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# SAINTGITS COLLEGE OF ENGINEERING
# KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FIRST SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION(S), JULY 2021**

**Course Code:** **20IMCAT103**

**Course Name:** **BASIC MATHEMATICS**

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

## PART A

***(Answer all questions. Each question carries 3 marks)***

1. Prove the De Morgan's Law $\bar{A} \cap \bar{B} = \overline{A \cup B}$
2. What is the Cartesian product $A \times B \times C$, where $A = \{0,1\}, B = \{1,2\}$, and $C = \{0,1,2\}$
3. Let $R = \{(2,2),(2,3),(2,4),(3,2),(3,3),(3,4)\}$ be relation on $A = \{1,2,3,4\}$. Determine whether the relation $R$ is irreflexive, antisymmetric, transitive.
4. Define a partially ordered set and give an example
5. Distinguish between relation and function
6. Let $f(x) = x - 1$ and $g(x) = 4x^2 + 2$ be functions defined on set of real numbers $\mathbb{R}$. Examine whether $fog = gof$.
7. Find $f'(5)$ if $f(x) = \frac{5}{x} - \frac{x}{5}$
8. Find the second derivative of $y(x) = e^x sinx$
9. If $\int_o^a 3x^2 dx = 8$ find the value a.
10. Evaluate the integral $\int \left(\frac{e^{\sqrt{x}}}{\sqrt{x}}\right) dx$

## PART B

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

### MODULE I

11. If $A = \{3,4,7,8\}$ $B = \{1,2,4,8\}$ and $C = \{1,2,3,5,7\}$ verify $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (6)

**OR**

12. Among 18 students in a room, 7 study mathematics, 10 study science, and 10 study computer programming. Also, 3 study mathematics and science, 4 study mathematics and computer programming, and 5 study science and computer programming. We know that 1 student studies all three subjects. Evaluate the number of student's study none of the three subjects. (6)

**MODULE II**

13. Let R be a relation on A = {1, 2, 3, 4 }. Given its associated relation matrix (6)

$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$ . Evaluate the following

(a) the relation R
(b) the digraph of R
(c) the relation $R^2$

**OR**

14. Define an equivalence relation. Prove that for every $x, y \in \mathbb{Z}$**,** the relation defined by $\mathcal{R} = \{(x, y): 3 \text{ divids } x - y\}$ is an equivalence relation. (6)

**MODULE III**

15. Give an example of function which is (6)
(a) one – one, not onto
(b) not one – one, onto
(c) both one – one and onto
(d) neither one – one nor onto

**OR**

16. Check whether the function $f: \mathbb{R} \to \mathbb{R}$ defined as $f(x) = 4x + 3$ for all $x \in \mathbb{R}$ is invertible. If yes find the inverse function. (6)

**MODULE IV**

17. a) Find $\frac{d}{dx}(x^2 - x + 2)^{3/4}$ (3)

b) Differentiate $(x^2 + 7)(3x^2 - 5)$ using product rule (3)

**OR**

18. a) Differentiate $y(x) = \frac{x^2-1}{x^2+1}$ (3)

b) If $y = 2sinx + 3cosx$ prove that $\frac{d^2y}{dx^2} + y = 0$ (3)

**MODULE V**

19. a) Evaluate the integral $\int_0^3 f(x)dx$ where $f(x) = \begin{cases} x^2, & x < 2 \\ 3x - 2, & x \geq 0 \end{cases}$ (3)

b) Integrate $\int \left(\frac{3x^3+6x-8}{x}\right) dx$ (3)

**OR**

20. Evaluate $\int x^2 e^{-x} dx$ (6)

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