QP CODE: 21103141

21103141

Reg No : ....

Name : ....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, DECEMBER 2021

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

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Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. A pyramid 3m high has a square base that is 3m on a side. The cross section of the pyramid perpendicular to the altitude x m down from the vertex is a square of x m on a side. Find the volume of the pyramid.
2. Write a short note on Washer Method for finding volume of solid of revolution.
3. Find the area of the surface generated by revolving the curve y = 2$\sqrt{x}$, 1 $\leq$x $\leq$ 2, about the x-axis.
4. Change the order of integration of the double integral $\int_0^4 \int_{\sqrt{y}}^2 e^{x^3}\ dxdy.$
5. Find the area bounded between the curve $y = x^2$ above the $x-$axis and below the line $y = 2.$
6. Define the volume of a closed bounded region in space.
7. Verify that the function $x^2 + y^2 = c$ is a solution of the differential equation $y\frac{dy}{dx} + x = 0.$
8. Examine whether the differential equation $(3xy + y^2) + (x^2 + xy)\frac{dy}{dx} = 0$ is exact or not.

9. Solve $\frac{dy}{dx} + 2xy = 4x$.

10. Find the integral curves of the equations $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$.

11. Solve the partial diffrential equation $\frac{\partial^2 u}{\partial x^2} - 4 = 0$

12. Obtain the partial differential equation associated with the equation $z = f(x^2 + y^2)$ where f is arbitrary

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Find the volume of the solid generated by revolving the region between the parabola x = y^2 + 1 and the line x = 3 about the line x = 3.

14. Use Shell method to find the volumes of the solids generated by revolving the region bounded by the lines y = 3x, y = 0, x = 2 about the line y = -2.

15. Find the volume of the solid bounded by the cylinder $x^2 + y^2 = 4$and the planes $y + z = 4$and $z = 0$.

16. Find the average value of $f(x, y) = \sin(x + y)$ over the rectangle $0 \le x \le \pi,\ 0 \le y \le \frac{\pi}{2}$.

17. Find values of A and B so that the function $y(x) = Asinx + Bcosx + 1$ satisfy the initial conditions $y(\pi) = 0, y'(\pi) = 0$.

18. Solve the initial value problem $\frac{dy}{dx} = 2e^x y^3; y(0) = 0.5$.

19. Find integrating factor and solve the following initial value problem $(2y + xy)dx + 2xdy = 0; y(3) = \sqrt{2}$.

20. Find the integral curves of the equations $\frac{dx}{x^2} = \frac{dy}{y^2} = \frac{dz}{(x+y)z}$.

21. Write the method for solving a Lagrange's equation.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. (a) Find the length of the curve $y = \left(\frac{x}{2}\right)^{\frac{2}{3}}$, from x = 0 to x = 2.
(b) Find the arc length function for the curve f(x) = $\frac{x^3}{12} + \frac{1}{x}, 1 \le x \le 4$.

23. Evaluate the iterated integrals,

(i) $\int_0^{\ln 3} \int_0^{\ln 2} e^{(x+y)}\ dydx$

(ii) $\int_0^{\ln 2} \int_0^{1} xye^{y^2x}\ dydx.$

24. a)Solve $\frac{dy}{dx} + xsin2y = x^3cos^2y.$

b) Solve $siny\frac{dy}{dx} = cosy(1 - xcosy)$

25. Show that the condition that the surfaces $F(x, y, z) = 0,\ G(x, y, z) = 0$ should touch is that the eliminant of x, y and z from these equations and the equations $\frac{F_x}{G_x} = \frac{F_y}{G_y} = \frac{F_z}{G_z}$ should hold. Hence find the condition that the plane $lx + my + nz + p = 0$ should touch the central conicoid $ax^2 + by^2 + cz^2 = 1.$

(2×15=30)