February 2012

Bachelor of Computer Applications (BCA) Examination

I Semester

Mathematics–I

Time 3 Hours]   [Max. Marks 40

Note : All questions are compulsory. Solve any two parts from each questions. Each question carries equal marks.

1. (a) Find the limit $\lim\limits_{n \to 1} \dfrac{x-1}{2x^2 - 7x + 5}$

    (b) Discuss the continuity
$$f(x) = \begin{cases} x^2 - 1 & ; x \le 0 \\ \log x & ; x > 0 \end{cases} \text{ at } x = 0$$

    (c) Discuss the differentiability of the function f, given below at $x = 0$
$$f(x) = \begin{cases} x - 1 & ; x < 0 \\ \dfrac{1}{4} & ; x = 0 \\ x^2 & ; x > 0 \end{cases}$$

2. (a) Verify Rolle's theorem for the function :
$f(x) = x^3 - 2x^2 + 2x$
in the interval $(0, 2)$.

    (b) Find the nth differential coefficient of $e^{ax} \sin nx$.

    (c) Expand by Maclarin's theorem $e^x \log \sec x$

3. (a) Find the equation of the normal to the curve $x^2 = 4y$ which passes through the point $(1, 2)$.

    (b) Find the radius of curvature of at a point (x, y) of the curve $x^2 = 4ay$.

    (c) Find the asymptoles of $x^3 + y^3 - 3axy$.

4. (a) Find the directional derivative of the function of $A = xy + yz + zx$ along the tangent to the curve $x = t$, $y = t + 1$, $z = t^2$ at $(1, 2, 3)$.

    (b) If $A = x^4 y$ and $B = ix + yj + zk$ and $C = x^2 i + z^4 k$. Then find

$\dfrac{\partial^3}{\partial^2 x \partial 2} (ABC)$ at point $(1, 1, 1)$.

    (c) Evaluate $\nabla \cdot \vec{F}$ and $\nabla \left(\nabla \times \vec{F} \right)$ where $\vec{F} = xzi - xyj + yz^2 k$.

5. (a) Find the inverse of the following matrix :
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \\ 4 & 3 & 1 \end{bmatrix}$$

    (b) Find the normal form of the matrix :
$$A = \begin{bmatrix} 0 & -1 & -2 \\ 8 & 9 & 10 \\ 8 & 8 & 8 \end{bmatrix}$$

    (c) Solve the system by matrix method :
$x + 2y + 3z = 9$
$x - xy + z = 1$
$4x - 4z = 2$

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