TEST PAPER – 2 (St. Xavier's)

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. Let R be the relation on **Z** defined by $R = \{(a, b): if\ a - b \in \boldsymbol{Z}; a, b \in \boldsymbol{Z}\}$. Find the domain and range of R.

Q. 2. Evaluate : $\lim_{x \to 0} \left\{\frac{(x+1)^5 - 1}{\sin x}\right\}$

Q. 3. Evaluate : $\tan(165^{\circ})$

Q. 4. Show that the points $(-2, 3, 5), (1, 2, 3)$ and $(7, 0, -1)$ do not forms a triangle.

SECTION – B

Q. 5. If, $y - \cos y = x$, then show that $(y\sin y + \cos y + x)\frac{dy}{dx} = y$

Q. 6. Find the equation of the parabola with focus $(2,0)$ and directrix $x = -2$.

Q. 7. Let $A = \{9,10,11,12,13\}$ and let $f: A \rightarrow N$ be defined by $f(n) =$ the highest prime factor of n. Find the range of f.

Q. 8. If, $A = \{a, b, c\}$, find the number of all possible relation defined over the set A.

Q. 9. In a game, a man has decided to throw a die thrice but to quit as and when he gets a six. Find the number of all possible simple events.

Q. 10. Prove that, $\tan 70° = \tan 20° + 2\tan 50°$

Q. 11. Evaluate : $\lim_{x \to 0} \left\{\frac{x\left(e^{2+x} - e^2\right)}{1 - \cos x}\right\}$

Q. 12. Find what the equation, $x^2 + xy - 3y^2 - y + 2 = 0$ become when the origin is shifted to the point $(1, 1)$

SECTION – C

Q. 13. Prove that the product of the lengths of the perpendiculars drawn from the points $\left(\sqrt{a^2 - b^2},\ 0\right)$ and $\left(-\sqrt{a^2 - b^2},\ 0\right)$ to the line $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$ is b^2

Q. 14. Show that the middle term in the expansion of $(1+x)^{2n}$ is $\frac{1.3.5.---(2n-1)}{n!}2^n.x^n; n \in Z_+$

Q. 15. A point R with x −coordinate 4 lies on the line segment joining the points $P(2, -3, 4)$ & $Q(8, 0, 10)$. Find the coordinates of the point R.

Q. 16. A box contains 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, what is the probability that (i) all will be blue? (ii) atleast one will be green?

Q. 17. Find the equation of hyperbola having foci on $(0,\ \pm 5)$ and vertices $(0,\ \pm 3)$

Q. 18. In a triangle ABC prove that : $a(\cos C - \cos B) = 2(b - c)\cos^2\left(\frac{A}{2}\right)$

OR

Show that : $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

Q. 19. Find the domain, range of the function $f(x) = [x]$, where [.] is greatest integer function. Also plot the graph of the function.

Q. 20. Evaluate : $\lim_{x\to 1}\left\{\frac{x-2}{x^2-x}-\frac{1}{x^3-x^2+2x}\right\}$

OR

Find $\frac{dy}{dx}$ if $(i)(ax+b)^m(cx+d)^n$ $(ii)\frac{x^5-\cos x}{\sin x}$

Q. 21. 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. 22. Let R be a relation over Q defined by $R=\{(a,b): a,b\in Q\ and\ a-b\in Z\}$. Are the following true?
(i) $(a,a)\in R$, for all $a\in Q$ (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. 23. 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) No Chemical

SECTION – C

Q. 24. If $\lim_{x\to 0}f(x)$ & $\lim_{x\to 1}f(x)$ exists, for the function $f(x)=\begin{cases} mx^2+n; & x<0 \\ m+nx; & 0\le x\le 1, \\ m+nx^3; & x>1 \end{cases}$

Find the possible integral value of m and n

Q. 25. Using delta process, find the derivative of the function $f(x)=\sin x+\cos x$

Q. 26. The 2^{nd}, 3^{rd} and 4^{th} terms in the binomial expansion $(x+a)^n$ are 240, 720 and 1080, respectively. Find x, a and n.

Q. 27. Solve the inequalities graphically: $3x+2y\le 150, x+4y\le 80, x\le 15, y\ge 0$

Q. 28. Find the equation of the line through the point $(3,2)$ and which makes an angle 45° with $x-2y=3$.

OR

Assuming that straight lines work as the plane mirror for a point, find the image of the point $(1,2)$ in the line $x-3y+4=0$.

Q. 29. Find the equation of the circle which passes through the point $(4,1)$ and $(6,5)$ and whose centre lies on the line $4x+y=16$.

OR

Find the foci, vertices, eccentricity and LLR of the hyperbola $9y^2-4x^2=36$.

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