Date: 04-11-2017   Dept. No.   Max. : 100 Marks

Time: 01:00-04:00

Part – A

Answer ALL the questions :   (10x2=20)

1) Define linear functions.

2) Find the equation of line passing through (3,2) and (4,5).

3) Write the normal equations of y = ax + b.

4) Convert $y = ae^{bx}$ to normal form.

5) Solve the difference equation $y_{n+2} - 3y_{n+1} + 2y_n = 0$.

6) Find the order and degree of the difference equation $y_{n+2} - y_{n+1} + y_n = 0$.

7) Define symmetric and skew symmetric matrix.

8) Find the sum and product of all Eigen values of the matrix.

$$\begin{bmatrix} 7 & -2 & -2 \\ -2 & 1 & 4 \\ -2 & 4 & 1 \end{bmatrix}$$

9) Define odd and even functions.

10) Define half range cosine Fourier series.

Part – B

Answer any FIVE questions: (5x8=40)

11) The total cost function for the production of x units of an item is given by

$T = 10 - 4x^3 + 3x^4$. Find

    a)The average cost   b)The marginal cost

    c)The marginal average cost

12) By the method of group averages fit a curve of the form $y = \dfrac{x}{a+bx}$ to the following data

x	8	10	15	20	30	40
y	13	14	15.4	16.3	17.2	17.8

13) By the method of least squares, fit a straight line that best fits the following data

x	1	2	3	4	5
y	14	27	40	55	68

14) Solve: $y_{n+2} - 3y_{n+1} + 2y_n = 5^n + 2^n$

15) Solve the difference equation: $u_{n+2} - 2u_{n+1} + 6u_n = 4$.

16) Find the Eigen values and Eigen vectors of the matrix

$$A = \begin{pmatrix} 1 & 2 \\ 5 & 4 \end{pmatrix}$$

17) Verify Cayley Hamilton theorem for matrix

$$A = \begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix}$$

18) Determine the Fourier expansion of $f(x) = x(2\pi - x)$ in $(0, 2\pi)$

Part – C

Answer any TWO questions: (2x20=40)

19) a) Fit a curve of the form $y = ax^2 + bx + c$ for the data given below using of group averages.

x	10	20	30	40	50	60
y	4.5	7.1	10.5	15.5	20.5	27.1

(15)

b) A steel plant produces x tons of steel per week at a total cost of

$$Rs. \left(\frac{1}{3}x^3 - 5x^2 + 99x + 35 \right).$$ **(05)**

Find the output level at which the marginal cost attains its minimum.

20) a) Solve $y_{n+2} - 2y_{n+1} + y_n = n^2 \, 2^n$

b) Form the difference equation by eliminating a and b from the equation $y_n = a \, 2^n + b \, 3^n$

21) Show that $x^2 = \frac{\pi^2}{3} + 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$ in the interval $(-\pi \le x \le \pi)$

Deduce that (1) $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \ldots\ldots\ldots = \frac{\pi^2}{12}$

(2) $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots\ldots\ldots = \frac{\pi^2}{6}$

(3) $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots = \frac{\pi^2}{8}$

22) Diagonalize the matrix.

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

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