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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTERINTEGRATED M.C.A DEGREE EXAMINATION (S), MAY 2022

(2020 SCHEME)

Course Code:	**20IMCAT103**
Course Name:	**Basic Mathematics**
Max. Marks: **60**	**Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Draw the Venn diagram of $A^c \cap (B \cup C)$.
2. Distinguish between equal sets and equivalent sets.
3. Define equivalence relation. Give an example.
4. Give an example for a partial ordering.
5. Give an example of a function that is not one-to-one.
6. Define inverse of a function.
7. Find the derivative of $y = x^3 \log x$.
8. Find $y'''(0)$ where $y = \frac{x^3}{2}$.
9. State the fundamental theorem of Calculus.
10. Evaluate $\int_0^\pi (\cos x - \sin x)\, dx$.

PART B

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

MODULE I

11. a) Define generalized union and intersection. (2)
    b) Find $\bigcup_{i=1}^{n} A_i$ where $A_i = \{i, i+1, i+2, \dots\}$ and $\bigcap_{i=1}^{\infty} A_i$ where $A_i = \{i\}$. (4)

OR

12. Find the number of elements in $A_1 \cup A_2$ if there are 12 elements in A_1 and 18 elements in A_2 in each of the following cases.
    a) $A_1 \cap A_2 = \emptyset$
    b) $|A_1 \cap A_2| = 1$ (6)
    c) $|A_1 \cap A_2| = 6$
    d) $A_1 \subseteq A_2$

MODULE II

13. Let R_1 and R_2 be two relations from the set $A = \{1, 2, 3\}$ to the set (6)
    $B = \{2, 3, 4\}$ defined by $R_1 = \{(a, b) \mid a\ divides\ b\}$ and $R_2 = \{(a, b) \mid a = b\}$. Find
    the matrix representation of R_1, R_2, $R_1 \cap R_2$, $R_1 \cup R_2$, R_1^c and R_2^c.

OR

14. a) Show that the divisibility relation "|" is a partial ordering on the set of all positive integers. (4)

    b) Distinguish between maximal and minimal elements in posets. (2)

MODULE III

15. a) Define function as a relation. (3)

    b) Check whether $f: R \rightarrow R$ defined as $f(x) = -3x + 4$ is invertible. If it is invertible, find the inverse. (3)

OR

16. a) Give an example of a function that is not onto. (2)

    b) Let $f, g: R \rightarrow R$ be defined as $f(x) = e^x$ and $g(x) = x^5$.
       Find $f \circ g, \; g \circ f, fg, f + g$ and $f - g$. (4)

MODULE IV

17. a) Find $f(0), \; f'(0) \; and \; f''(0) \; for \; f(x) = x^3 + 3x + \cos x$. (3)

    b) Find the derivative of $y = e^{\left(1+x^2\right)^3}$. (3)

OR

18. Let $f(x) = k \left(\frac{x+1}{x-1}\right)$, $k \neq 0$. Find the value of k if $f'(x) = 4$ for $x = 0$. (6)

MODULE V

19. a) Evaluate $\int_0^\pi \cos^2 x \, dx$. (3)

    b) Evaluate $\int_0^1 e^{1-x} \, dx$. (3)

OR

20. Find the area under the graph $y = \frac{x}{2}\sqrt{x}$ from $x = 0$ to $x = 1$. (6)

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