

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIRST SEMESTER – APRIL 2018

MT 1501– GRAPHS, DIFF. EQU., MATRICES & FOURIER SERIES

Date: 27-04-2018

Dept. No.

Max. : 100 Marks

Time: 01:00-04:00

Part – A (10 x 2 = 20)

Answer all the questions:

- 1) Define linear functions.
- 2) Find the slope of the line $x = 5y - 9$.
- 3) Reduce $xy = ax + b$ to the linear form.
- 4) State the Principle of least square.
- 5) Solve $y_{n+2} - 6y_{n+1} + 8y_n = 0$.
- 6) Form the difference equation by eliminating a from $y_n = a5^n$
- 7) Find the sum and product of all eigen values of the matrix
$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{bmatrix}$$
- 8) Define symmetric and skew-symmetric matrices.
- 9) Define half range Fourier series.
- 10) Find the Fourier coefficient a_0 if $f(x) = x$ in the range $(0, \pi)$.

Part – B (5 x 8 = 40)

Answer any five questions:

- 11) The cost function for producing x units of a product is

$$C(x) = x^3 - 12x^2 + 48x + 11 \text{ (in rupees) and the revenue function is}$$

$$R = 83x - 4x^2 - 21. \text{ Find the output for which profit is maximum.}$$

- 12) Fit a straight line $y = ax + b$ to the following data by the method of group averages.

x	0	5	10	15	20	25
y	12	15	17	22	24	30

- 13) By the method of least squares, find the straight line that best fits the following data:

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

- 14) Solve $y_{n+2} - 2y_{n+1} + 6y_n = 4$.

15) Find the eigen values of the matrix $\begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$.

16) Verify Cayley-Hamilton theorem for the matrix $\begin{pmatrix} 1 & -1 & 2 \\ -2 & 1 & 3 \\ 3 & 2 & -3 \end{pmatrix}$.

17) Obtain the Fourier series for the function $f(x) = \pi - x$ in $(0, 2\pi)$.

18) Form the difference equation by eliminating a and b from the equation $y_n = a4^n + b5^n$.

Part – C (2 x 20 = 40)

Answer any two questions:

19) a) Fit a curve of the form $y = ax^2 + bx + c$ to the following data using method of least squares.

x	20	40	60	80	100	120
y	5.5	9.1	14.9	22.8	33.3	46

b) Let the cost function of a firm be $C(x) = 300x - 10x^2 + \frac{x^3}{3}$, where x stands for output.

Calculate :

i) Output at which marginal cost is minimum.

ii) Output at which average cost is minimum.

(10+10)

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

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

(10+10)

21) a) Find the Fourier series for the function $f(x) = x^2$ in $-\pi \leq x \leq \pi$.

b) Find a half range sine series for the function $f(x) = x$ in $(0, \pi)$. **(12+8)**

22) Diagonalize the matrix.

$$A = \begin{bmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{bmatrix}$$
