(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

(2042)

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.

UNIT—I

1. (a) Find the intervals where the curve $y = x^4-6x^3+12x^2+5x+7$ is concave upwards or downwards. Also find points of inflexion.

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

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

2. (a) Find all asymptotes of the curve :

   $x^3-5x^2y+8xy^2-4y^3+x^2-3xy+2y^2-7=0$.

   (b) Show that the asymptotes of the curve

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

   meet the curve in three points. Also find the curve on which these points lie. 3,3

3. Draw the graph of the curve $y = x + \frac{1}{x}$. Find the intervals where the curve is increasing, decreasing, concave upwards, concave downwards. Also show points of inflexion. 6

4. (a) Find the radius of curvature at any point of the curve $x = a\cos^3 t$, $y = a\sin^3 t$.

(b) Find the circle of curvature at the point $\left(\frac{1}{4}, \frac{1}{4}\right)$ of the curve $\sqrt{x} + \sqrt{y} = 1$. 3,3

UNIT—II

5. (a) Evaluate $\int \frac{\sinh x + \cosh x}{\sinh^2 x + \cosh^2 x} dx$.

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

6. (a) If $I_{m,n} = \int_0^{\pi/2} \cos^m x \cos n x \, dx$, prove that $I_{m,n} = \frac{m}{m+n} I_{m-1, n-1}$.

(b) Use Trapezoidal rule to approximate the integral $\int_1^2 (1 + x^3) dx$, n = 4. Also estimate the error. 3,3

7. (a) Evaluate the limit

$$\lim_{n\to\infty}\left[\frac{1}{n}+\frac{\sqrt{n}}{\sqrt{(n+4)^3}}+\frac{\sqrt{n}}{\sqrt{(n+8)^3}}+\ldots+\frac{\sqrt{n}}{\sqrt{[n+4(n-1)]^3}}\right]$$

(b) Find the area of the smaller portion enclosed by the curves $y^2 = 8x$ and $x^2+y^2 = 9$. 3,3

8. (a) Find the length of the curve $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$, $0 \le \theta \le \pi/2$.

(b) Find the surface area generated by revolving the parabola $y^2 = 4ax$ about the y-axis from $x = 0$ to $x = 9$. 3,3