11 R

Time : 3.00 hrs.

Quarterly Examination - 2024

MATHEMATICS

Reg. No. 1 1 9 6 A1 3 7

Max. Marks : 90

SECTION - A

20 x 1 = 20

Answer all the questions

Choose the correct answer

1. The number of constant functions from a set containing m elements to a set containing n elements is
   a) mn b) m c) n d) m + n
2. If $\frac{|x-2|}{x-2} \geq 0$, then x belongs to a) $[2, \infty]$ b) $(2, \infty)$ c) $(-\infty, 2)$ d) $(-2, \infty)$
3. A wheel is spinning at 2 radians /second. How many seconds will it take to make 10 complete rotations?
   a) 10π seconds b) 20π seconds c) 5π seconds d) 15π seconds
4. Let A and B be subsets of the universal set N, the set of natural numbers. Then A'U(A B) B'] is
   a) A b) A' c) B d) N
5. In a triangle ABC, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then the triangle is
   a) equilateral triangle b) isosceles triangle c) right triangle d) scalene triangle
6. $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots + \cos 179^\circ =$ a) 0 b) 1 c) –1 d) 89
7. The sum of the digits at the 10^{th} place of all numbers formed with the help of 2, 4, 5, 7 taken all at a time is
   a) 432 b) 108 c) 36 d) 18
8. In 3 fingers, the number of ways four rings can be worn is .....ways.
   a) $4^3 - 1$ b) 34 c) 68 d) 64
9. The number of solution $x^2 + |x - 1| = 1$ is a) 1 b) 0 c) 2 d) 3
10. If P_n stands for ^nP_n then the sum of the series $1 + P_1 + 2P_2 + 3P_3 + \ldots + nP_n$ is
    a) P_{n+1} b) $P_{n+1} - 1$ c) $P_{n-1} + 1$ c) $^{n+1}P_{(n-1)}$
11. If S_n denotes the sum of n terms of an AP whose common difference is d, the value of $2S_n - 2S_{n-1} + S_{n-2}$ is
    a) d b) 2d c) 4d d) d^2
12. The value of $\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \ldots$ .....is .
    a) $\frac{e^2+1}{2e}$ b) $\frac{(e+1)^2}{2e}$ c) $\frac{(e-1)^2}{2e}$ d) $\frac{e^2-1}{2e}$
13. In $^{2n}C_3 : {}^nC_3 = 11 : 1$ then n is a) 5 b) 6 c) 11 d) 7
14. The line $(p + 2q)x + (p - 3q)y = p - q$ for different values of p and q passes through the point
    a) $\left(\frac{2}{5}, \frac{5}{2}\right)$ b) $\left(\frac{2}{5}, \frac{2}{5}\right)$ c) $\left(\frac{3}{5}, \frac{3}{5}\right)$ d) $\left(\frac{2}{5}, \frac{3}{5}\right)$
15. The image of the point (2, 3) in the line $y = -x$ is
    a) (–3, –2) b) (–3, 2) c) (–2, –3) d) (3, 2)
16. If one of the lines given by $6x^2 - xy + 4cy^2 = 0$ is $3x + 4y = 0$, then c equals to
    a) –3 b) –1 c) 3 d) 1
17. The value of log 1 is a) 1 b) 0 c) ∞ d) –1
18. The number of roots of $(x + 3)^4 + (x + 5)^4 = 16$ is
    a) 4 b) 2 c) 3 d) 0
19. Which of the following is not true?
    a) $\sin\theta = -\frac{3}{4}$ b) $\cos\theta = -1$ c) $\tan\theta = 25$ d) $\sec\theta = \frac{1}{4}$
20. Let A = {–2, –1, 0, 1, 2} and f : A $\rightarrow$ Z be given by $f(x) = x^2 - 2x - 3$ then preimage of 5 is.....
    a) –2 b) –1 c) 0 d) 1

SECTION - B

7 x 2 = 14

Answer any seven questions.

Question No.30 is compulsory.

21. Find the value of $\cos 105^\circ$.
22. Write the following in roster form {x ∈ N : x^2 < 121 and x is a prime}
23. Construct a quadratic equation with roots 7 and –3.
24. Write the n^{th} term of the following sequences. 2, 2, 4, 4, 6, 6...
25. Solve $|4x - 5| \geq -2$
26. Determine the number of permutations of the letters of the word SIMPLE if all are taken at a time?

27. Find the equation of the straight line passing through (–1, 1) and cutting off equal intercepts, but opposite in signs with the two coordinate axes
28. Find the distance between the line $4x + 3y + 4 = 0$ and a point (7, –3)
29. Find the domain of $f(x) = \frac{1}{1 - 3\cos x}$
30. Write $f(x) = x^2 + 5x + 4$ in completed square form.

SECTION - C

$7 \times 3 = 21$

Answer any seven questions.
Question No.40 is compulsory.

31. If A and B are two sets so that $n(B - A) = 2n(A - B) = 4n(A \cap B)$ and if $n(A \cup B) = 14$, then find $n(P(A))$.
32. Prove that $\sqrt{3}$ is an irrational number. (Hint follow the method that we have used to prove $\sqrt{2} \notin Q$)
33. Find a quadratic polynomial f(x) such that, $f(0) = 1$; $f(-2) = 0$ and $f(1) = 0$.
34. Find the values of other five trigonometric functions for the following. Given $\cos\theta = \frac{2}{3}$, θ lies in the 1 quadrant.
35. In the set Z of integers, define mRn if m – n is divisible by 7. Prove that R is an equivalence relation.
36. How many differentselections of 5 books can be made from 12 different books if,
    (i) Two particular books are always selected?
    (ii) Two particular books are never selected?
37. Find the general terms and sum to n terms of the sequence $1, \frac{4}{3}, \frac{7}{9}, \frac{10}{27}, \ldots$
38. Prove that if a, b, c are in HP, if and only if $\frac{a}{c} = \frac{a-b}{a-c}$
39. If ${}^{15}C_{2r-1} = {}^{15}C_{2r+4}$ then find r.
40. Show the points $\left(0, -\frac{3}{2}\right)$, (1, –1) and $\left(2, -\frac{1}{2}\right)$ are collinear.

SECTION - D

$7 \times 5 = 35$

Answer all questions.

41. a) Resolve the following rational expressions into partial fractions. $\frac{2x^2 + 5x - 11}{x^2 + 2x - 3}$ **(OR)**
    b) From the curve y = x, draw
    i) $y = -x$ ii) $y = 2x$ iii) $y = x + 1$ iv) $y = \frac{1}{2}x + 1$ v) $2x + y + 3 = 0$
42. a) If $f : R \to R$ is defined by $f(x) = 2x - 3$, prove that f is a bijection and find its inverse. **(OR)**
    b) Let $f, g : R \to R$ be defined as $f(x) = 2x - |x|$ and $g(x) = 2x + |x|$. find fog.
43. a) By the principle of mathematical induction, prove that, for all integers $n > 1$, $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$ **(OR)**
    b) State and proive The Law of Cosines.
44. a) A manufacturer has 600 litres of a 12 percent solution of acid. How many litres of a 30 percent acid solution must be added to it so that acid content in the resulting mixtur will be more than 15 percent but less than 18 percent? **(OR)**
    b) If the equations $x^2 - ax + b = 0$ and $x^2 - ex + f = 0$ have one root in common and if the second equation has equalroots, the prove that $ae = 2(b + f)$.
45. a) If $A + B + C = \pi$, prove that $\cos^2A + \cos^2B + \cos^2C = 1, 2\cos A \cos B \cos C$. **(OR)**
    b) If the letters of the word TABLE are permuted in all possible ways and the words thus formed are arranged in the dictionary order (alphabetical order), find the ranks of the word (i) TABLE, (ii) BLEAT.
46. a) If a, b, c are respectively the p^{th} q^{th} and r^{th} terms of a GP, show that $(q - r)\log a + (r - p)\log b + (p + q)\log c = 0$. **(OR)**
    b) Prove that $\sqrt[3]{x^3 + 7} - \sqrt[3]{x^3 + 4}$ is approximately equal to $\frac{1}{x^2}$ when x is large.
47. a) A 150 m long train is moving with constant velocity of 125 m/s. Find
    i) the equation of the motion of the train ii) time taken to cross a pole iii) the time taken to cross the bridge of length 850m is? **(OR)**
    b) Find the equation of the pair of line through the origin and perpendicular to the pair of lines $ax^2 + 2hxy + by^2 = 0$.