TEST PAPER – 1 (St. Xavier)

Mathematics – XI

Time : 3 hr   Max Marks : 100

GENERAL INSTRUCTIONS :-

1. *All questions are compulsory*.
2. *SECTION – A comprises of 6 questions of one marks each*.
3. *SECTION – B comprises of 13 questions of four marks each.*
4. *SECTION – C comprises of 7 questions of six marks each.*
5. *Internal choice has been provided in 04 questions of four marks each and 02 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 $y = \tan x^o$, 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. Find the vertex of the conic $y = 6x - x^2$.

Q. 5. If 'A' and 'B' are any two events such that P(A) = 0.42, P(B) = 0.48 & P(A∩B) = 0.16. Determine P(A but not B)

Q. 6. Find the domain of the function $f(x) = \frac{x+2}{|x+2|}$

SECTION – B

Q. 7. 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. 8. 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*) $(a, b) \in R \Rightarrow (b, a) \in R$ (*iii*) $(a, b) \in R, (b, c) \in R \Rightarrow (a, c) \in R$

Q. 9. 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. 10. 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. 11. Prove that the middle term of the expansion $(1 + 4x + 4x^2)^n$ *is* $\frac{1.3.5.7.---.(2n-1)4^n.\ x^n}{n!}$; $n \in Z_+$

Q. 12. A person standing at the junction of two straight paths represented by the equations $2x - 3y + 4 = 0$ and $3x + 4y - 5 = 0$ wants to reach the path whose equation is $6x - 7y + 8 = 0$ in the least time. Find equation of the path that he should follow.

Q. 13. Find the equation of circum circle to the triangle formed by the line $2x + 3y = 6$ and coordinate axes.

Q. 14. Find the equation of hyperbola having foci (± 4 , 0) and the length of latus rectum is 12.

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.

OR

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.

Q. 16. Evaluate : $\lim_{x \to 0} \left\{\frac{1 - \cos x \sqrt{\cos 2x}}{x^2}\right\}$ OR Evaluate : $\lim_{x \to \frac{\pi}{4}} \left\{\frac{\tan^3 x - \tan x}{\cos\left(x + \frac{\pi}{4}\right)}\right\}$

Q. 17. Find the value of '*a*' and '*b*', so that $\lim_{x \to 1} f(x) = f(1)$, if, $f(x) = \begin{cases} 5ax - 2b & ; x < 1 \\ 11 & ; x = 1 \\ 3ax + b & ; x > 1 \end{cases}$

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Q. 18. 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. 19. A typical *PIN* is a sequence of any four symbols chosen from the 26 letters in the alphabet and the ten digits. What is the probability that a randomly chosen *PIN* contains a repeated symbol?

OR

A bag contains 2 white and 4 black balls, while another bag contains 4 white and 2 black balls. A bag is selected at random and a ball is drawn. Find the probability that the ball drawn is of the black colour.

SECTION – C

Q. 20. In a triangle ABC prove that : $(b - c)\cot\left(\frac{A}{2}\right) + (c - a)\cot\left(\frac{B}{2}\right) + (a - b)\cot\left(\frac{C}{2}\right) = 0$

Q. 21. The coefficients of the $(r-1)^{th}, r^{th}$ and $(r+1)^{th}$ terms in the expansion $(1+x)^n$ are in the ratio $1 : 3 : 5$. Find 'n' and 'r'.

Q. 22. 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. 23. 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. 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.

OR

Evaluate : $\lim_{x \to 2}\left\{\frac{3^x + 3^{3-x} - 12}{3^{3-x} - 3^{x/2}}\right\}$

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