Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER INTEGRATED MCA DEGREE EXAMINATION (R), DECEMBER 2023
(2020 SCHEME)

Course Code: **20IMCAT103**

Course Name: **Basic Mathematics**

Max. Marks: **60** **Duration: 3 Hours**

Use of non-programmable calculators can be permitted.

PART A

(Answer all questions. Each question carries 3 marks)

1. Define a singleton set with an example.
2. List the members of the set A = $\{x: x \text{ is an integer such that } x^2 = 2\}$.
3. Define transitive relation on a set.
4. Are the integers 4 and 5 comparable in the poset $(Z^+, /)$
5. Define an onto function with an example.
6. Find the domain and range of the function $f: R \to R$ given by $f(x) = 4x + 5$, $x \in R$. Also evaluate $f(0), f\left(\frac{1}{2}\right)$
7. Find $\frac{d}{dx}\left(\frac{4}{x^3}\right)$
8. Find $y'(x)$ for $y(x) = (x^2 + 2)(2x - 1)$
9. Compute $\int (x^2 + \sqrt{x})\, dx$
10. State the Fundamental Theorem of Calculus.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

11. a) Show that Cartesian product of $B \times A$ is not equal to Cartesian product of $A \times B$ by using an example. (4)
    b) Define Power set of a set. Also find P(A) if A= {1}. (2)

OR

12. (a) Define difference of two set A and B . (2)
    (b) Use set builder notation and logical equivalences to establish the second De Morgan's Law. (4)

MODULE II

13. a) Define composition of relations and also find the composite of the relations R and S, where R is the relation from {1,2,3} to {1,2,3,4} with R ={(1,1),(1,4),(2,3),(3,1),(3,4)} and S is the relation from {1,2,3,4} to {0,1,2} with S={(1,0),(2,0),(3,1),(3,2),(4,1)}. (4)

b) Show that the "divides" relation on the set of positive integers is not an equivalence relation . (2)

OR

14. a) Draw a directed graph of the relation $R = \{(1,3),(1,4),(2,1),(2,2),(2,3),(3,1),(3,3),(4,1),(4,3)\}$ on the set {1,2,3,4} (2)

b) Show that the "greater than or equal" relation (≥) is partial ordering on the set of integers. (4)

MODULE III

15. a) Give the geometrical meaning of injective, surjective and bijective functions. (3)

b) Let $f: Z \to Z$ and $g: Z \to Z$ defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. Find fog and gof. (3)

OR

16. Let the function f(x) = 5x+1 from R to R. Is the function f is invertible , if so find its inverse. (6)

MODULE IV

17. Which of the following could be true if $f''(x) = x^{-1/3}$.

$a)\ f(x) = \frac{3}{2}x^{2/3} - 3$ $b)\ f(x) = \frac{9}{10}x^{5/3} - 7$

$c)\ f'''(x) = \frac{-1}{3}x^{-4/3}$ $d)\ f'(x) = \frac{3}{2}x^{2/3}$ (6)

OR

18. a) Use chain rule to find the derivative of $g(t) = \tan(5 - sin2t)$ (4)

b) When does a function not have a derivative at a point? (2)

MODULE V

19. a) Evaluate the indefinite integral $\int x^2 \sin(x^3)\, dx$. (3)

b) Using definite integral to find an area of the region between the parabola $y = x^2$ and the x-axis on the interval [0, b]. (3)

OR

20. a) State Mean Value Theorem for Definite Integral. (2)

b) Find the average value of $f(x) = 4 - x^2\ on\ [0,3]$.Does $f$actually take on this value at some point in the given domain? (4)

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