

2071
B.A./B.Sc. (General) Second Semester
Mathematics
Paper – II: Calculus - II

Time allowed: 3 Hours

Max. Marks: 30

NOTE: Attempt five questions in all, selecting atleast two questions each Unit.

x-x-x

UNIT – I

- I. a) Find the intervals of concave downwards for the curve $y = 3x^5 - 40x^3 + 3x - 25$.
b) Find points of inflexion of $x = (\log y)^3$. (2x3)
- II. Define node, cusp of a curve. Find the conditions under which point P(x,y) on the curve $f(x,y) = 0$ is a node or cusp. (6)
- III. a) Define asymptote of a curve. Is there any asymptote of a curve? Explain.
b) Trace the curve $y = 4(x - 2)^2$. (2x3)
- IV. a) Find the radius of curvature of a circle of radius r.
b) Find the circle of curvature at $\left(\frac{a}{4}, \frac{a}{4}\right)$ of $\sqrt{x} + \sqrt{y} = \sqrt{a}, a > 0$. (2x3)

UNIT – II

- V. a) Evaluate integral $\int \frac{1 + 2\text{Sinh}^2 x}{\text{Sinh}^2 x + \text{Cosh}^2 x} dx$.
b) Obtain reduction formula for $\int x \cos^n x dx$. (2x3)
- VI. a) If $I_n = \int_0^{\infty} e^{-x} \text{Sin}^n x dx$, prove that $I_n = \frac{n(n-1)}{n^2+1} I_{n-2}$
b) Apply Simpson's rule to approximate $\int_4^8 \frac{1}{x^2} dx$ using five ordinates. (2x3)

P.T.O.

(2)

VII. a) Evaluate $\lim_{n \rightarrow \infty} \left(\frac{1}{n+1} + \frac{1}{n+2} + \frac{1}{n+3} + \dots + \frac{1}{4n} \right)$

b) Find area of region $\{(x,y): x^2 \leq y \leq |x|\}$. (2x3)

VIII. a) Find the length of the boundary of the region bounded by $y = \frac{x^2}{2} + 1$, $x = 0$, $x = 2$ and $y = x$.

b) Find the volume of the solid generated by revolving the curve $y^2(x+a) = x^2(3a-x)$ about x-axis; $a > 0$. (2x3)

x-x-x