



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIRST SEMESTER – NOVEMBER 2018

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

Date: 25-10-2018

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

PART – A

Answer ALL questions.

(10 x 2 = 20 marks)

1. Find the domain and range of $f(x) = x^2$.
2. Define odd and even functions.
3. Write the normal equations of $y = ax+b$.
4. Find the Fourier coefficient a_n for the function $f(x) = e^x$ in $(-\pi, \pi)$.
5. State the principle of least squares.
6. Define symmetric and skew-symmetric matrices.
7. Solve $y_{n+2} - 8y_{n+1} + 15y_n = 0$.
8. State Cayley – Hamilton theorem.
9. Find order of the differential equation $u_{x+2} - 3u_{x+1} + 5u_x = x^2$.

10. Find the eigen values of $A = \begin{pmatrix} a & h & g \\ 0 & b & 0 \\ 0 & 0 & c \end{pmatrix}$

PART – B

Answer any FIVE questions.

(5 X 8 = 40 marks)

11. The cost function of a firm is $C = 300x - 10x^2 + \frac{1}{3}x^3$. Calculate (i) output at which average cost is minimum and the minimal average cost.
12. The weight of a calf at weekly intervals is given. Fit a straight line and calculate the average rate of growth per week:

Age	1	2	3	4	5	6	7	8	9	10
Weight	52.5	58.7	65.0	70.2	75.4	81.1	87.2	95.5	102.2	108.4

13. Reduce to linear form $y = ae^{bx}$.
14. Eliminate the constants from $y_n = A2^n + B3^n$ and find the differential equation of the lowest order.

15. Find the eigen vectors of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 0 & 2 & 3 \\ 0 & 0 & 2 \end{pmatrix}$.

16. Verify Cayley Hamilton theorem for the matrix $A = \begin{pmatrix} 0 & 0 & 1 \\ 3 & 1 & 0 \\ -2 & 1 & 4 \end{pmatrix}$.

17. Show that for all values of x on $(-\pi, \pi)$, $\frac{x}{2} = \sin x - \frac{\sin 2x}{2} + \frac{\sin 3x}{3} - \frac{\sin 4x}{4} + \dots \infty$.

18. Solve $y_{x+2} - 6y_{x+1} + 8y_x = 4^x$.

PART – C

Answer any TWO questions.

(2 X 20= 40 marks)

19. a) If the demand function $P = 550 - 3x - 6x^2$ where x is the quantity demanded and P is the price per unit, find the average revenue and marginal revenue.

b) Use the method of least squares to fit the following data to a straight line:

x	0	5	10	15	20
y	7	11	16	20	26

20. a) Find the half – range cosine series for $f(x) = x$ in $(0, \pi)$.

b) Solve $y_{n+2} + y_{n+1} - 56y_n = 2^n(n^2 - 3)$.

21. Diagonalise the matrix: $A = \begin{pmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$.

22. Find the Fourier series expansion of $f(x) = \pi^2 - x^2$ in $(-\pi, \pi)$ and hence find an expansion for $\frac{\pi^2}{12}$.
