22 To study fault finding in two band transistor receiver, audio cassette tape recorder - player, mobile, black and white TV, CD player.
23. To study installation of TV antenna
24. To study cassette driving mechanism.
25. to study installation of DTH.

FORMAT OF MODEL QUESTION PAPER FOR THE THEORY EXAMINATION IN CLASS XIITH

Subjects: EMWP, DEC, EEM, DCA, ACE, IE & I

MARKS: 50

Q.1.	A] Fill in the blanks (4 questions with choices: ½ Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.2.	A] Match the pairs (4 pairs with 7 choices: ½ Mark each)	**(2 Marks)**
	B] Answer the following in brief (2 questions: 3 Marks each)	**(6 Marks)**
	C] Answer the following in short (1 Question: 2 Marks)	**(2 Marks)**
Q.3.	A] Fill in the blanks (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in short (1 questions: 3 Marks each)	(**3 Marks**)
	C] Answer the following in detail (1 Question: 5 Marks)	**(5 Marks)**
Q.4.	A] Answer the following in brief (2 questions: 1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (1 questions: 3 Mark each)	**(3 Marks)**
	C] Answer the following in details (1 Question: 5 Marks)	**(5 Marks)**
Q.5.	A] Answer the following in one or two words (1 Mark each)	**(2 Marks)**
	B] Answer the following in brief (4 questions: 2 Marks each)	**(8 Marks)**

Note: 1) Wherever required, options for the students be given to choose from set of questions (only for short and long answer type questions)

3) Marking Scheme similar to the above shall be followed for the Mid-term test with proportionate Marking.

4) Internal options to be provided for Five Mark Questions.

BLUE PRINT FOR THE THEORY EXAMINATION IN CLASS XIITH

Subjects: EMWP, DEC, EEM, DCA, ACE, IE & I **MARKS: 50**

Allocation of Marks

1)Topic-wise marks are given in the Instructional Material to be followed

2)Marks for Domains

Knowledge	20 %	10 Marks
Understanding	35 %	17.5 Marks
Application	25 %	12.5 Marks
Skill	20 %	10 Marks
Total	100 %	

3)Types of Questions

Objective	20 %	10 Marks
Short Answers	60 %	30 Marks
Essay Type	20 %	10 Marks
Total	100 %	50 rks

4)Types of Questions (Difficulty wise)

Easy	20 %	10 Marks
Average	60 %	30 Marks
Difficult	20 %	10 Marks
Total	100 %	50

5)Number of Questions

Objective	2 Fill in the blanks without alternatives	1x2=	2
	2 definations	1 x2 =	2
	2 Answer in one/two words	1 x 2 =	2
	2 Fill in the blanks without alternatives	1 x 2 =	2
	2 Answer in one/two words or definitions	1 x 2 =	2
		Total	10

Short Answers	6 Questions of 3 Marks each	3 x 6 =	18
	6 Questions of 2 Marks each	2 x 6 =	12
		Total	30

Essay Type Answers	2 Questions of 5 Marks each with a choice from the same topic	5 x 2 =	10
		Total	10