TEST PAPER – 3

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. Let $A = \{1, 2, 3, 4\}$ & $B = \{3, 4, 5, 6\}$. Find $A\Delta B$.

Q. 2. If $\boldsymbol{R}$ is the set of real numbers and $\boldsymbol{Q}$ is the set of rational numbers, then what is $\boldsymbol{R}-\boldsymbol{Q}$?

OR

Let $A = \{1, 2, 3, 4\}$. Find the number of proper subsets of A.

Q. 3. Let f be the subset of $Z \times Z$ defined by $f = \{(ab, a + b): a, b \in Z\}$, then show that f is not a function.

Q. 4. The argument of the complex number z is $+\theta$, then argument of the complex number iz.

Q. 5. Find the conjugate of the complex number $\dfrac{(3-2i)(2+3i)}{(1+2i)(2-i)}$

OR

Find the multiplicative inverse of $2-3i$.

Q. 6. Solve the inequation : $\left|\dfrac{3x-4}{2}\right| \leq \dfrac{5}{12}$; $x \in R$

Q. 7. Find the number of different words that can be formed from the letters of the word $TRIANGLE$ so that no two vowels are adjacent.

OR

Out of 18 points in a plane, no three are in the same line except five points which are collinear. Find the number of lines that can be formed joining the point.

Q. 8. If $A.M.$ & $G.M.$ of roots of a quadratic equation are 8 & 5, respectively, then find the quadratic equation.

Q. 9. Find the fixed point from which the line $(3+4k)x + (4+3k)y = 1 + k$ will pass through.

Q. 10. Find c, if the perpendicular from the origin to the line $y = mx + c$ meets it at the point (–1, 2).

OR

Find h, if the line through the points $(h, 3)$ and $(4, 1)$ intersects the line $7x - 9y = 19$, at right angle.

Q. 11. Find the length of perpendicular from the point $(3, 2, -4)$ on $y - axis$.

Q. 12. If the origin is the centroid of the triangle PQR with vertices $P(2a, 2, 6)$, $Q(-4, 3b, -10)$ & $R(8, 14, 2c)$, then find the values of a, b and c.

Q. 13. If $y = \dfrac{x^3.\ sin\, x}{cos\, x}$, find $\dfrac{dy}{dx}$

Q. 14. Evaluate: $\lim_{x\to 0}\left\{\frac{x\left(e^{2+x}-e^{2}\right)}{1-\cos x}\right\}$

Q. 15. A bag contains 30 tickets**,** numbered from $1\ to\ 30$**.** Five tickets are drawn at random and arranged in ascending order. Find the probability that the third number is 20.

Q. 16. If A and B are two events such that $P(A)=0.54, P(B)=0.69\ \&\ P(A\cap B)=0.35$. Find $P(A\cap B')$

SECTION – II

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

Q. 17. The sum of first two terms of an infinite geometric series is 15 and each term is equal to the sum of all the terms following it. Answer the following:

(i) Find the sum of the series.

$(a)\ 15$ $(b)\ 20$ $(c)\ 25$ (d) *none of these*

(ii) Find the first term of the series.

$(a)\ 10$ $(b)\ 9$ $(c)\ 8$ (d) *none of these*

(iii) Find the common ratio of the series.

$(a)\ 0.25$ $(b)\ 0.5$ $(c)\ 0.125$ (d) *none of these*

(iv) Find the third term of the series.

$(a)\ 5$ $(b)\ 6$ $(c)\ 2.5$ (d) *none of these*

Q. 18. If $x^2+8x+12y+4=0$ is an equation of some conic section, then answer the followings:

(i) Find the vertex of conic – section.

$(a)\ (4,1)$ $(b)\ (-4,1)$ $(c)\ (4,-1)$ (d) *none of these*

(ii) Find the focus of conic – section.

$(a)\ (-4,-1)$ $(b)\ (4,-3)$ $(c)\ (-4,-3)$ (d) *none of these*

(iii) Find the equation of directrix of conic – section.

$(a)\ y+4=0$ $(b)\ y=4$ $(c)\ x+4=0$ (d) *none of these*

(iv) Find the LLR of conic – section.

$(a)\ 48$ $(b)\ 3$ $(c)\ 12$ (d) *none of these*

PART – B ***SECTION – III***

Q. 19. Find the and range of the function $f=\left\{\left(x,\frac{x^2}{x^2+1}\right): x\in Real\right\}$

Q. 20. Prove that : $\tan 4x=\frac{4\tan x\,(1-\tan^2 x)}{1-6\tan^2 x+\tan^4 x}$

Q. 21. Let $a=2-i$ and $b=-2+i$, then find $Re\left(\frac{ab}{\bar{a}}\right)$

Q. 22. Show that: $C(n,r)+C(n,r+1)=C(n+1,r+1)$

Q. 23. If the $p^{th}, q^{th}\ \&\ r^{th}$ terms of a $G.P.$ are $a, b\ \&\ c$, respectively. Prove that, $a^{q-r}.b^{r-p}.c^{p-q}=1$

OR

If, $a\left(\frac{1}{b}+\frac{1}{c}\right), b\left(\frac{1}{c}+\frac{1}{a}\right), c\left(\frac{1}{a}+\frac{1}{b}\right)$ are in $A.P$. Prove that a,b,c are in $A.P$

Q. 24. If p and q are the lengths of perpendiculars from the origin to the lines $x\cos\theta-y\sin\theta=k\cos 2\theta$ and $x\sec\theta+y\,\text{cosec}\,\theta=k$, respectively, prove that $p^2+4q^2=k^2$

Q. 25. Find focus, axis, directrix and LLR (length of the latus rectum) of the parabola $x^2=-9y$.

Q. 26. If $y=(ax+b)^m(cx+d)^n$, find $\frac{dy}{dx}$

OR

Evaluate: $\lim_{x\to 3}\left\{\frac{x^4-81}{2x^2-5x-3}\right\}$

Q. 27. A man wants to cut three lengths from a single piece of board of length $91cm$. The second length is to be $3cm$ longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second?

Q. 28. Find the coordinate of the point P which is $five-sixth$ of the way from $(-2,0,6)$ to $(10,\ 6,-12)$.

SECTION – IV

Q. 29. There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2 and 30 to both the chemicals C_1 and C_2. Find the number of individuals exposed to (i) Chemical C_1 but not Chemical C_2. (ii) Neither Chemical C_1 nor Chemical C_2

Q. 30. Solve the inequalities graphically: $2x + y \le 12, 4x + 5y > 20, x + 2y \le 12, x \ge 0, y \ge 0$

Q. 31. In how many ways can the letters of the word $PERMUTATIONS$ be arranged if the (i) Vowels are all together, (ii) There are always 4 letters between P and S?

Q. 32. If $\lim_{x \to a} f(x)$ exists, for the function $f(x) = \begin{cases} |x| + 1 ; & x < 0 \\ 0 ; & x = 0 \\ |x| - 1 ; & x > 0 \end{cases}$, find the value of a.

OR

Using first principle, find derivative of the function $f(x) = sin\sqrt{x}$

Q. 33. Find the equation of the ellipse, such that major axis is $x-axis$, centre is at origin and the ellipse passes through $(4, 3)$ and $(6, 2)$.

Q. 34. If A, B & C are any three events associated with any random experiment, then prove that,
$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$.

Q. 35. 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

The difference between any two consecutive interior angles of a polygon is 5°. If the smallest angle is 120°, find the number of the sides of the polygon.

SECTION – V

Q. 36. Calculate the mean deviation about median age for the age distribution of 100 persons given below:

Age	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41 – 45	46 – 50	51 – 55
$Number$	5	6	12	14	26	12	16	9

OR

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. 37. Find the equation of the line through the point $(3, 2)$ and which makes an angle 45° with $x - 2y = 3$.

Q. 38. If $sin(\theta + \alpha) = a$ and $sin(\theta + \beta) = b$, then prove that $\cos 2(\alpha - \beta) - 4ab\cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$

OR

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

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