

Roll No.

Total Pages : 3

BT-4/M-22

44221

MATHEMATICS FOR INTELLIGENT SYSTEMS

Course No. : PC-CS-CYS-202A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *five* questions in all by selecting at least *one* question from each unit. All questions carry equal marks.

UNIT-I

1. (a) Factor the matrix into $A = LU$, where

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

7½

- (b) Find whether or not the set of vectors are linearly dependent or independent $[1, 1, 1, 1]$, $[0, 1, 1, 1]$, $[0, 0, 1, 1]$, $[0, 0, 0, 1]$.

7½

2. Find the eigen values of A , B and $A + B$, where $A = \begin{bmatrix} 3 & 0 \\ 1 & 1 \end{bmatrix}$,

$$B = \begin{bmatrix} 1 & 1 \\ 0 & 3 \end{bmatrix}$$

Is the eigen values of $A + B$ equal to or not

equal to eigen values of A plus eigen values of B ? 15

UNIT-II

3. Let $x[n] = \delta[n] + 2\delta[n-1] - \delta[n-3]$ and $h[n] = 2\delta[n+1] + 2\delta[n-1]$. Compute and plot each of the following convolutions :

(i) $y[n] = x[n] * h[n]$.

(ii) $y[n] = x[n+2] * h[n]$. 15

4. Solve the equation $L \frac{di}{dt} + Ri = E_0 \sin \omega t$, where L , R and E_0 are constants and discuss the case when t increases indefinitely. 15

UNIT-III

5. A particle falls under gravity in a resisting medium whose resistance varies with velocity. Find the relation between distance and velocity if initially the particle starts from rest. 15
6. (a) A condenser of capacity C is discharged through the inductance L and a resistance R in series and the charge q at any time t satisfies the equation

$$L \frac{d^2 q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = 0. \text{ Given that } L = 0.25 \text{ henry,}$$

$$R = 250 \text{ ohms, } C = 2 \times 10^{-6} \text{ farad and that when } t = 0,$$

$$\text{the charge } q \text{ is } 0.002 \text{ coulombs and the current } \frac{dq}{dt} = 0,$$

$$\text{obtain the value of } q \text{ in terms of } t. \quad 7\frac{1}{2}$$

- (b) Find the first six terms of the expansion of the function $f(x, y) = e^x \log (1 + y)$ in a Taylor's series in the neighbourhood of the point $(0, 0)$. 7½

UNIT-IV

7. The odds that a book will be favourably reviewed by three independent critics are 5 to 2, 4 to 3 and 3 to 4, respectively. What is the probability that, of the three reviews, a majority will be favourable ? 15
8. (a) What is distribution ? Explain the types of distributions. 5
- (b) If mean and variance of a binomial distribution are 4 and 2 respectively, find the probability of (i) exact 2 success (ii) less than 2 success (iii) at least 2 success. 5
- (c) Explain Monte Carlo simulations. 5