(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 8 Sub. Code : 0 1 4 6

Exam. Code : 0 0 0 2

B.A./B.Sc. (General) 2nd Semester

(2053)

MATHEMATICS

Paper–II : Calculus–II

Time Allowed : Three Hours] [Maximum Marks : 30

Note :—Attempt **FIVE** questions in all, selecting at least TWO questions from each unit. Each question carries 6 marks.

UNIT—I

1. (a) Find the point of inflexion of curve $y = \frac{x^2+1}{x^2-1}$. Also find the interval where the function is concave upward or downward.

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

   $$x^3 + x^2 + y^2 - x - 4y + 3 = 0.$$ 3,3

2. (a) Find all asymptotes of the curve

   $$x^3 - x^2y - xy^2 + y^3 + 2x^2 - 4y^2 + 2xy + x + y + 1 = 0.$$

(b) Show that the asymptotes of the curve

$$x^2y + xy^2 + 2x^2 - 2xy - y^2 - 6x - 2y + 2 = 0$$

meet the curve in atmost three points which lies on the straight line $2x - 3y - 4 = 0$. 3,3

3. Find the value of x for which the curve $y = \frac{x}{x^2+1}$ is increasing, decreasing, concave upwards, concave downwards. Draw the graph of the curve indicating its points of inflexion and asymptotes if any. 6

4. (a) Find the points on the parabola $y^2 = 8x$ at which the radius of curvature is $\frac{125}{16}$.

(b) Find equation of the circle of curvature at the point (0, b) of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. 3,3

UNIT—II

5. (a) Evaluate $\int \cosh^{-1}\left(\frac{1+x^2}{1-x^2}\right)dx.$, $|x| < 1$.

(b) Obtain reduction formula for $\int x.\cos^n x\,dx$. Hence solve $\int x\cos^3 x\,dx$. 3,3

6. (a) If $I_n = \int_0^{\pi/2} x^n \sin x \, dx$, $n \in N$ and $n > 1$.

Prove that $I_n + n(n-1)I_{n-2} = n\left(\frac{\pi}{2}\right)^{n-1}$.

(b) Compute $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's rule with $n = 2$.

Hence obtain an approximate value of π. 3,3

7. (a) Evaluate the limit

$$\lim_{n\to\infty}\left[\frac{1}{n}+\frac{1}{\sqrt{n^2-1^2}}+\frac{1}{\sqrt{n^2-2^2}}+.....+\frac{1}{\sqrt{n^2-(n-1)^2}}\right].$$

(b) Find the whole area of the curve

$x^{2/3} + y^{2/3} = a^{2/3}$. 3,3

8. (a) Find the length of the arc of parabola $y^2 - 4y + 2x = 0$ which lies in the first quadrant.

(b) Find the surface area of solid generated by the revolution of ellipse $x^2 + 4y^2 = 16$ about its major axis. 3,3