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

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

Exam. Code : 0 0 0 2

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

1046

MATHEMATICS

Paper : II Calculus–II

Time Allowed : Three Hours] **[Maximum Marks : 30**

Note :– (1) Attempt **five** questions, selecting at least **two** questions from each unit.

(2) Each question carries 6 marks.

UNIT–I

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

(b) Show that abscissa of the points of inflexion on the curve $x=a-b\cos\theta, y=a\theta-b\sin\theta$ is $\frac{a^2-b^2}{a}$. 3,3

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

$(x+y)^2(x^2+y^2)-8(x+y)y^2+4x^2-3xy-y^2+4x+3=0.$

(b) Find asymptotes of $x^4-5x^2y^2+4y^4+x^2-y^2+x+y+1=0$ and show that asymptotes of the curve cut the curve in at most eight points which lie on a rectangular hyperbola.

3,3

3. (a) Find the position and nature of the double point on the curve $x^3+x^2+y^2-x-4y+3=0$.

(b) If $y=(x+1)^2(x-2)$, find the intervals of values of x for which the curve is :

(i) rising

(ii) falling

(iii) concave upwards

(iv) concave downwards

Sketch the graph showing points of inflexion and asymptotes. 3,3

4. (a) Prove that the radius of curvature at any point P on the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is $\frac{a^2b^2}{p^3}$, where p is the length of perpendicular from the centre of ellipse on the tangent at P.

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

UNIT–II

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

(b) Find a reduction formula for :

$\int x^n \sin x\,dx$ and hence evaluate $\int_0^{\pi/2} x^3 \sin x\,dx$. 3,3

6. (a) Prove that :

$$\frac{2}{\pi}\int_0^{\pi/2}\frac{d\theta}{(1-e^2\sin^2\theta)^{1/2}} 1+\frac{1^2}{2^2}e^2+\frac{1^2.3^2}{2^2.4^2}e^4+\frac{1^2.3^2.5^2}{2^2.4^2.6^2}e^6+.....$$

where $e < 1$.

(b) Find a reduction formula for $In = \int e^{ax}\cos^n x\,dx$. 3,3

7. (a) Use Simpson's rule to approximate $\int_0^{\pi}\sin x\,dx$,

taking five ordinates.

(b) Evaluate $\lim_{n\to\infty}\frac{(\lfloor n)^{1/n}}{n}$. 3,3

8. (a) Find the whole area of the astroid $x^{2/3}+y^{2/3}=a^{2/3}$.

(b) Find the length of the arc of the parabola $y^2-4y+2x=0$ which lies in the first quardant. 3,3