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Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree Examination, December 2021

First Degree Programme Under CBCSS

Mathematics

Complementary Course for Chemistry/Polymer Chemistry

MM 1231.2 : MATHEMATICS – II

INTEGRATION, DIFFERENTIAL EQUATIONS AND ANALYTIC GEOMETRY

(2014-2017 Admissions)

Time : 3 Hours Max. Marks : 80

SECTION – I

All the **first ten** questions are compulsory. They carry **1** mark each.

1. Evaluate $\int (\cos x + \sin x)dx$.

2. Define average -value of a continuous-function f on an interval $[a,b]$.

3. Define are length of a smooth curve $y = f(x)$ on the interval [a, b].

4. Evaluate $\int_1^2 \int_0^3 (1+8xy)dx\,dy$.

5. Find the order of the differential equation $(y''')^2 + (y'')^9 + 2y = 6$.

6. Give the general form of a separable equation.

P.T.O.

7. Write down the auxiliary equation of the differential equation $y'' - 10y' + 5y = 0$.

8. Define the conic hyperbola.

9. State reflection property of parabola.

10. State Kepler's first law.

(10 × 1 = 10 Marks)

SECTION – II

Answer **any eight** questions from among the questions 11 to 22. These questions carry **2** marks each.

11. Find the position function of a particle moves with velocity $v(t) = \cos \pi t$ along a coordinate line, assuming that the particle has coordinate $s = 4$ at time $t = 0$.

12. Find the area of the region bounded above by $y = x + 6$, bounded below by $y = x^2$, and bounded on the sides by the lines $x = 0$ and $x = 2$.

13. 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 $R = [0,1] \times [0,2]$.

14. Use a polar double integral to find the area enclosed by the three-petaled rose $r = \sin 3\theta$.

15. Solve $x(1 + y^2)dx + y(1 + x^2)dy = 0$.

16. Solve $y' + 3y = e^{-2x}$.

17. Show that the differential equation $(1 + 4xy + 2y^2)dx + (1 + 4xy + 2x^2)dy = 0$ is exact.

18. Find a general solution of $y'' + 9y' + 20y = 0$.

19. Sketch the graph of the parabola $x^2 = 12y$.

20. Find the foci of the ellipse $\frac{x^2}{9}+\frac{y^2}{16}=1$.

21. Find the equation of the hyperbola with vertices (0, ±8) and asymptotes $y=\pm\frac{4}{3}x$.

22. Find an equation for the parabola that has its vertex at (1,2) and its focus (4,2).

(8 × 2 = 16 Marks)

SECTION – III

Answer **any six** questions. from among the questions 23 to 31. These questions carry **4** marks each.

23. Suppose that a curve $y=f(x)$ in the $xy-$plane has the property that at each point (x,y) on the curve, the tangent line has x^2. Find an equation for the curve given that it passes through the point(2,1).

24. Suppose that a particle moves on a coordinate line so that its velocity at time t is $v(t)=(t^2-2t)m/s$. Find the distance travelled by the particle during the time interval $0\le t\le 3$.

25. Derive the formula for the volume of a sphere of radius τ.

26. Evaluate $\iint_R xy\,dA$ over the region R enclosed between $y=\frac{1}{2}x, y=\sqrt{x}, x=2,$ and $x=4$.

27. Evaluate $\int_0^2\int_{y/2}^1 e^{x^2}\,dx\,dy$.

28. Solve $\cos(x+y)dx+(3y^2+2y+\cos(x+y))dy=0$.

29. Solve the differential equation $y''+4y'+4y=0$.

30. Solve the differential equation $y''+3y'+2y=12x^3$.

31. Sketch the graph of $r=\frac{2}{1-\cos}$ in polar coordinates.

(6 × 4 = 24 Marks)

SECTION – IV

Answer **any two** questions from among the questions 32 to 35. These questions carry **15** marks each.

32. (a) Find the area of the region enclosed by $x = y^2$ and $y = x - 2$.

(b) Use a double integral to find the area of the region R enclosed between the parabola $y = \frac{1}{2}x^2$ and the line $y = 2x$.

33. (a) Find the arc length of the curve $y = x^{3/2}$ from (1,1) to $(2, 2\sqrt{2})$.

(b) Find the area of the surface that is generated by revolving the portion of the curve y = between $x = 1$ and $x = 2$ about they – axis.

34. Solve the following differential equations

(a) $y'' + 5y' + 4y = 10e^{-3x}$

(b) $4'' + 4' + 4y = e^{-x}\cos x$.

35. Sketch the graphs of the hyperbolas

(a) $\frac{x^2}{4} - \frac{y^2}{9} = 1$

(b) $y^2 - x^2 = 1$.

(2 × 15 = 30 Marks)