January - 2009 . Maths - I
B.Sc (IT) - I

Con. 235-09. **TT-1020**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from question Nos. **2** to question No. **7**.
(3) **Figures** to the **right** indicate **full** marks.

1. Solve : **20**

(a) $\frac{dy}{dx} = \cos(x+y)$

(b) $(x - 2e^y)\,dy + (y + x\sin x)\,dx = 0$

(c) $x\left(1-x^2\right)\frac{dy}{dx} + \left(2x^2-1\right)y = x^3$.

(d) $(x^2 + y^2)\,dx + 2xy\cdot dy = 0$.

2. (a) Find the eigen values and eigen vector for— **10**

$$A = \begin{bmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$

(b) Find the inverse of the matrix by applying elementary row transformations **10**

$$A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$$

3. (a) Find the n^{th} derivative by method of fraction : **10**

$$y = \frac{x}{(x-1)(x-2)(x-3)}$$

(b) Find n^{th} derivative of **10**

$$y = \frac{x}{x^2 + a^2}.$$

4. (a) Find the curve in which length of the radius of curvature at any point is equal to two times the length of the normal at that point. **8**

(b) Solve— **6**

$$\frac{dy}{dx} - y\tan x = y^4 \sec x.$$

(c) From the differential equation from $x = a\sin(wt + c)$ where a and c are arbitrary constants. **6**

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5. (a) Discuss the consistency of— **10**

$$3x + y + 2z = 3$$
$$2x - 3y - z = -3$$
$$x + 2y + z = 4$$

(b) Find the inverse of the following matrix by finding its adjoint : **10**

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$$

6. (a) Find the order and degree of the following : **6**

(1) $y = x\frac{dy}{dx} + \frac{5}{\frac{dy}{dx}}$

(2) $y = x\frac{dy}{dx} + 5\sqrt{1 + \left(\frac{dy}{dx}\right)^2}$

(b) Reduce the matrix to Echelon and find its rank— **8**

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{bmatrix}$$

(c) Solve— **6**

$$(x + y)\frac{dy}{dx} + y = 0.$$

7. (a) Solve— **6**

$$(y^4 + 2y)\, dx\, (xy^3 + 2y^4 - 4x)\, dy = 0.$$

(b) If the temperature of air is 30 °C and substance cools from 100°C to 70°C in 15 minutes. Find when the temperature will be 40°C. **8**

(c) If $z = x^y + y^x$ then show that— **6**

$$\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}.$$