TEST PAPER – 2

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. If, A = {1, 2, 3, 4} be any set, then find the number of all possible functions from the set A on the set A.

Q. 2. If, A = $\{1, \{2, 3\}, \{4, 5\}\}$ be any set, then find the number of all proper subset of the set A.

Q. 3. If $y = log\left(x + \sqrt{1 + x^2}\right)$, find $\frac{dy}{dx}$.

Q. 4. Sum the series to infinity $\frac{2}{5} + \frac{3}{5^2} + \frac{2}{5^3} + \frac{3}{5^4} + - - -$

Q. 5. Find the probability of 53 Sundays or 53 Mondays in a leap year.

Q. 6. Find the length of perpendicular drawn from the point P (3, 4, 5) on *y-axis*.

SECTION – B

Q. 7. A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the range of number of consumers that must have liked both products?

Q. 8. Find the range of the function $f(x) = \frac{x^2}{1 + x^2}$

Q. 9. By using the principle of mathematical induction prove that,

for all $n \geq 1$, $\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + - - - + \frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}$

Q. 10. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it . The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added?

Q. 11. Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that, (i) all vowels do not occur together.

(ii) Respective position of vowel and consonant remains unchanged.

Q. 12. If the coefficients of a^{r-1}, a^r and a^{r+1} in the expansion of $(1 + a)^n$ are in A.P, prove that $n^2 - n(4r + 1) + 4r^2 - 2 = 0$.

OR

Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(2^{1/4} + 3^{-1/4}\right)^n$ is $\sqrt{6} : 1$.

Q. 13. Find the sum of the first *n* terms of the series: 3 + 7 +13 +21 +31 + - - - .

Q. 14. Find the distance of the line $4x - y = 0$ from the point P (4, 1) measured along the line making an angle of 135° with the positive *x-axis*.

Q. 15. If, $f(x) = \begin{cases} |x| + 1, & x < 0 \\ 0, & x = 0 \\ |x| - 1, & x > 0 \end{cases}$ For what value(s) of *a* does $\lim_{x \to a} f(x)$ exists?

P.T.O

Q. 16. Find the coordinates of a point equidistant from the four points O (0, 0, 0), A (l, 0, 0), B (0, m, 0) and C (0, 0, n).

OR

Find the centroid of a triangle, if the mid-points of the sides of the triangle are (1, 2, – 3), (3, 0, 1) and (–1, 1, – 4).

Q. 17. A die is loaded in such a way that each odd number is twice as likely to occur as each even number. Find the probability of a number greater than 3 occurs on a single roll of the die.

Q. 18. Find the general solution of the equation ; $\sin x + \sin 3x + \sin 5x = 0$.

OR

In a triangle ABC if $a \cos A = b \cos B$ then prove that the triangle is either isosceles or right angled.

Q. 19. A rod AB = 15 cm lies in between coordinate axes in such a way A always lies on x – *axis* and B on y – *axis* . Find the locus of a point on the rod which divides AB in the ratio 3 : 2 internally.

OR

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

SECTION – C

Q. 20. The angle of elevation of the top point P of the vertical tower PQ of height 'h' from a point A is 45°, and from a point B the angle of elevation is 60° where B is a point at a distance 'd' from the point A measured along the line AB which makes an angle 30° with AQ, prove that $d = h(\sqrt{3} - 1)$

Q. 21. Find the equation of the line through the point (3 , 2) and which makes an angle 45° with $x - 2y = 3$.

Q. 22. Find the nearest and farthest point on the circle $x^2 + y^2 - 4x - 6y = 2$, from the straight line $x + y + 4 = 0$

OR

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. 23. Show that : $\dfrac{1 \times 2^2 + 2 \times 3^2 + 3 \times 4^2 + - - - + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + 3^2 \times 4 + - - - + n^2 \times (n+1)} = \dfrac{3n + 5}{3n + 1}$.

Q. 24. Using first principle, find the differential coefficient of $f(x) = x \sec x$.

Q. 25. One card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn. Find the probability that the drawn cards are both diamonds.

Q. 26. Find the mean 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

OR

Find the mean deviation about the median for the following data :

Marks obtained	10-20	20-30	30 – 40	40-50	50-60	60-70	70-80
Number of students	2	3	8	14	8	3	2

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