Reg. No.															

Question Paper Code	12657

M.E. / M.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

First Semester

M.E - Embedded Systems Technologies

(Common to M.E. - Power Electronics and Drives)

20PESMA102 – APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Define a generalized Eigen vector of rank m for a square matrix A.	2	K1	CO1
2.	Define a Unitary matrix.	2	K1	CO1
3.	Write the necessary condition for a functional to be extremum.	2	K1	CO2
4.	What are the direct methods in variational problems?	2	K1	CO2
5.	If A and B are events with $P(A)=\frac{3}{8}, P(B)=\frac{1}{2}$ and $P(A\cap B)=\frac{1}{4}$, find $P(A^c \cap B^C)$	2	K2	CO3
6.	State Baye's theorem.	2	K1	CO3
7.	Define feasible solution.	2	K1	CO4
8.	What are the disadvantages of Big-M method over Two-phase method?	2	K1	CO4
9.	Define the energy of a signal $f(t)$ over all time.	2	K1	CO5
10.	Write the exponential Fourier series representation of a periodic function $f(t)$ with period $T=\frac{2\pi}{\omega_0}$.	2	K2	CO5

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

			Marks	K – Level	CO
11.	a) i)	Determine the Cholesky decomposition for the matrix $A=\begin{bmatrix} 4 & 2i & -i \\ -2i & 10 & 1 \\ i & 1 & 9 \end{bmatrix}$.	8	K3	CO1
	ii)	Find the equation of the straight line that best fits the following data in the least-square sense:	8	K3	CO1

x	-3	-2	-1	0	1	2	3
y	10	15	19	27	28	34	42

OR

b) Construct QR decomposition for the matrix *16 K3 CO1*

$$A=\begin{bmatrix}0 & 1 & 1 & 1\\ 1 & 0 & 1 & 1\\ 1 & 1 & 0 & 1\\ 1 & 1 & 1 & 0\end{bmatrix}.$$

12. a) Find the approximate solution by Rayleigh – Ritz method of differential equation $y'' + x^2y = x$ with $y(0) = y(1) = 0$. *16 K3 CO2*

OR

b) On which curve the functional $V[y(x)] = \int_0^{\pi}(y'^2 - y^2 + 4ycosx)\,dx$ is extremal. *16 K3 CO2*

13. a) In a bolt factory machines A, B, C manufacture respectively 25,35 and 40 percent of the total. Of their output 5,4 and 2 percent are defective bolts respectively. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machines A, B, C? *16 K3 CO3*

OR

b) i) The number of monthly breakdowns of a computer is a random variable having a Poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month (a) without a breakdown (b) with only one breakdown (c) with atleast one breakdown. *8 K3 CO3*

ii) The life of a certain kind of electronic device has a mean of 300 hours and standard deviation of 25 hours. Assuming that the life times of the devices follow normal distribution. 1. Find the probability that any one of these devices will have a life time more than 350 hours. 2. What percentage will have life time between 220 and 260 hours? *8 K3 CO3*

14. a) Use simplex method to solve the LPP *16 K3 CO4*

Maximize $Z = 4x_1 + 10x_2$

subject to: $2x_1 + x_2 \le 5$; $2x_1 + 5x_2 \le 100$

$2x_1 + 3x_2 \le 90$ and $x_1, x_2 \ge 0$.

OR

b) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows: *16 K3 CO4*

		Job				
		1	**2**	**3**	**4**	**5**
Person	**A**	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

Determine the optimum assignment schedule.

15. a) i) Find the Fourier series of the sawtooth function *8 K3 CO5*

$f(t) = t, \ -1 < t < 1, \ f(t+2) = f(t).$

ii) Find the exponential Fourier series of the rectified sine wave, *8 K3 CO5*

$f(t) = |v(t)| = A|\sin \pi t|, A > 0, 0 < t < 1.$

OR

b) Find an expression for the Fourier coefficients associated with the generalized Fourier series arising from the eigenfunctions of $y'' + y' + \lambda y = 0, 0 < x < 3, y(0) = y(3) = 0.$ *16 K3 CO5*