

SYLLABUS

Sr. No.	Topic and sub-topic	Recomdations		Remark
		Theory period	Marks	
1	BATTERY 1.7] Battery charging methods and precautions. 1.8] Battery tests.	10	6	To be stressed in practical content
2	GENERATOR AND MAGNETO 2.6] Introduction and Principle of D.C. Generator. 2.7] Construction and working of the following components of D.C. Generator:- (a) Armature; (b) Field;; (c) Brush assembly; (d) Yoke or housing.	10	6	To be added in theory content.
3	REGULATOR 4.7] Construction and working of coil type Voltage Regulator.	6	3	To be added in theory content.

GENERATOR OR DYNAMO

2.6----- INTRODUCTION:

The generator is an electromagnetic device which converts the mechanical energy received from the engine into electrical energy. The generator is mounted on the engine block in such a way that engine fan belt provides the drive to generator. Generator produces the current flowing in one direction i.e. D.C. current. Generators producing the current in forward and reverse direction are called as Alternators.

PRINCIPLE OF GENERATOR:

When the electric conductor is moved through magnetic field, current is induced in it. This effect is called as electromagnetic induction. Generator works on the principle of electromagnetic induction.

If we consider a loop of conductor placed in two poles of magnet is made to turn, it will cut the magnetic field and produce the current. This current can be taken out by using a pair of brush and rings. If half rings are used, then direct current will flow through the loop.

Modern automobile generators are two poles, two brush shunt wound type.

2.7---- CONSTRUCTION OF GENERATOR:

(A) ARMATURE:

(i) Armature shaft: - It is supported on end plates. It is made of alloy steel. It supports the commutator and armature core.

(ii) Armature Core: - It is made of number of circular plates stamped together on armature shaft. The plates are provided with holes at the centre and slots near the circumference. Each plate is varnished. Such core arrangements reduce eddy current. Armature windings are placed in the slots. The core completes the magnetic circuit between poles.

(iii) Armature Winding: - Each armature coil is soldered between two commutator segments. Coil consists of enamel insulated copper wire. There are a number of coils placed in the slots of armature core. Each coil when rotated cuts the magnetic field produced by field winding and produces current.

(iv) Commutator: - It is a hollow cylindrical ring connected to molten insulator called **mica**. Rectangular box shaped copper segments are fitted over it in the direction parallel to the shaft. Number of commutator segments is same as the number of slots on armature core.

Each commutator segment is soldered to one end of armature coil. Each segment is insulated from one another.

Commutator collects the current produced by armature winding and sends it to the brushes. Commutator segments along with carbon brushes cause complete reversal of direction of current flow in an armature coil. This phenomenon is called **commutation**. Thus the commutator is also responsible for direct current output from generator.

(B) FIELD OF GENERATOR:

(i) Pole Core: - It is laminated box shaped core attached to the generator yoke (body) from inside. Pole core supports the pole winding and pole shoe.

(ii) Pole Winding: - It is made of number of turns of enamel insulated copper wire, placed in pole core. Winding is connected along two poles, pole terminal and earth (body). As current passes through pole winding, it produces magnetic field. It is transferred to armature core through pole shoe.

(iii) Pole Shoe: - It is an arc shaped plate made of steel attached to the pole core. It is weakly magnetized and retains magnetic field called as residual field. This field is useful to begin the generator operation. In small generators, pole core and pole shoe are made from single stampings.

(iv) Pole Terminal: - It is a brass stud attached to the yoke. It is connected to the pole winding. A wire lead coming from regulator is connected to the pole terminal.

(C) BRUSH ASSEMBLY:

There are two brush assemblies, one positive and one negative. Each brush assembly consists of the following parts:

(i) Brush Holder: It is steel holder mounted on end plate. Positive brush is placed on insulator while negative brush holder is directly fitted to the end plate, in negative earthing system.

(ii) Brush: There are two brushes placed in respective holder. Brush is made of carbon and copper alloy in big generators while only carbon in small generators. Negative brush is earthed while positive brush is connected to the output terminal through lead wire. Both the brushes are kept pressed over commutator by means of spiral springs. Brushes collect the current from commutator and send it to output terminal.

(D) YOKE OR BODY:

It is a cylindrical box which support and protect the above mentioned electrical components. It consists of central cylindrical part made of rolled steel. Two end plates are made of cast iron or cast aluminium. Front end plate is provided with bearing to support armature shaft. At the front end armature shaft is fitted with driving pulley and thus belt tension is beared by bearing.

Rear end plate is provided with phosphor bronze bush to support the armature shaft. Both end plates are often provided with extended brackets to support generator on automobile engine.

(E) DRIVE TRAIN: Generator gets its drive through a V-belt pulley keyed to armature shaft. Pulley is connected to crankshaft pulley through V-belt. Some automobiles are also provided with idler pulley to adjust belt tension. Many automobiles have common V-belt for radiator fan. Generally plastic or aluminum fan is connected to the pulley. This fan blows air over generator windings and cools them.

CHAPTER 4 REGULATOR

DEFINITION OF REGULATOR: It is an electromagnetic device which is used to control the output of generator.

4.7 CONSTRUCTION AND WORKING OF COIL TYPE VOLTAGE REGULATOR:

It is an electromagnetic switch. It consists of soft iron core and solenoid winding over it. This winding is made of thin enamel insulated wire with much number of turns. Above its core an armature is fitted on spring post. Armature consists of steel plate with contact points fitted at free end which carry current to generator field. Armature plate is connected to leaf spring whose tension can be changed by rotating a cam placed under it. A high voltage resistance is connected across CB point. Winding of voltage regulator is connected in parallel with generator armature. Normally the CB point remains closed.

WORKING: When the armature current is normal, it passes through winding of voltage regulator, it produces a magnetic field along the core. This field is insufficient to pull the armature and thus CB point remains closed. Thus maximum current is given to the field winding through the CB point. However as the voltage produced by armature of generator increases, the current and magnetic field of regulator winding also increases. Magnetic force pulls the armature towards the core and the CB point open. Hence the current through the points get diverted through the resistance and its strength decreases. Hence low magnetic field is produced by field winding and armature of generator also produces lower voltage.

MARKING SCHEME FOR BOARD EXAMINATION MARCH 2016.
AUTOMOBILE ELECTRICALS

1. BATTERY	:06 marks.
2. GENERATOR AND MAGNETO	: 06 marks.
3. ALTERNATOR	: 05 marks.
4. REGULATOR	: 03 marks.
5. STARTER MOTOR	: 06 marks.
6. IGNITION SYSTEM	: 10 marks.
7. SWITCHES AND LIGHTING	: 06 marks.
8. ACCESSORIES AND GAUGES	: 08 marks.

TOTAL	: 50 marks
