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Name.....

B.Sc. DEGREE (C.B.C.S.) EXAMINATION, JUNE 2018

Second Semester

Complementary Course

MM2 CMT 01—Mathematics–INTEGRAL CALCULUS AND DIFFERENTIAL EQUATIONS

(2017 Admissions only)

[Common to Chemistry M I, Geology M I, Physics M I Chemistry M II Industrial Chemistry, Physics M II Applied Electronics, Physics M II Computer Applications, Chemistry M III Petrochemicals, Electronics and Computer Maintenance M III, Food Science and Quality Control M III, Geology and Water Management M III and Physics M III Electronic Equipment and Maintenance Programmes]

Time : Three Hours Maximum Marks : 80

Part A

Answer any **ten** *questions.*
Each question carries 2 *marks.*

1. The circle is rotated about the x-axis to generate a sphere. Find the volume.

2. Find the length of the curve $y = \int_0^x \sqrt{\cos 2t}\ dt$ from $x = 0$ to $x = \pi/4$.

3. Find the volume of the solid generated by revolving the region bounded by the curve $y = \sqrt{2}$, the y-axis and the curve about the x-axis.

4. Find $\int_1^2 \int_0^4 xy\ dy\ dx$.

5. Find $\int_0^2 \int_x^{x^2} dy\ dx$.

6. Find $\int_0^1 \int_0^1 \int_0^1 dx\ dy\ dz$.

Turn over

7. Solve the differential equation $\frac{dy}{dx} = \frac{y}{x}$.

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

9. Solve $\frac{dy}{dx} + xy = y, y(1) = 4$.

10. Find the direction cosines of the normal to the surface $z = x^2 + y^2$ at $(1, 1, 2)$.

11. Form a partial differential equation by eliminating the constants a and b from the equation $z = (x+a)(x+b)$.

12. Write the standard form of a linear partial differential equation in two variables.

(10 × 2 = 20 marks)

Part B

Answer any **six** *questions.*
Each question carries 5 *marks.*

13. Evaluate $\iint_R (6y^2 - 2x)\, dA$, when R is the region bounded by the rectangle $0 \le x \le 1, 0 \le y \le 2$.

14. Evaluate $\int_0^1 \int_0^{y^2} 3y^3 e^{xy}\, dx\, dy$.

15. Evaluate $\int_0^{\pi} \int_0^{\pi} \int_0^{\pi} \cos(x+y+z)\, dx\, dy\, dz$.

16. Find the volume of the solid generated by revolving the region bounded dy $x = y^{3/2}, x = 0$ and $y = 2$.

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

18. Solve the differential equation $(3x^2 y + e^y)\, dx + (x^3 + xe^y - 2y)\, dy = 0$.

19. Solve the differential equation $x\frac{dy}{dx} + (3x+1)y = e^{-3x}$.

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20. Find the solution of the equation $\frac{dx}{y(x+y)+az}=\frac{dy}{x(x+y)-az}=\frac{dz}{z(x+y)}$.

21. Form a partial differential equation by eliminating f from $z=xy+f\left(x^2+y^2\right)$.

(6 × 5 = 30 marks)

Part C

Answer any **two** *questions.*
Each question carries 15 *marks.*

22. (a) Find the area of surface generated by revolving $y=2\sqrt{x}, 1\le x\le 2$ about the x-axis.

(b) A curved wedge is cut from a circular cylinder of radius 3 by two planes.one plane is perpendicular to the axis of the cylinder and second plane crosses the first plane at 45° angle at the center of the cylinder. Find the volume of the wedge.

23. Find the volume of the region enclosed by the surface $z=x^2+3y^2$ and $z=8-x^2-y^2$.

24. Solve the partial differential equation $y^2\frac{\partial z}{\partial x}-xy\frac{\partial z}{\partial y}=x(z-2y)$.

25. (a) Solve $\left(y^2+yx\right)dx+x^2dy=0$.

(b) Solve $xy\,dx+2x^2+\left(3y^2-20\right)dy=0$.

(2 × 15 = 30 marks)