11

Register No: P.K

FIRST MIDTERM TEST 2024

Time: 1:30Hrs **MATHEMATICS** **Marks : 50**

PART - A

I. choose the correct answer: **10 x 1 = 10**

1. If A = {(x,y) :Y=ex XER } and B = { (x,y) : Y=e-x XER } then n (ANB) is
   a) Infinity b) 0 c) 1 d)2
2. If n (A) = 2 and n (BUC) = 3 then n(AXB) U (AXC) is
   a) 2^3 b) 3^2 c) 6 d) 5
3. The number of relations on a set containing 3 elements is
   a) 9 b) 81 c) 512 d) 1024
4. The solution set of the following inequality $|x-1| \geq |x-3|$ is
   a) [0,2] b) [2,∞) c) (0,2) d) (-∞,2)
5. If 3 is the logarithm of 343 then the base is
   a) 5 b) 7 c) 6 d) 9
6. If $\frac{Kx}{(x+2(x-1)} = \frac{2}{x+2} + \frac{1}{x-1}$ then the value of K is
   a) 1 b) 2 c) 3 d) 4
7. The number of roots $(x+3)^4 + (x+5)^4 = 16$ is
   a) 4 b) 2 c) 3 d) 0
8. $\frac{1}{cos80^0} - \frac{\sqrt{3}}{sin80^0} = -$
   a) √2 b) √3 c) 2 d) 4
9. Which of the following is not true
   a) Sinθ = -3/4 b) Cos θ = -1 c) tan θ = 25 d) Sec θ = ¼
10. The value of cos 135^0 is
    a) -1/ √2 b) +√2 c) -√3/2 d) 0

PART – B

II. Answer Any Four only: **4 x 2 = 8**

11. If n [P(A)] = 1024 n (AUB) =15 and n(P(B)) = then find n(AUB)
12. Find the domain of $\frac{1}{1-2\sin x}$
13. Construct a quadratic equation with roots 3+√2 and 3-√2.
14. Find the logarithm of 1728 to the base 2√3.
15. Find a coterminal angle for (i) 1150^0 (ii) -270^0
16. Find the length of an arc of a circle of radius 5 cm subtending a central angle measuring 15^0.

PART –C

III. Answer Any Four Only: **4 x 3 = 12**

17. Write the values of f at -3, 5, 0 if $f(x) = \begin{cases} x^2 + x - 5 \text{ if } x \in (-\infty, 0) \\ x^2 + 3x - 2 \text{ if } x \in (3, \infty) \\ x^2 \text{ if } x \in (0,2) \\ x^2 - 3 \text{ otherwise} \end{cases}$

18. In the set Z of integers, define mRn if m – n is divisible by 7. Prove that R is an equivalence relation.
19. Discuss the nature of roots of
(i) $-x^2+3x+1=0$ (ii) $4x^2-x-2=0$ (iii) $9x^2+5x=0$
20. Prove $log_{a^2}^{a} log_{b^2}^{b} log_{c^2}^{c} = \frac{1}{8}$
21. prove that $\frac{tan\theta+sin\theta-1}{tan\theta-sin\theta-1} = 1+\frac{sin\theta}{cos\theta}$
22. If $sinx = \frac{15}{17}$ and $cosy = \frac{12}{13} 0 < x < \frac{\pi}{2}, 0 < y < \frac{\pi}{2}$ find the value of $\sin(x+y)$

PART – D

IV. ANSWER ALL THE QUESTIONS: **4 X 5 = 20**

23. 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) If If $f, g: R \to R$ are defined by $f(x) = |x| + x$ and $g(x) = |x| - x$ find fog and gof
24. a) solve $\frac{x^2-4}{x^2-2x-15} \leq 0$
(OR)
b) If $x = \sqrt{2}+\sqrt{3}$ find $\frac{x^2+1}{x^2-2}$
25. a) Prove that $\frac{cot(180^0+\theta)\sin(90^0-\theta)\cos(-\theta)}{\sin(270^0+\theta)\tan(-\theta)cosec(360^0+\theta)} = cos^2\theta cot\theta$ (OR)
b) Prove that $\cot(A+B) = \frac{cotAcotB-1}{cotA+cotB}$
26. a) Draw the graph of (i) $f(x) = |x|$ ii) $f(x) = |x| - 1$ iii) $f(x) = |x+1|$ iv) $f(x) = |x| - 1$ v) $f(x) = |x+2| + 3$
(OR)
b) Resolve into partial fractions: $\frac{x^2+x+1}{x^2-5x+6}$