QP CODE: 24803752

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, JUNE 2024

Second Semester

INTEGRATED MSC BASIC SCIENCE-CHEMISTRY

COMPLEMENTARY - ICH2CM05 - MATHEMATICS II - INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

2020 Admission Onwards

0DEA7FBA

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Write the formula to find the volume of a solid of known integrable cross section area A(x) from x=a to x=b.
2. Write the equation to find the volume of a solid generated by revolving about the x-axis.
3. Write the equation to find the arc length of the curve $y = f(x)$ from x=a to x=b.
4. Sketch the following region of integration:
   $-2 \leq y \leq 2,\ \ y^2 \leq x \leq 4.$
5. Define volume of a closed, bounded region D in a space using triple integrals.
6. Solve $\frac{dy}{dx} + 2xy = 4x.$
7. Solve the initial value problem $\frac{dy}{dx} + xy = y$, given y(1) = 4.
8. Define parallel edges in a graph. Give an example.
9. Define a regular graph. Give an example.
10. Define proper subgraph of a graph. Give an example.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. The region enclosed by the x-axis and the parabola $y = 3x - x^2$ is revolved about the vertical line x=-1 to generate the solid. Find the volume of the solid.
12. Find the area of the surface generated by revolving the curve $x = \frac{y^3}{3}, 0 \leq y \leq 1$ about y-axis.

13. Find the volume of the region bounded above by the elliptical paraboloid $z = 10 + x^2 + 3y^2$ and below by the rectangle $R: \ 0 \leq x \leq 1, \ 0 \leq y \leq 2.$

14. Find the average value of $F(x, y, z) = x^2 + 9$ over the cube in the first octant bounded by the coordinate planes and the planes x=2,y=2 and z=2.

15. Solve $\frac{dy}{dx} = \frac{x^2 - 4xy - 2y^2}{2x^2 + 4xy - y^2}$.

16. Solve $(2xy + y - tan\, y)dx + (x^2 - xtan^2\, y + sec^2\, y + 2)dy = 0.$

17. Define a graph. Give an example in which a graph provide natural mathematical model.

18. Define adjacency matrix of a graph. Draw the graphs having the following matrices as adjacency matrices:

a) $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 2 & 2 \\ 0 & 2 & 1 & 2 \\ 0 & 2 & 2 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 0 & 1 & 2 & 3 \\ 1 & 0 & 3 & 2 \\ 2 & 3 & 0 & 1 \\ 3 & 2 & 1 & 0 \end{bmatrix}$

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. a) Find the volume of the solid generated by revolving the region bounded by $x = \sqrt{5}y^2\, , x = 0\, , y = -1\, , y = 1$ about the y-axis.
b)Find the volume of the solid generated by revolving the region between the y-axis and the curve $x = \frac{2}{y}\, , 1 \leq y \leq 4\, ,$ about the y-axis

20. a) Define average value of a function over a region R in a plane. Find the average value of $f(x, y) = xcosxy$ over the rectangle $R: 0 \leq x \leq \pi, 0 \leq y \leq 1..$
b)Find the average value of $f(x, y) = sin(x + y)$ over the rectangle $0 \leq x \leq \pi, 0 \leq y \leq \pi.$
c)Find the average value of $f(x, y) = \frac{1}{xy}$ over the square $ln2 \leq x \leq 2ln2, ln2 \leq y \leq 2ln2.$

21. Solve a) $2xy\, dy + (2y^2 + 3x)dx = 0.$
b) $(4xy + y^2)dx - (2x^2 - 2y)dy = 0.$

22. Solve a) $x^2y - x^3y' = y^4cosx.$
b) $xy^2\frac{dy}{dx} + y^3 = 1.$

(2×5=10 weightage)