QP CODE: 20101101

20101101

Reg No : ....

Name : ....

B.Sc. DEGREE (CBCS) EXAMINATION, NOVEMBER 2020

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

2017 ADMISSION ONWARDS

A12773AE

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Find the volume of the solid generated by revolving the region bounded by the line x + 2y = 2 and the lines y = 0, x = 0 about the x-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. Write Shell formula for revolution about a vertical line.
4. Evaluate the double integral $\iint_R y^2x\, dA$ over the rectangle $R = \{(x, y) : -3 \le x \le 2, 0 \le y \le 1\}$.
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 one variable.
7. Obtain the differential equation associated with the primitive $y = Ax^2 + Bx + C$.
8. Examine whether the differential equation $(x^2 - y^2)dx + (x^2 - 2xy)dy = 0$ is exact or not.
9. Find an integrating factor of $2ydx + 3xdy = 0$

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

11. Define partial differential equations with examples.

12. Explain Lagrange's equation. Give an example.

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. The base of the solid is the region in the first quadrant between the line y = x and the parabola y^2 = 4x. The cross-section of the solid perpendicular to the x-axis are equilateral triangles whose bases stretch from line to the curve. Find the volume of the solid.

14. Find the area of the surface generated by revolving the curve $y^2 = 4 + x, -4 \leq x \leq 2$, about the x-axis.

15. Evaluate the integral by first reversing the order of integration of the double integral $\int_0^4 \int_{\sqrt{y}}^2 e^{x^3}\, dxdy.$

16. Find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1.$

17. Verify that the given function $y = x^4 + ax^2 + bx + c$ is a solution of the differential equation $\frac{d^3y}{dx^3} = 24x.$

18. Solve $(1 + x^2)dy + x\sqrt{1 - y^2}dx = 0.$

19. Solve $\frac{dy}{dx} - y = xy^5.$

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 $x^2 - y^2 = f(y^2 - z^2)$

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Find the length of the graph of
    (a) f(x) = $\frac{x^3}{12} + \frac{1}{x}, 1 \leq x \leq 4$
    (b) x = $\frac{y^3}{3} + \frac{1}{4y}, 1 \leq y \leq 3$

23. (a) Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, using double integration.

(b) Using double integration, find the area of the region encloesd by the parabola $y = x^2$ and the line $y = x + 2$.

24. a) Solve $x\frac{dy}{dx} = y + x^3 + 3x^2 - 2x$.
b)Solve $\frac{dy}{dx} + ycotx = 5e^{cosx}$.

25. Find the integral curves of the equations

1. $\dfrac{dx}{x(y-z)} = \dfrac{dy}{y(z-x))} = \dfrac{dz}{z(x-y)}$.
2. $\dfrac{dx}{xz-y} = \dfrac{dy}{yz-x} = \dfrac{dz}{1-z^2}$.

(2×15=30)