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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION (R), DECEMBER 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. Give reasons whether the following statements is true or false

   If A = {4, -4,5} and B = {x: either $x^2 = 16 \text{ or } x^2 + x - 20 = 0, x \in Z\}$, then $A = B$.

2. Define cardinality of a set with an example.
3. Let A = {a, b, c, d} and R = {(a, a), (a, d), (d, a), (d, d), (b, b), (b, c), (c, b), (c, c)}. Write the matrix of R and sketch its graph.
4. Show that $f: R \to R$ defined by $f(x) = x^2$ is neither one -one nor onto.
5. Define composition of functions with an example.
6. Give an example of a function $f: N \to N$ that is one-to-one but not onto.
7. Find $\frac{dy}{dx}, if\ y = (x-1)(x^2+x+1)$.
8. If $f(x) = 4 - x^2$, find the values of $f'(-3), f'(0), f'(1)$.
9. Evaluate $\int_0^1 (3x^2 + 2x)\, dx$.
10. State mean value theorem for definite integral.

PART B

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

MODULE I

11. State and prove De Morgan's law. (6)

OR

12. a) In a group of 500 persons,400 can speak Hindi and 150 can speak English. Then how many can speak

    (i)both Hindi and English

    (ii)Hindi only (4)

    (iii)English only

    b) Define cartesian product of two sets with an example. (2)

MODULE II

13. a) Show that the "*greater than or equal*" relation (≥) is a partial ordering on the set of integers. (3)

b) Let A = {2, 3, 4} and B = {3, 4, 5, 6, 7}. Assume a relation R from A to B such that (x, y) ϵ R when a divides b (with zero remainder). Determine the relation R, its domain, co-domain and range. (3)

OR

14. a) Define an equivalence relation.
b) Let A= {1,2,3} and consider a relation R on A defined by R= {(1,2), (2,1), (2,3)}. Is R symmetric, antisymmetric? (6)

MODULE III

15. Describe whether the function $f(x) = 2x + 1$ is a bijection from $R \to R$.If so, find its inverse. (6)

OR

16. a) If $f(x) = \frac{4x+3}{6x-4}, where\ x \neq \frac{2}{3}$, show that $(fof)(x) = x$. (3)

b) Let $f, g : Z \to Z$, be two functions defined by $f(x) = x^2 + 2$ and $g(x) = x + 3$ respectively. Find fog and gof . (3)

MODULE IV

17. a) Find the derivative of $y = \sqrt{x^2 + 1}$. (2)

b) Find y'' if $y = \left(1 + \frac{1}{x}\right)^3$. (4)

OR

18. a) Find the derivative of $g(t) = \tan(5 - \sin 2t)$. (3)

b) Find the value of $(fog)'(x)$ at $, x = 1$ where $f(x) = x^5 + 1$ and $g(x) = \sqrt{x}$. (3)

MODULE V

19. a) Evaluate $\int \frac{2z dz}{(\sqrt{z^2+1})^{1/3}}$. (4)

b) State the fundamental theorem of calculus. (2)

OR

20. a) Use a substitution to find an antiderivative and then apply the fundamental theorem to evaluate the integral (3)

$$\int_0^1 t\sqrt{t^2 + 1}\, dt$$

b) Evaluate $\int_{\pi/4}^{\pi/2} \cot\theta\ cosec^2\,\theta d\theta$. (3)

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