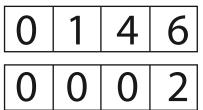
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Exam. Code:



B.A./B.Sc. (General) 2nd Semester 1048 MATHEMATICS Paper : II Calculus-II

Time : 3 Hours]

[Max. Marks: 30

3,3

- *Note* :- (1) Attempt five questions in all, selecting at least two questions from each section.
 - (2) Each questions carries 6 marks.

SECTION-I

1. (i) Show that the line joining the two points of inflexion of the curve :

 $y^2(x - a) = x^2(x + a), x \neq \pm a$ subtends an angle $\pi/3$ at the origin.

- (ii) Trace the curve $y^2 = (x + 1)^3$.
- 2. (i) Find the asymptotes of the curve : $x^{2}y + xy^{2} + 2x^{2} - 2xy - y^{2} - 6x - 2y + 2 = 0$ and show that they cut the curve in at most three points which lie on the straight line 2x - 3y - 4 = 0.

(ii) Determine the position and nature of the double points on the curve :

$$x^{3} - y^{2} - 7x^{2} + 4y + 15x - 13 = 0.$$
 3,3

3. (i) Define circle of curvature. Find the equation of the curve

 $\sqrt{x} + \sqrt{y} = \sqrt{a}$.

- (ii) Show that the points of intersection of the curve $xy(x^2 y^2) 25x^2 9y^2 + 144 = 0$ and its asymptotes lie on ellipse whose eccentricity is 4/5. 3,3
- 4. (i) If C_o , C_p denote the lengths of chord of curvatures of the cardioid $r = a (1 + cos \theta)$ along and perpendicular to the radius vector through any point respectively. Prove that :

$$B(C_{o}^{2}+C_{p}^{2}) = 8aC_{0}$$

(ii) Find the interval in which the curve $y = (x^2 + 4x + 5)e^{-x}$ is concave upwards or downwards. 4,2

6

SECTION-II

5. (i) If
$$\int_{0}^{\pi/4} \tan^{n} x dx$$
, show that, for $n > 1$, $I_{n} + I_{n-2} = \frac{1}{n-1}$.
Hence deduce the value of I_{3} .
(ii) Evaluate $\int \cosh^{-1} \frac{1+x^{2}}{1-x^{2}} dx$.

- 6. (i) Find the length of the curve $x^{2/3} + y^{2/3} = a^{2/3}$ measured from (0, a) to any point (x, y).
 - (ii) Find the volume of the solid obtained by revolving the area included between the curves $y^2 = x^3$ and $x^2 = y^3$. about X-axis.
- 7. (i) Find the surface area of the solid obtained by revolving the curve $y = 2x + 1 + \frac{1}{x^2}$ about x-axis for $1 \le x \le 2$.
 - (ii) Use Simpson's rule with n = 4 to approximate $\int_{-1}^{1} (x^{3} + 1) dx.$ Also find the error. 3,3
- 8. (i) Evaluate :

$$\lim_{n\to\infty} \frac{1}{n^{16}} \left(1^{15} + 2^{15} + \dots + n^{15} \right).$$

(ii) Derive the reduction formula for $\int x^n \sin(ax) dx$.

Hence evaluate
$$\int_{0}^{\pi/2} x^{3} \sin(x) dx$$
. 2,4