

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



## 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(R), MARCH 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. Define power set of a set. Find the power set of  $\{a, b, c\}$ .
2. State and prove associative laws for set operations.
3. Define Cartesian product of two sets. Find the cartesian product of  $A = \{1, 2\}$  and  $B = \{-1, 0\}$
4. Is the 'divides' relation an equivalence relation on the set of integers; Justify.
5. Distinguish injective and surjective functions.
6. Let  $f: A \rightarrow B$  is defined by  $f(x) = 2x + 3$  and  $g: B \rightarrow C$  defined by  $g(x) = x^2$ . Find  $f \circ g$  and  $g \circ f$ .
7. Obtain the value of  $f'(1)$  if  $f(x) = \frac{x}{x+1}$ .
8. Define derivative of a function and give its geometrical interpretation.
9. Evaluate  $\int_1^2 \frac{2x}{x^2+1} dx$
10. State and explain with the help of an example, 'The fundamental theorem of calculus'.

### PART B

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

#### MODULE I

11. a) State and prove inclusion-exclusion principle for two sets. (3)
- b) Draw the Venn Diagrams of, (3)
  - i.  $A \cap B'$
  - ii.  $(A - B) \cup (B - A)$

#### OR

12. Out of 40 students in a class, 22 opted for 'Elective I' and 28 opted for 'Elective II'. Assume that each one opted for at least one of the two electives. How many opted for, (6)
  - i. Only Elective I not II
  - ii. Only Elective II not I
  - iii. Both Electives

#### MODULE II

13. Relation  $R$  on the set of real integers is defined by  $aRb$  if and only if  $1+ab > 0$ . Check whether  $R$  is an equivalence relation. (6)

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**OR**

14. Show that the divisibility relation is a partial ordering relation on the set of positive integers, but not in the set of integers. (6)

**MODULE III**

15. Consider a function,  $f:Z \rightarrow Z$  defined by  $f(x) = 4x - 9$ . Is the function invertible? If yes, find the inverse. (6)

**OR**

16. Find the domain of the functions (6)

i.  $f(x) = \sqrt{49 - x^2}$   
ii.  $g(x) = \frac{2}{(x-1)(x+1)}$

**MODULE IV**

17. a) Obtain the value of  $y'(1), y''(1)$  and  $y'''(1)$  for  $y(x) = \left(2x - \frac{3x^2}{2} + \frac{x}{x+1}\right)$  (3)

- b) Find  $f'(1)$  &  $f''(0)$  for  $f(x) = x^2 e^{2x}$  (3)

**OR**

18. a) Evaluate  $f'(2\pi)$ , for  $f(x) = x \sin x$  (3)

- b) Show that  $\frac{dy}{dx} = 3x^2$ , for  $y = x^3$  by using the definition of derivative (3)

**MODULE V**

19. a) Calculate the area under the curve  $y = \frac{1}{\sqrt{x}}$  from  $x = 4$  to  $x = 9$  (3)

- b) Compute  $\int \frac{5x^2}{x^3+1} dx$  (3)

**OR**

20. a) Evaluate  $\int_1^2 f(x) dx$ , where  $f(x) = x^2 - 3x^3 + \frac{1}{x}$  (3)

- b) Using integration by parts, Evaluate  $\int e^{2x} \cos 2x dx$ . (3)

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