



GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

ALTO BETIM – GOA 403521

Std : XI SCIENCE

Sub: MATHEMATICS

[ effective from June

2016]

MODEL QUESTION PAPER- First Term Examination.,

Time : 2½ hrs.

: 80

Max Marks

GENERAL INSTRUCTIONS:

- ✓ This question paper contains seven main questions.
- ✓ All seven questions are compulsory.
- ✓ Use of calculator is not allowed.
- ✓ Log tables will be supplied on request.
- ✓ Graphs should be drawn on the answer paper only.
- ✓ For each main questions the sub questions carry the following marks:  
A = 1 mark, B = 2 marks, C = 3 marks, D = 4 marks, E = 5 marks.

Q1 A. Write the power set of  $A = \{1, 2, 3\}$

B. If  $U = \{1, 2, 3, 4, 5\}$ ,  $A = \{2, 3\}$ ,  $B = \{1, 2\}$ . Verify  $(A \cup B)' = A' \cap B'$

C. Determine n if  ${}^{2n}C_2 : {}^nC_2 = 12 : 1$

D. Prove that 
$$\frac{\sin 5x + \sin 7x + \sin 3x + \sin 9x}{\cos 5x + \cos 7x + \cos 3x + \cos 9x} = \tan 6x$$

Q2 A. Write the interval  $(6, 12]$  in set-builder form.

B. In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket, if everyone likes atleast one of the games.

C. Prove that for any real numbers x and y,  $\sin x = \sin y$  implies  $x = n\pi + (-1)^n y$ , where  $n \in \mathbb{Z}$

D. By using the Principle of Mathematical Induction, prove that

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left[ \frac{n(n+1)}{2} \right]^2, \text{ for all natural numbers } n$$

Q3 A. Convert  $270^\circ$  In radian measure.

B. Determine the domain and range of the relation R defined by

$$R = \{ (x, x+5) : x \in \{0, 1, 2, 3, 4, 5\} \}$$

C. How many words with or without meaning can be formed from the letters of the word 'MATHEMATICS'. How many words will start with M and end with S.

D. If 'a' is the first term and 'd' is the common difference of an A.P

then prove that the sum  $S_n$  of the first n terms of the A.P is given by

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

- Q4** A. Find the sum of squares of first 50 natural numbers.  
 B. Solve the inequality  $3(x-1) \leq 6x + 7(2-5x)$   
 C. Prove that  $\cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1$   
 D. Attempt the following:
- In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 specific courses are compulsory for every student?
  - Find the number of 4 digit numbers that can be formed using the digits 1, 2, 3, 4, 5 if no digit is repeated. How many of these will be odd?

- Q5** A. Choose the correct alternative from the given alternatives:  
 If  $2-3i$  is one root of the equation  $x^2 + kx + 13 = 0$  then the value of  $k =$  ---  
 (a) 2 (b) 4 (c) -2 (d) -4

- B. Find the domain and range of the function  $f(x) = \frac{1}{x^2 - 2x}$   
 C. In how many ways 5 girls and 4 boys can be seated in a row, so that  
 (i) no two boys are together.  
 (ii) all boys are together.  
 (iii) one particular boy is always in the middle.  
 D. Attempt **any one** of the following:  
 (i) Find the sum of the series  $7 + 77 + 777 + \dots$  upto  $n$  terms.  
 (ii) Find the sum of the series  $1.6 + 2.9 + 3.12 + \dots$  upto  $n$  terms.

- Q6** A. Choose the correct alternative from the given alternatives:

The value of  $i^{100} + i^8$  is -----

- (a)  $i$  (b) 2 (c) 1 (d) -1  
 B. Find the modulus of the complex number  $\frac{1-i}{2+i}$   
 C. Find the square root of the complex number  $-8 - 15i$ .  
 D. By using the Principle of Mathematical Induction, prove that  $3^{2n+2} - 8n - 9$  is divisible by 8, for all  $n \in \mathbb{N}$   
 E. Attempt **any one** of the following:  
 (i) Calculate the Mean deviation from the median of the marks of students tabulated as follows:

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Number of students	15	40	20	15	5	5

(ii) Calculate the Standard deviation of the marks of students tabulated as follows:

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Number of students	5	8	15	9	3

Q7 A. Choose the correct alternative from the given alternatives:

The number of principal solutions of  $\sin x = \frac{1}{2}$  is \_\_\_\_\_

- (a) 1      (b) 2      (c) 3      (d) infinite

B. What is dispersion? State the measures of dispersion?

C. Solve  $2x^2 - (3+7i)x + (9i - 3) = 0$

D. Find 3 numbers in G.P such that their sum is 21 and the sum of their squares is 189.

E. Attempt **any one** of the following

(i) Solve the following system of inequalities graphically:

$$2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6.$$

(ii) A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture should be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, then how many litres of the 2% solution will have to be added?



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MODEL QUESTION PAPER – Second Term Examination

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- ✓ All seven questions are compulsory.
- ✓ Use of calculator is not allowed.
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**Q1 A.** Choose the correct alternative from the given alternatives.  
If a line is inclined at an angle of  $60^\circ$  with the positive direction of the x-axis then the slope of the line is -----.

- (a)  $-\sqrt{3}$                       (b)  $\sqrt{3}$                       (c)  $\frac{1}{\sqrt{3}}$                       (d)  $\frac{\sqrt{3}}{2}$

B. Find the equation of the line passing through  $(-3, 5)$  and perpendicular to the line through the points  $(2, 5)$  and  $(-3, 6)$ .

C. State and prove two point form of the equation of line.

D. Evaluate :  $\lim_{x \rightarrow 2} \frac{x^2 - 4x + 4}{x^3 - 3x^2 + 4}$

**Q2 A.** Write the octant in which the point  $(-1, -4, 6)$  lie.

B. If three points  $(h, 0)$ ,  $(a, b)$  and  $(0, k)$  lie on a line then show that  $\frac{a}{h} + \frac{b}{k} = 1$

C. A horse is running at a speed of 21 Kms/hr on a circular track whose radius is 35 m. Find the angle in degrees described by the horse at the centre of the track  
in half a minute.

D. If  $p$  is the length of perpendicular from the origin to the line whose intercepts on the axes are  $a$  and  $b$ , then show that  $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

**Q3 A.** Choose the correct alternative from the given alternatives.

The centre of the circle  $(x + 2)^2 + (y - 3)^2 = 10$  is -----

- (a)  $(2, 3)$                       (b)  $(2, -3)$                       (c)  $(-2, 3)$                       (d)  $(-2, -3)$

B. Find the coordinates of the focus, and the length and equation of the latus rectum of the parabola  $3x^2 = -27y$ .

- C. Find the coordinates of the points which trisect the line segment joining the points  $P = (4, 2, -6)$  and  $Q = (10, -16, 6)$ .
- D. Derive the standard equation of the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ,  $a > b$

**Q4 A.** State whether the following sentence is a statement:  
'Today is a windy day'

B. Given  $P(A) = \frac{3}{5}$  and  $P(B) = \frac{1}{5}$ . Find  $P(A \text{ or } B)$  and  $P(A \text{ but not } B)$ , if A and B are mutually exclusive events.

C. Two dice are thrown. Find the probability of getting sum on the uppermost faces atleast 8.

D. A wire in the form of a rectangle of sides 6cms and 4cms is reshaped into a sector of a circle of radius 5cms. Find the angle of the sector in radians and degrees.

**Q5 A.** Write the converse of the statement.

"If you are born in India then you are a citizen of India"

B. How many words with or without meaning can be formed from the letters of the word "PERMUTATIONS". In how many of them both T's will be together.

C. A committee of 6 is to be formed from 6 boys and 4 girls. In how many ways can

this be done if the committee contains (i) 2 girls (ii) atleast 3 girls.

D. Attempt **any one** of the following:

(i) Find the equation of the set of points P, the sum of whose distances from  $A = (4, 0, 0)$  and  $B = (-4, 0, 0)$  is equal to 10.

(ii) Find the lengths of the medians of the triangle with vertices  $A = (0, 0, 6)$ ,  $B = (0, 4, 0)$  and  $C = (6, 0, 0)$ .

**Q6 A.** Write the contrapositive of the statement

"If a triangle is equilateral then it is isosceles".

B. Find the value of  $(99)^3$  using binomial theorem.

C. Find the modulus and argument of the complex number  $\frac{1}{(1+i)(2-3i)}$

D. Find the middle terms in the expansion of  $(x^2 - \frac{1}{x})^9$

E. Attempt **any one** of the following:

(i) Find the term independent of x in the expansion of  $(\sqrt{x} - \frac{2}{x^2})^{10}$

(ii) If the term independent of x in the expansion of  $(ax - \frac{1}{x^2})^6$  is 240, find a.

- Q7 A. Write the following statement in the form "if-then"  
 "The banana trees will bloom when it stays warm for a month".
- B. Six boys and three girls are to be seated at random in a row for a photograph.  
 Find the probability that no two girls are together.
- C. If  $y = \frac{x^2 + 5x - 9}{x(1 + \sin x)}$  find  $\frac{dy}{dx}$
- D. Find the general solution of the equation  $\cos 4x = \cos 3x$ .

E. Attempt **any one** of the following:

(i) Evaluate:  $\lim_{x \rightarrow 0} \frac{(ab)^x - a^x - b^x + 1}{\sqrt{1 - \cos 2x} \operatorname{Log}(1 + 5x)}$

(ii) Suppose  $f(x) = \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ b - ax, & x > 1 \end{cases}$

and if  $\lim_{x \rightarrow 1} f(x) = f(1)$  what are possible values of  $a$  and  $b$ ?