Reg. No.												

Question Paper Code	12298

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

First Semester

M.E. - Embedded Systems Technologies

(Common to 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. Determine the canonical basis for the matrix $A = \begin{pmatrix} 3 & 5 \\ -2 & -4 \end{pmatrix}$. *2,K2,CO1*
2. Define Least square method. *2,K1,CO1*
3. What are the direct methods in variational problems? *2,K2,CO2*
4. Write the Ostrogradsky equation for the functional $\int F[x, y, u, u_x, u_y]\, dx\, dy$. *2,K1,CO2*
5. State Baye's theorem. *2,K1,CO3*
6. Obtain the moment generating function of Geometric distribution. *2,K2,CO3*
7. Write down the mathematical formulation of L.P.P. *2,K1,CO4*
8. When will you say a transportation problem is said to be unbalanced? *2,K1,CO4*
9. Find the Fourier constants b_n for x sinx in $(-\pi,\pi)$. *2,K2,CO5*
10. State the properties of the eigen values of a Regular Sturm -Liouville System. *2,K1,CO5*

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11\. a) Find the QR factorization of $A = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$. *16,K3,CO1*

OR

b) Obtain the singular value decomposition for $\begin{pmatrix} 2 & 2 & -2 \\ 2 & 2 & -2 \\ 2 & -2 & 6 \end{pmatrix}$. *16,K3,CO1*

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

OR

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

13. a) A random variables X has the following probability function: *16,K3,CO3*

X	0	1	2	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

(i). Find K.
(ii). Find the distribution function of X.
(iii). If $P[X \le C] > 1/2$ Find the minimum value of $\boldsymbol{C}$.
(iv). Find $P(X < 6), P(X \ge 6)$.

OR

b) (i) State and prove Memoryless property of Exponential distribution. *8,K2,CO3*
(ii) The number of monthly breakdown 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 breakdown (b) With only one breakdown and (c) With at least one breakdown. *8,K3,CO3*

14. a) Use simplex method to solve the LPP *16,K3,CO4*
Maximize $Z = 4x_1 + 10x_2$
subject to $2x_1 + x_2 \le 50;\ 2x_1 + 5x_2 \le 100$
$2x_1 + 3x_2 \le 90$ and $x_1, x_2 \ge 0$.

OR

b) The processing times in hours for the jobs when allocated to different machines are indicated below. Assign the machine for the jobs so that the total processing time is minimum. *16,K3,CO4*

	M_1	M_2	M_3	M_4	M_5
J_1	9	22	58	11	19
J_2	43	78	72	50	63
J_3	41	28	91	37	45
J_4	74	42	27	49	39
J_5	36	11	57	22	25

15. a) (i) Obtain Fourier series expansion for the function $f(x) = \begin{cases} 1 + \dfrac{2x}{\pi}, & -\pi < x < 0 \\ 1 - \dfrac{2x}{\pi}, & 0 < x < \pi \end{cases}$. Hence prove that $\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + \ldots = \dfrac{\pi^2}{8}$. *8,K3,CO5*
(ii) Find the eigen values and eigen functions of $y'' + \lambda y = 0,\ 0 < x < p$, $y(0) = 0,\ y(p) = 0$. *8,K3,CO5*

OR

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