Register No : ____________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2026

First Semester

Power Systems Engineering

PAMPST2411 - APPLIED MATHEMATICS FOR POWER SYSTEMS ENGINEERS

Regulations – 2024

Duration : 3 Hrs — ***Maximum : 100 Marks***

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

Q.No	Questions	BLT	CO	Marks
1.	Find the Cholesky decomposition of $\begin{pmatrix} 4 & 2 \\ 2 & 10 \end{pmatrix}$	L -1	1	2
2.	Define Least square method.	L -1	1	2
3.	State the convolution theorem on Laplace transforms.	L -3	2	2
4.	If L [f (t): s] = F(S), then prove that L $[e^{at} f(t): s]$ = F(S-a).	L -1	2	2
5.	Find a Fourier sine series for the function f(x) = 1 , 0 < x < π.	L -1	3	2
6.	State Parseval's theorem.	L -3	3	2
7.	What is degeneracy in a transportation model?	L -1	4	2
8.	What is meant by Unbalanced Assignment Problem?	L -1	4	2
9.	Write down the general non-linear programming problem in matrix notation.	L -2	5	2
10.	Write down the necessary conditions for a maximum or minimum of objective function in non-linear programming problems.	L -2	5	2

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

Q.No			Questions	BLT	CO	Marks
11.	a	i	Solve the following system of equations in the least square sense $x_1 + x_2 + 3x_3 = 1$; $x_1 + x_2 + 3x_3 = 2$	L -3	1	8
		ii	Solve the system of equations using Cholesky decomposition $4x_1 - x_2 - x_3 = 3$; $-x_1 + 4x_2 - x_3 = -0.5$; $-x_1 - 3x_2 + 5x_3 = 0$	L -3	1	8
			Or			
	b	i	Construct the singular value decomposition for $\begin{bmatrix} 2 & 2 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 6 \end{bmatrix}$	L -3	1	8
		ii	Fit a straight line in the least square sense to the following data **X:** **-3** **-2** **-1** **0** **1** **2** **3** **Y:** **10** **15** **19** **27** **28** **34** **42**	L -6	1	8
12.	a	i	State and prove the second shifting property. Hence find the Laplace transform of the function $f(t) = \begin{cases} 2, & 0 < t < \pi \\ 0, & \pi < t < 2\pi \\ \sin t & t > 2\pi \end{cases}$	L -2	2	12
		ii	Find the Laplace transform of Dirac delta function.	L -1	2	4
			Or			

b i An infinitely long string having one end at x = 0 is initially at rest on the x-axis. The end x = 0 undergoes a periodic transverse displacement described by $A_0 \sin \omega t, t > 0$. Find the displacement of any point on the string at any time t. L -2 2 12

ii What are the sufficient conditions for the existence of Laplace transform of f (t)? L -1 2 4

13. a i Find the Fourier series of the function $\boldsymbol{f(x)} = (\boldsymbol{\pi - x})^{2}$, in $(\mathbf{0}, \mathbf{2\pi})$ with periodicity . L -1 3 8

ii Obtain the Fourier series for f(x) = 1 + x + x^2 in (-□ ,□). L -3 3 8

Or

b i Find the Fourier series expansion of L -1 3 8

$$\boldsymbol{f(x)} = \begin{cases} -\boldsymbol{x} + \mathbf{1}\ \boldsymbol{for} - \boldsymbol{\pi} < x < 0 \\ \boldsymbol{x} + \mathbf{1}\ \boldsymbol{for}\ \mathbf{0} < x < \pi \end{cases}$$

ii Find half range cosine series given $f(x)$ □ x 0 □ x □ 1 L -1 3 8

□□□ 2 - x 1 □ x □ 2

14. a i Solve by Simplex method Maximize $\boldsymbol{Z} = \mathbf{5}\boldsymbol{x}_{\mathbf{1}} + \mathbf{4}\boldsymbol{x}_{\mathbf{2}}$, Subject to $\mathbf{4}\boldsymbol{x}_{\mathbf{1}} + \mathbf{10}\boldsymbol{x}_{\mathbf{2}} \leq \mathbf{10}, \mathbf{3}\boldsymbol{x}_{\mathbf{1}} + \mathbf{2}\boldsymbol{x}_{\mathbf{2}} \leq \mathbf{9}, \mathbf{8}\boldsymbol{x}_{\mathbf{1}} + \mathbf{3}\boldsymbol{x}_{\mathbf{2}} \leq \mathbf{12}, \boldsymbol{x}_{\mathbf{1}}, \boldsymbol{x}_{\mathbf{2}} \geq \mathbf{0}$ L -5 4 8

ii Find the initial feasible solution for the following transportationproblem L -1 4 8

	D1	D2	D3	D4	D5	Supply3
		2	3	4	1	100
	4	1	2	4	2	125
	1	0	5	3	2	75
Total	100	60	40	75	25	

Or

b i Solve by graphical method Minimize Z = 2x1 + 3x2, subject to x1 + x2 ≥ 5; x1 + 2x2 ≥ 6; and x1, x2, ≥ 0 L -3 4 8

ii Explain Row, Column, minima methods to find initial solution of Transportation problem. L -2 4 8

15. a Solve: Minimize f(x) = $x_1^2 + x_2^2 + x_3^2$ L -3 5 16

Subject to $g_1(x) = x_1 + x_2 + 3x_3 - 2 = 0$

$g_2(x) = 5x_1 + 2x_2 + x_3 - 5 = 0$

Or

b Solve the following non-linear programming problem L -3 5 16

Maximize Z = 3.6 $x_1 - 0.4x_1^2 + 1.6x_2 - 0.2x_2^2$

Subject to the constraints:

$2x_1 + x_2 \leq 10; x_1, x_2 \geq 0$

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