

TEST PAPER – 1
Mathematics – XI

Time : 3 hr

Max Marks : 100

GENERAL INSTRUCTIONS :-

1. All questions are compulsory.
2. SECTION – A comprises of 4 questions of one marks each.
3. SECTION – B comprises of 8 questions of two marks each.
4. SECTION – C comprises of 11 questions of four marks each.
5. SECTION – D comprises of 6 questions of six marks each.
6. Internal choice has been provided in 03 questions of four marks each and 03 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

SECTION – A

- Q. 1. Find the number of all possible relations that can be defined from the set {1, 2, 3} on the set {4, 5}.
- Q. 2. If $y = \tan x^\circ$, find $\frac{dy}{dx}$
- Q. 3. Find $\angle C$ if in triangle ABC the three sides are $a = 3, b = 5, c = 7$.
- Q. 4. If 'A' and 'B' are any two events such that $P(A) = 0.42, P(B) = 0.48$ & $P(A \cap B) = 0.16$.
Determine $P(A \text{ but not } B)$

SECTION – B

- Q. 5. Find the number of diagonals in a polygon having n sides.
- Q. 6. If the sum of n terms of an A.P. is $3n^2 + 5n$ then which term would be 164.
- Q. 7. Find the value of x^3 , if $x = \sqrt{-1 - \sqrt{-1 - \sqrt{1 - \dots \infty}}}$
- Q. 8. If Z_1 and Z_2 are two complex numbers then prove that $Re(Z_1 Z_2) = Re(Z_1) \cdot Re(Z_2) - Im(Z_1) \cdot Im(Z_2)$
- Q. 9. Find the vertex of the conic $y = 6x - x^2$.
- Q. 10. Find the image of the point $(-1, 2, -3)$ in x – axis.
- Q. 11. Find the equation of the line over which foot of perpendicular from origin is $(-2, 8)$
- Q. 12. $\lim_{x \rightarrow 0} \{ \operatorname{cosec} x - \cot x \}$

SECTION – C

- Q. 13. If p, q, r are in G.P. and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P

OR

- If $p^{\text{th}}, q^{\text{th}}, r^{\text{th}}$ and s^{th} terms of an A.P are in G.P, then show that $(p - q), (q - r), (r - s)$ are also in G.P.
- Q. 14. By using the principle of mathematical induction prove that,

$$\text{for all } n \geq 1, 1 + \frac{1}{1+2} + \frac{1}{1+2+3} + \dots + \frac{1}{1+2+3+\dots+n} = \frac{2n}{n+1}$$

- Q. 15. Verify that $(-1, 2, 1), (1, -2, 5), (4, -7, 8)$ and $(2, -3, 4)$ are the vertices of a parallelogram and not of a rectangle.
- Q. 16. Find the direction in which a line must be drawn through the point $(-1, 2)$ so that its point of intersection with the line $x + y = 4$ may be at a distance 3 units from this point .

OR

Find the image of the point $(3, 8)$ with respect to the line $x + 3y = 7$ assuming the line to be a plane mirror.

- Q. 17. Evaluate : $\lim_{x \rightarrow 0} \left\{ \frac{1 - \cos x \sqrt{\cos 2x}}{x^2} \right\}$

P.T.O

Q. 18. Prove that, $\sin^3 x + \sin^3 \left\{ x + \frac{2\pi}{3} \right\} + \sin^3 \left\{ x + \frac{4\pi}{3} \right\} = -\frac{3}{4} \sin 3x$

OR

If in a triangle ABC, $\frac{b+c}{12} = \frac{c+a}{13} = \frac{a+b}{15}$, prove that $\frac{\cos A}{2} = \frac{\cos B}{7} = \frac{\cos C}{11}$

Q. 19. In how many ways can the letters of the word *PERMUTATIONS* be arranged if the

(i) All vowels are not together

(ii) there are always 5 letters between P and S?

OR

If the different permutations of all the letter of the word *EXAMINATION* are listed as in a dictionary,

(i) How many words are there in this list before the first word starting with E?

(ii) How many words are there in this list starting with a vowel?

Q. 20. Prove that the middle term of the expansion $(1 + 4x + 4x^2)^n$ is $\frac{1.3.5.7. \dots (2n-1)4^n \cdot x^n}{n!}$; $n \in \mathbb{Z}_+$

Q. 21. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports ?

Q. 22. Solve the system of inequalities graphically: $x + 2y \leq 10$, $x + y \geq 1$, $x - y \leq 0$, $x \geq 0$, $y \geq 0$

Q. 23. Let R be a relation from N to N defined by $R = \{(a, b) : a, b \in \mathbb{N} \text{ and } a = b^2\}$. Are the following true?

(i) $(a, a) \in R$, for all $a \in \mathbb{N}$

(ii) $(a, b) \in R \Rightarrow (b, a) \in R$

(iii) $(a, b) \in R, (b, c) \in R \Rightarrow (a, c) \in R$.

SECTION - D

Q. 24. Find the equation of conic – section such that, $e = \frac{3}{4}$, foci on y – axis, centre at origin and passing through the point (6, 4).

OR

Find the equation of the hyperbola having foci on $(0, \pm \sqrt{10})$ and which passes through (2, 3).

Q. 25. The mean and standard deviation of 20 observations are found to be 10 and 2, respectively. On rechecking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation in each of the following cases:

(i) If wrong item is omitted. (ii) If it is replaced by 12.

Q. 26. Find the differential coefficient of $\sin \sqrt[3]{x}$, by first principle.

Q. 27. A line is such that its segment between the lines $5x - y + 4 = 0$ and $3x + 4y - 4 = 0$ is bisected at the point (1, 5). Obtain its equation.

Q. 28. If 4-digit numbers greater than or equals to 5,000 are randomly formed from the digits 0, 1, 3, 5, and 7, what is the probability of forming a number divisible by 5 when,

(i) the digits are repeated ? (ii) the repetition of digits is not allowed ?

Q. 29. In a triangle ABC prove that : $(b - c) \cot\left(\frac{A}{2}\right) + (c - a) \cot\left(\frac{B}{2}\right) + (a - b) \cot\left(\frac{C}{2}\right) = 0$

OR

Find the value of $\sin\left(\frac{x}{2}\right)$, $\cos\left(\frac{x}{2}\right)$ and $\tan\left(\frac{x}{2}\right)$ if $\sin x = -\frac{1}{4}$; x lies in IVth quadrant .
