19101721

QP CODE: 19101721

Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, MAY 2019

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

30968F0B

Maximum Marks: 80 **Time: 3 Hours**

Part A

Answer any **ten** questions.

Each question carries **2** marks.

1. The solid lies between planes perpendicular to the x-axis at x - -1 and x = 1. Find a formula for the area A(x) of the cross-sections, if
   (a) The cross-sections, perpendicular to x-axis, between these planes, are circular disk with diameters run from the semicircle $y = -\sqrt{1-x^2}$ to the semicircle $y = \sqrt{1-x^2}$.
   (b) (a) The cross-sections, perpendicular to x-axis, between these planes, are squares with side run from the semicircle $y = -\sqrt{1-x^2}$ to the semicircle $y = \sqrt{1-x^2}$.

2. The region between the curve $y = 2\sqrt{x}$, $0 \leq x \leq 2$ and the x-axis is revolved about the x-axis to generate a solid. Find its volume.

3. Write the formula for areas of surfaces of revolution.

4. State the fubini's theorem (First form).

5. Use a double integral to find the volume of the solid that is bounded above by the plane $z = 4 - x - y$ and below by the rectangle $R = [0,1] \times [0,2]$.

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. Solve the differential equation $(1+x^2)\frac{dy}{dx} = 1+y^2$.

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. Form the partial differential equation by eliminating the constants a and b from $z = ax + by + ab$

(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 in the first quadrant bounded on the left by the circle $x^2 + y^2 = 3$, on the right by the line $x = \sqrt{3}$ and above by the line $y = \sqrt{3}$, about y-axis.

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

15. Evaluate $\iint_R xy\, dxdy$ over the region R where R is the first quadrant of the circle $x^2 + y^2 = a^2$.

16. Find the volume of the solid enclosed between the paraboloids $z = 5x^2 + 5y^2$ and $z = 6 - 7x^2 - y^2$.

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

18. Solve $(x-2)\frac{dy}{dx} = y + 2(x-2)^3$.

19. Solve $x\frac{dy}{dx} + y = x^3y^6$

20. Find the equation of the tangent line to the space circle $x^2 + y^2 + z^2 = 1,\ x + y + z = 0$ at the point $\left(\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}\right)$.

21. Find the general integral of the partial differential equation $zp - zq = z^2 + (x+y)^2$.

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **15** marks.

22. Use Shell method to find the volumes of the solids generated by revolving the regions bounded by the curves and lines given below about the y-axis.
    (i) y = 2x - 1, y = $\sqrt{x}$, x = 0
    (ii) y = x^2, y = 2 - x^2, x = 0 for x $\geq$0
    (iii) y = 1 + $\frac{x^2}{4}$, x = 0, x = 2

23. Find the area of the region bounded by the given lines and curves,
    (i) The coordinate axes and the line $x + y = 2$.
    (ii) The parabola $x = y^2 - 1$ and $x = 2y^2 - 2$.

24. a) Solve $(y^2 + xy)dx + x^2dy = 0$.
    b)Solve $2xy\frac{dy}{dx} - y^2 + x^2 = 0$.

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)