QP CODE: 24019195

24019195

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / IMPROVEMENT / REAPPEARANCE EXAMINATIONS, MAY 2024

Second Semester

Complementary Course - MM2CMT01 - MATHEMATICS - INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

(Common for B.Sc Chemistry Model I, B.Sc Chemistry Model II Industrial Chemistry,B.Sc Chemistry Model III Petrochemicals, B.Sc Electronics and Computer Maintenance Model III, B.Sc Food Science & Quality Control Model III, B.Sc Geology Model I, B.Sc Geology and Water Management Model III, B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic Equipment Maintenance)

2017 ADMISSION ONWARDS

31387C1F

Time: 3 Hours Max. Marks : 80

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Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. What is a solid of revolution? Write the formula for the volume of a solid generated by revolving a region about (a) x-axis (b) y-axis.
2. Find the volume of the solid generated by revolving the region bounded by y = x, y = 1, x = 0 about the x-axis.
3. Find the length of the curve y = log(sec x) between the points given by x = 0 and x = $\frac{\pi}{3}$.
4. Evaluate $\int_0^1 \int_x^2 x \, dxdy.$
5. Use a double integral to find the volume of the solid enclosed by the surface $z = x^2$ and the planes $x = 0,\ x = 2,\ y = 3,\ y = 0,$ and $z = 0.$
6. Define the average value of an integrable function of two variables.
7. Find the degree and the order of a differential equation $\frac{d^2y}{dt^2} - [1 + (\frac{dy}{dt})^2]^{\frac{3}{2}} = 0.$
8. Verify that the function $y = ce^{-8x}$ is a solution of the differential equation $\frac{dy}{dx} + 8y = 0.$
9. Write the general form of Bernoull's equation.

10. Write the general form of the integral curves of the set of equations $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

11. Define the order and degree of partial differential equations with examples

12. Find the general integral of the linear partial differential equation $xp + yq = z$

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. The region bounded by the curve $y = \sqrt{4x - x^2}$, the x-axis and the line x = 2 is revolved about x-axis to generate a solid. Find the volume of the solid.

14. Find the area of the surface generated by revolving the curve $y = \sqrt{2x - x^2}, 0.5 \leq x \leq 1.5$, about the x-axis.

15. Evaluate $\int_0^1 \int_0^2 xy(x - y)\, dxdy$.

16. Evaluate $\int_1^3 \int_{\frac{1}{x}}^1 \int_0^{\sqrt{xy}} xyz\, dzdydx$.

17. Solve $\frac{dy}{dx} = \frac{y + \sqrt{x^2 + y^2}}{x}$.

18. Find integrating factor and hence solve the differential equation $y^2dx + (1 + xy)dy = 0$

19. Solve the differential equation $\frac{dy}{dx} - y = e^{2x}$

20. By means of an example, prove that parametric equations of a surface are not unique.

21. Form the partial differential equation by eliminating the arbitrary function from $z = f(\frac{xy}{z})$

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. (a) A curved wedge is cut from a cylinder of radius 3 by two planes. One plane is perpendicular to the axis of the cylinder. The second plane crosses the first plance at a 45^0 angle at the center of th ecylinder. Find the volume of the wedge.

(b) The solid lies between planes perpendicular to the x-axis at x = -1 and x = 1. The cross-sections perpendicular to x-axis are circular disk whose diameters run from the parabola $y = x^2$ to the parabola $y = 2 - x^2$. Find the volume of the solid.

23. Find the area of the region bounded by the given lines and the curves.

(i) The lines $x = 0,\ y = 2x$, and $y = 4$.

(i) The curves $y = \ln x$ and $y = 2 \ln x$ and the line $x = e$, in the first quadrant.

24. a) Solve $3e^x tanydx + (1 - e^x)sec^2 ydy = 0.$
    b) Solve $x\sqrt{1+y^2}dx + y\sqrt{1+x^2}dy = 0.$

25. Find the integral curves of the equations.

    1. $\frac{dx}{x(y^2 - z^2)} = \frac{dy}{y(z^2 - x^2)} = \frac{dz}{z(x^2 - y^2)}.$
    2. $\frac{dx}{y + zx} = \frac{dy}{-(x + yz)} = \frac{dz}{x^2 - y^2}.$

(2×15=30)