Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Third Semester

Agricultural Engineering

MA3301 - Fourier Series and Linear Programming

Regulations - 2021

Duration : 3 Hrs *Maximum: 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	State Dirichlet's conditions for Fourier series.	RE	1	2
2.	Mention the Root mean square value over the interval(a, b).	UN	1	2
3.	Define Fourier transform pair.	RE	2	2
4.	State Convolution theorem for Fourier transform.	RE	2	2
5.	Define Basic feasible solution of linear programming problem.	RE	3	2
6.	Mention any two Artificial variable techniques to solve linear programming problem.	UN	3	2
7.	Discuss the matrix terminology in transportation models.	UN	4	2
8.	Distinguish between transportation models and assignment models.	UN	4	2
9.	Construct the Lagrangean function for the following Non linear programming problem. Optimize $Z = 4x_1 - x_1^2 + 9x_2 - x_2^2$, Subject to $4x_1 + 3x_2 = 15$, $3x_1 + 5x_2 = 14$ and $x_1, x_2 \geq 0$.	UN	5	2
10.	Give the expression of general quadratic programming problem.	RE	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Obtain the Fourier series to represent $f(x) = x^2$ in the interval $(-l, l)$	AP	1	16
		Or			
	b	Find the Fourier series expansion of period 2π for the function $y = f(x)$which is defined in $(0,2\pi)$ by means of the table of values given below. Find the series upto the third harmonic.	AP	1	16

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y	1.0	1.4	1.9	1.7	1.5	1.2	1.0

12. a Obtain the Fourier transform of $f(x) = \begin{cases} 1-x^2, & x \le 1 \\ 0, & x > 1 \end{cases}$ hence prove that $\int_0^\infty \frac{sins - scoss}{s^3} cos\frac{s}{2} ds = \frac{3\pi}{16}$ AP 2 16

Or

b Find Fourier cosine transform of e^{-ax} and Fourier sine transform of e^{-ax}. Using Parseval's identity calculate $\int_0^\infty \frac{x^2}{(a^2+x^2)^2} dx$ AP 2 16

13. a Solve the following Linear programming problem by simplex method.
Minimize $Z = 8x_1 - 2x_2$
Subject to
$-4x_1 + 2x_2 \le 1$,
$5x_1 - 4x_2 \le 3$,and $x_1, x_2 \ge 0$. AP 3 16

Or

b By using Big M method solve the following Linear programming problem
Minimize $Z = 12x_1 + 20x_2$,
Subject to
$6x_1 + 8x_2 \ge 100$,
$7x_1 + 12x_2 \ge 120$,
and $x_1, x_2 \ge 0$. AP 3 16

14. a Obtain an optimum basic feasible solution to the following transportation problem. UN 4 16

	1	2	3	4	Supply
I	21	16	25	13	11
II	17	18	14	23	13
III	32	27	18	41	19
Demand	6	10	12	15	

Or

b The processing times in hours for the jobs when allocated to the different machines are indicated below. Assign the machines for the jobs so that the total processing time is minimum. UN 4 16

		Machines				
		M1	M2	M3	M4	M5
Jobs	J1	8	4	2	6	1
	J2	0	9	5	5	4
	J3	3	8	9	2	6
	J4	4	3	1	0	3
	J5	9	5	8	9	5

Determine the optimal assignment schedule.

15.	a	Solve the non linear programming problem Maximize $Z = 4x_1 - x_1^2 + 8x_2 - x_2^2$, Subject to $x_1 + x_2 = 2$, and $x_1, x_2 \geq 0$.	AP	5	16
		Or			
	b	Use Kuhn-Tucker condition to solve the following non-linear programming problem: Maximize $Z = 7x_1^2 - 6x_1 + 5x_2^2$ Subject to $x_1 + 2x_2 \leq 10$, $x_1 - 3x_2 \leq 9$, and $x_1, x_2 \geq 0$.	AP	5	16