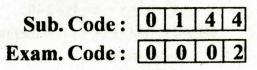
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(ii) Questions :8



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

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Turn over

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.

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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 $\frac{a^2 b^2}{p^3}$, 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 :

 $\int x^n \sin x \, dx \text{ and hence evaluate } \int x^3 \sin x \, dx.$

2

3,3

3,3

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6. (a) Prove that :

$$\frac{2}{\pi} \int_{0}^{\pi/2} \frac{d\theta}{\left(1 - e^2 \sin^2 \theta\right)^{1/2}} 1 + \frac{1^2}{2^2} e^2 + \frac{1^2 \cdot 3^2}{2^2 \cdot 4^2} e^4 + \frac{1^2 \cdot 3^2 \cdot 5^2}{2^2 \cdot 4^2 \cdot 6^2} e^6 + \dots$$

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 $\int_{0}^{1} \sin x \, dx$, taking five ordinates.

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

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