

Printed Pages:

BCA / D-12
MATHEMATICAL FOUNDATIONS-III
Paper-BCA-236

Time allowed: 3 hours

Maximum marks: 80

Note: Attempt **five** questions in all, selecting **one** question from each section.

All questions carry equal marks.

Compulsory question

1. (a) Differentiate x^x w.r.t. x . 2
- (b) Find the n th derivative of x^n . 2
- (c) Find the point on the curve $x = a(\theta + \sin \theta)$;
 $Y = a(1 - \cos \theta)$ where the tangent is parallel to y -axis. 2
- (d) State maclaurin's Theorem with Cauchy's form of remainder after n terms 2
- (e) Find the asymptote to the curve $y = 1 + e^x$, parallel to x -axis. 2
- (f) Find the radius of curvature for the curve
 $r^2 = a^2 - b^2 + a^2b^2$
 $\frac{p^2}{-----}$ 2
- (g) Define cusp and point of inflexion. 2
- (h) Evaluate $\lim_{x \rightarrow 0^+} (1/x - \operatorname{cosec} x)$ 2

Section-I

2. (a) if $x = \cos^{-1} (1/\sqrt{1+t^2})$ and $y = \sin^{-1} (t/\sqrt{1+t^2})$;
Find dy/dx . 8
- (b) $x^{\sin x}$ w.r.t. $(\sin x)^x$. 8
3. (a) Find the n th derivative of $\frac{x^2}{(x-1)^3(x+1)}$ 8
- (b) if $y = [\log(x + \sqrt{1+x^2})]^2$; prove that $(1+x^2)y_{n+2} + (2n+1)xy_{n+2} + n^2 y_n = 0$ 8

Section-II

4. (a) Tangents are drawn from the origin to the curve $y = \sin x$. prove that their points of contact lie on the curve $x^2 - y^2 = x^2 - y^2$. 8
- (b) Show that the curve $r^m = a^m \sin m\theta$ and $rm = a^m \cos m\theta$ cut each other Orthogonally 8
5. (a) if $f(x) = x^3 - 6x^2 + 7$, find the value of $f(21/20)$ by Taylor's theorem. 8
- (b) Evaluate: $\lim_{x \rightarrow 0} (1/x^2 - \cot^2 x)$ 8

Section-III

6. (a) Find all the asymptotes of the curve:
 $2x^3 - x^2y - 2xy^2 + y^3 + 2x^2 - 7xy + 3y^2 + 2x + 2y + 1 = 0$ 8
- (b) Find the asymptotes of $r \sin \theta = 2 \cos 2\theta$ 8
7. (a) Show that the curve $y^2 - 2x^2y + x^4 - x^5 = 0$ has a single cusp of second species At the origin. 8
- (b) Find the points of inflexion on the curve :
 $Y(a^2 + x^2) = x^3$. 8

Section-IV

8. (a) Find the radius of curvature for the curve $r^n = a^n \cos n \theta$. 8
(b) Find the coordinates of the centre of curvature at any point (x, y) of a parabola $y^2 = ax$. 8
9. (a) Trace the curve $y^2 (a^2 + x^2) = x^2 (a^2 - x^2)$. 8
(b) Trace the curve $x = a(\theta + \sin \theta)$, $y = a(1 + \cos \theta)$, $-\pi \leq \theta \leq \pi$. 8