

TEST PAPER – 1  
Mathematics – XI

Time : 3 hr

Max Marks : 80

**GENERAL INSTRUCTIONS**

1. This question paper contains two parts A & B, each part is compulsory. Part A carries 24 marks and Part B carries 56 marks
2. Part – A has Objective Type Questions and Part – B has Descriptive Type Questions
3. Both Part A and Part B have choices.

**PART – A**

1. It consists of two sections Sections – I & Sections – II
2. Sections – I comprises of 16 very short answer type questions.
3. Sections – II contains 2 case studies. Each case study comprises of 5 case-based MCQs. An examinee is to attempt any 4 out of 5 MCQs.

**PART – B**

1. It consists of three sections Sections – III, Sections – IV & Sections – V
2. Sections – III comprises of 10 questions of 2 marks each.
3. Sections – IV comprises of 7 questions of 3 marks each.
4. Sections – V comprises of 3 questions of 5 marks each.
5. Internal choice is provided in 4 questions of Sections – I, 2 questions of Sections – III, 2 questions of Sections – IV & 2 questions of Sections – V. An examinee has to attempt only one of the alternatives in all such questions.

**PART – A**

**SECTION – I**

**All questions are compulsory. In case of internal choices attempt any one.**

Q. 1. If  $P(A)$ : Power set of set A. Then find the value of  $n(P(P(P(\phi))))$

Q. 2. If  $A = \{1, 2, \{3, 4\}, 5\}$ , then  $\{3, 4\} \subset A$ . State True & False.

**OR**

Write the set  $A = \{-1, 0, 2\}$  in set builder form.

Q. 3. The Cartesian product  $A \times A$  has 9 elements among which are found  $(-1, 0)$  and  $(0, 1)$ . Find the set A.

Q. 4. Find the value of  $x^3$ , if  $x = \sqrt{-1 - \sqrt{-1 - \sqrt{-1 - \dots \infty}}}$

Q. 5. Express the complex number  $i^{-39}$ , in the standard form.

**OR**

Solve for  $x$ ,  $x^2 + x + \frac{1}{\sqrt{2}} = 0$

Q. 6. Solve :  $\frac{1}{2} \frac{3x}{5} + 4 \geq \frac{1}{3} (x - 6)$

Q. 7. Find  $n$  if  $P(n - 1, 3) : P(n, 4) = 1 : 9$

**OR**

In how many ways can we choose a chairman and a vice chairman, assuming one person cannot hold more than one position, from a committee of 8 persons?

Q. 8. In an A.P if  $m^{\text{th}}$  term is  $n$  and the  $n^{\text{th}}$  term is  $m$ , where  $m \neq n$ , find the  $p^{\text{th}}$  term.

Q. 9. Find the equation of line, inclined to  $y - axis$  at  $30^\circ$  and cutting it 3 units below the origin.

Q. 10. Find the equation of straight line passing through  $(2, 2\sqrt{3})$  and inclined at an angle of  $75^\circ$  with  $x - axis$

**OR**

If  $P = (x_1, y_1)$  &  $Q = (x_2, y_2)$ . Find  $PQ$  if  $PQ$  is parallel to  $y - axis$ .

Q. 11. Find the foot of perpendicular drawn from the point  $(3, 2, -1)$  on  $z - axis$ .

Q. 12. Find the equation of the set of points which are equidistant from the points  $(1, 2, 3)$  and  $(3, 2, -1)$ .

Q. 13. If  $y = \tan(x^\circ)$ , find  $\frac{dy}{dx}$

Q. 14. Evaluate:  $\lim_{x \rightarrow 0} x \sin\left(\frac{1}{x}\right)$

Q. 15. Three coins are tossed. Describe three events which are mutually exclusive and exhaustive.

Q. 16. Given that the events  $A$  and  $B$  are such that  $P(A) = 0.5$ ,  $P(A \cup B) = 0.6$  &  $P(B) = p$ . Find  $p$  if  $A$  and  $B$  are mutually exclusive events.

### SECTION - II

**Both the Case study based questions are compulsory. Attempt any 4 sub parts from each question Q. 17 and Q. 18. Each question carries 1 mark**

Q. 17. 150 workers were engaged to finish a job in a certain number of days. 4 workers dropped out on second day, 4 more workers dropped out on third day and so on. It took 8 more days to finish the work. Find the number of days in which the work was completed.

Q. 18. The cable of uniform loaded suspension bridge hangs in the form of a parabola. The roadway is horizontal and 100 m long is supported by vertical wire attached to the cable, the longest wire being 30 m and the shortest wire being 6 m. Find the length of the wire attached to the roadway 18 m from the middle.

### PART - B

### SECTION - III

Q. 19. Out of 500 car owners investigated, 400 owned car  $A$  and 200 owned car  $B$ , 50 owned both  $A$  and  $B$  cars. Is this data correct? Justify your answer.

Q. 20. Prove that :  $\cos 4x = 1 - 8 \sin^2 x \cdot \cos^2 x$

Q. 21. Find the real numbers  $x$  &  $y$  if  $(x - iy)(3 + 5i)$  is the conjugate of  $-6 - 24i$ .

Q. 22. From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decide that either all of them will join or none of them will join. In how many ways can the excursion party be chosen?

Q. 23. If the sum of  $n$  terms of an A.P. is  $3n^2 + 5n$  and its  $m^{\text{th}}$  term is 164, find the value of  $m$ .

### OR

If  $a, b, c$  &  $d$  are in G.P. show that  $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$

Q. 24. Find the equation of the circle with radius 5 units, whose centre lies on the  $x$ -axis and which passes through the point  $(2, 3)$ .

Q. 25. The perpendicular from the origin to a line meets it at the point  $(-2, 9)$ , find the equation of the line.

Q. 26. If  $y = 2\sqrt{\cot(x^2)}$ , prove that  $\frac{dy}{dx} = \frac{-2\sqrt{2} x}{\sin(x^2) \sqrt{\sin(2x^2)}}$

### OR

Evaluate:  $\lim_{x \rightarrow 0} \left\{ \frac{x(e^x - 1)}{1 - \cos x} \right\}$

Q. 27. Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.

Q. 28. Find the coordinates of centroid of triangle whose vertices are  $(x_1, y_1, z_1)$ ,  $(x_2, y_2, z_2)$  &  $(x_3, y_3, z_3)$ .

### SECTION - IV

Q. 29. Let  $R$  be a relation from  $N$  to  $N$  defined by  $R = \{(a, b) : a, b \in N \text{ and } a = b^2\}$ . Are the following true?

(i)  $(a, a) \in R$ , for all  $a \in N$  (ii)  $(a, b) \in R$ , implies  $(b, a) \in R$  (iii)  $(a, b) \in R$ ,  $(b, c) \in R$  implies  $(a, c) \in R$

Q. 30. Solve the inequalities graphically:  $x + y \leq 1200$ ;  $x - 2y > 0$ ;  $x - 3y \leq 600$ ;  $x, y \geq 0$

Q. 31. How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0, 2, 4, 2, 4?

Q. 32. Find  $\lim_{x \rightarrow 0} f(x)$  for the function  $f(x) = \begin{cases} \frac{|x|}{x} & ; x \neq 0 \\ 0 & ; x = 0 \end{cases}$

### OR

Using first principle, find derivative of the function  $f(x) = \frac{2x + 3}{x - 2}$

Q. 33. Find the equation of hyperbola having foci on  $(0, \pm 5)$  and vertices  $(0, \pm 3)$

Q. 34. Out of 100 students, two sections of 40 & 60 are formed, if you and your friend are among 100 students. What is the probability that, you both enter the (i) same section? (ii) different section?

Q. 35. Find the sum of the sequence  $8 + 88 + 888 + 8888 + \dots + n \text{ terms}$ .

**OR**

If  $a, b, c$  are in A.P.,  $b, c, d$  are in G.P. and  $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$  are in A.P. Prove that  $a, c, e$  are in G.P.

**SECTION - V**

Q. 36. Find the Mean, Variance and Standard Deviation, for the following distribution:

Classes	0 – 30	30 – 60	60 – 90	90 – 120	120 – 150	150 – 180	180 – 210
Frequency	2	3	5	10	3	5	2

**OR**

Find the mean, variance and standard deviation using short-cut method.

$x_i$	60	61	62	63	64	65	66	67	68
$f_i$	2	1	12	29	25	12	10	4	5

Q. 37. A line is such that its segment between the lines  $5x - y + 4 = 0$  and  $3x + 4y = 4$  is bisected at the point  $(1, 5)$ . Obtain its equation

Q. 38. Prove that :  $\left\{1 + \cos\left(\frac{\pi}{8}\right)\right\}\left\{1 + \cos\left(\frac{3\pi}{8}\right)\right\}\left\{1 + \cos\left(\frac{5\pi}{8}\right)\right\}\left\{1 + \cos\left(\frac{7\pi}{8}\right)\right\} = \frac{1}{8}$

**OR**

Find the value of,  $\sin\left(\frac{x}{2}\right)$ ,  $\cos\left(\frac{x}{2}\right)$  &  $\tan\left(\frac{x}{2}\right)$  if, in  $x = -\frac{1}{4}; \frac{3\pi}{2} \leq x \leq 2\pi$

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