FM

FIRST MID TERM TEST - 2023

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TIME: 1.30 Hrs

MATHS

MARKS : 45

PART - I

Note: 1) Answer all the questions. 2) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer. $10 \times 1 = 10$

- 1. If n(A) = 2 and $n(B \cup C) = 3$ then $n[(A \times B) \cup (A \times C)]$ is a) 2^3 b) 3^2 © 6 d) 5
- 2. Let $f: R \longrightarrow R$ be definded by f(x) = 1 |x|. Then the range of f is a) R b) $(1, \infty)$ c) $(-1, \infty)$ (3) $(-\infty, 1]$
- 3. Let A and B be subsets of the universal set N, the set of natural numbers. Then A' U [(A \cap B) U B'] is
 a) A b) A' c) B (3) N
- 4. The solution set of the following in equality $|x 1| \ge |x 3|$ is a) [0, 2] (a) $[2, \infty)$ (b) $[2, \infty)$ (c) [0, 2) (d) [0, 2]
- 5. If 8 and 2 are the roots of $x^2 + ax + c = 0$ and 3, 3 are the roots of $x^2 + dx + b = 0$, then the roots of the equation $x^2 + ax + b = 0$ are a) 1, 2 b) -1, 1 c) 9, 1 d) -1, 2
- 6. The value of $\log_3^{11} \log_{11}^{13} \log_{13}^{15} \log_{15}^{27} \log_{27}^{81}$ is a) 1 b) 2 c) 3
- 7. $\frac{1}{\cos 80^{\circ}} \frac{\sqrt{3}}{\sin 80^{\circ}} =$ a) $\sqrt{2}$ b) $\sqrt{3}$ c) 2 d) 4
- 8. $\frac{\sin \theta}{\cos e c \theta} + \frac{\cos \theta}{\sec \theta} = a \sin \theta \cos \theta \quad b) \csc \theta \sec \theta \quad cos \theta \quad$
- 9. If α , β are the roots the quadratic equation $x^2 + \sqrt{2}x + 1 = 0$ then $\frac{1}{\alpha^2} + \frac{1}{\beta^2} = ?$
- 10. If the number of relations defined on A is 5/2, then n(A) is

 (a) 9

 (b) 6

 (c) 3

 (d) 1

PART - II

Note: 1) Answer any three questions. 2) Question number 15 is compulsory. $3 \times 2 = 6$

- 11. If n(A) = 10 and $n(A \cap B) = 3$ then find $n((A \cap B) \mid nA)$
- Solve |x 9| < 2.
- Prove that: (SecA cosecA) (1+tanA + cot A) = tanA sec A cot A cosecA.
- 14. If a and b are the roots of the quadratic equation $x^2 px + q = 0$ then find the value of 1/a + 1/b.

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If $A = 30^{\circ}$ then find the value of $2\sin^2 A + \cos^2 A$. 15.

PART - III

Note: 1) Answer any three questions. 2) Question Number 20 is compulsory.

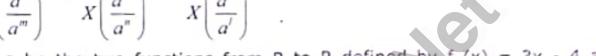
Let $A = \{a, b, c\}$ and $R = \{(a,a), (b,b), (a,c)\}$ write down the minimum number of 16. ordered pairs to be included to R to make it

iii) transitive iv) equivalence. (i) reflexive (ii) symmetric

Solve : $\frac{x+1}{x+3} < 3$

An airplane propeller rotates 1000 times perminute. Find the number of degrees that a point on the edge of the propeller will rotate in 1 second.

Simplify: $\left(\frac{a^l}{a^m}\right)^{(l+m)} X \left(\frac{a^m}{a^n}\right)^{(m+n)} X \left(\frac{a^n}{a^l}\right)^{(n+l)}$.



Let f and g be the two functions from R to R defined by f(x) = 3x - 4 and $g(x) = x^2 + 3$. Sind not read from R. $g(x) = x^2 + 3$. Find gof and fog.

PART - IV

Note: Answer all the questions.

a) Find the range of the function $f(x) = \frac{1-3\cos x}{1-\cos x}$.(OR) 21.

- b) If the equations $x^2 ax + b = 0$ and $x^2 ex + f = 0$ have one roof in common and if the second equation has equal roots, then prove that ae = 2 (b+f).
- 22. a) If $\frac{\cos^4 \alpha}{\cos^2 \beta} + \frac{\sin^4 \alpha}{\sin^2 \beta} = 1$ prove that (i) $\sin^4 \alpha + \sin^4 \beta = 2 \sin^2 \alpha \sin^2 \beta$

(ii) $\frac{\cos^4 \beta}{\cos^2 \alpha} + \frac{\sin^4 \beta}{\sin^2 \alpha} = 1$ (OR)

b) Write the value of f at -4, 1, -2, 7, 0 if $f(x) = \begin{cases} -x+4 & \text{if } -\infty/, x \le -3 \\ x+4 & \text{if } -3 < x < -2 \\ x^2-x & \text{if } -2 \le x < 1 \\ x-x & \text{if } 1 \le x < 7 \\ 0 & \text{if other wise} \end{cases}$

a) Resolve in to partial fractions $\frac{x}{(x+3)(x-4)}$. (OR) 23.

- b) If the arcs of same lengths in two circles subtend central angles 30° and 80° find the ratio of their radii.
- a) If $f: R \longrightarrow R$ is defined by f(x) = 2x 3 prove that f is bijection and find its 24. inverse.
 - b) Prove that $\log 2 + 16\log \frac{16}{15} + 12\log \frac{25}{24} + 7\log \frac{81}{80} = 1$.

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