FM

FIRST MID TERM TEST - 2023

11 - STD

MATHS

TIME : 1.30 Hrs

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 X 1 = 10

1. If n (A) = 2 and n (B ∪ C) = 3 then n [(A X B) ∪ (A X C) is
   a) 2^3 b) 3^2 c) 6 d) 5
2. Let f : R ---> R be definded by f (x) = 1 - |x| . Then the range of f is
   a) R b) (1, ∞) c) (-1, ∞) d) (-∞, 1]
3. Let A and B be subsets of the universal set N, the set of natural numbers. Then $A' \cup [(A \cap B) \cup B']$ is
   a) A b) A' c) B d) N
4. The solution set of the following in equality $|x - 1| \geq |x - 3|$ is
   a) [0, 2] b) [2, ∞) c) (0, 2) d) (∞, 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 d) 4
7. $\frac{1}{\cos 80^o} - \frac{\sqrt{3}}{\sin 80^o} =$ a) $\sqrt{2}$ b) $\sqrt{3}$ c) 2 d) 4
8. $\frac{\sin\theta}{\operatorname{cosec}\theta} + \frac{\cos\theta}{\sec\theta} =$ a) sinθ cosθ b) cosecθ secθ c) 1 d) 2
9. If α, β are the roots the quadratic equation $x^2 + \sqrt{2}x + 1 = 0$ then $\frac{1}{\alpha^2} + \frac{1}{\beta^2} = ?$
   a) 1 b) 0 c) $1/\sqrt{2}$ d) $\sqrt{2}$
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 X 2 = 6

11. If n (A) = 10 and n (A ∩ B) = 3 then find n((A ∩ B)|nA)
12. Solve |x - 9| < 2.
13. 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.

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

PART - III

Note : 1) Answer any three questions. 2) Question Number 20 is compulsory. 3 X 3 = 9

16. Let A = {a, b, c} and R = {(a,a), (b,b), (a,c)} write down the minimum number of ordered pairs to be included to R to make it
(i) reflexive (ii) symmetric iii) transitive iv) equivalence.

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

18. 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.

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

20. Let f and g be the two functions from R to R defined by f (x) = 3x - 4 and g(x) = x^2 + 3 . Find gof and fog.

PART - IV

Note : Answer all the questions. 4 X 5 = 20

21. a) Find the range of the function f (x) = $\frac{1}{1-3\cos x}$. ***(OR)***
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, 0if $f(x) = \begin{cases} -x+4 & if \quad -\infty/, x \le -3 \\ x+4 & if \quad -3 < x < -2 \\ x^2 - x & if \quad -2 \le x < 1 \\ x - x & if \quad 1 \le x < 7 \\ 0 & if \quad otherwise \end{cases}$

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

b) If the arcs of same lengths in two circles subtend central angles 30° and 80° find the ratio of their radii.

24. a) If f : R ---> R is defined by f (x) = 2x - 3 prove that f is bijection and find its inverse. ***(OR)***

b) Prove that $\log 2 + 16\log\frac{16}{15} + 12\log\frac{25}{24} + 7\log\frac{81}{80} = 1$.