Reg. No.												

Question Paper Code	21348

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

First Semester

M.E. - Embedded System 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.	Check whether the following matrix is positive definite: $A=\begin{bmatrix} 4 & 2i & 2 \\ -2i & 10 & 1-i \\ 2 & 1+i & 9 \end{bmatrix}$	*2,K2,CO1*
2.	Define canonical basis.	*2,K1,CO1*
3.	Write the necessary condition for $\int_{x_1}^{x_2} f(x,y,y',y'')dx$ to be an extremum.	*2,K2,CO2*
4.	Test for an extremum of the functional $\int_0^1 (xy+y^2-2y^2y')dx,\ y(0)=1,\ y(1)=2.$	*2,K2,CO2*
5.	If $P(A)=\frac{1}{3}, P(B)=\frac{3}{4}$ and $P(A\cup B)=\frac{11}{12}$, find $P(A/B)$ and $P(B/A)$.	*2,K2,CO3*
6.	If, on an average, 9 ships out of 10 arrive safely to a port, obtain the mean and standard deviation of the number of ships returning safety out of 150 ships.	*2,K2,CO3*
7.	State the limitations of the graphical method of solving a linear programming problem.	*2,K2,CO4*
8.	What do you mean by unbalanced transportation problem? How would you convert the unbalanced problem into a balanced one?	*2,K2,CO4*
9.	Define a periodic function.	*2,K1,CO5*
10.	Calculate the average power of the periodic signal (period $T=2$) $f(t)=2\cos 5\pi t+\sin 6\pi t$, using a time domain analysis.	*2,K2,CO5*

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11\. a) Construct QR decomposition for the matrix $A=\begin{bmatrix}0&1&1&1\\1&0&1&1\\1&1&0&1\\1&1&1&0\end{bmatrix}$. *16,K3,CO1*

OR

b) Find the Canonical basis for the matrix $A=\begin{bmatrix}3&2&0&1\\0&3&0&0\\0&0&3&-1\\0&0&0&3\end{bmatrix}$. *16,K3,CO1*

12\. a) Find a function $y(x)$ for which $\int_0^1 \left(x^2-y'^2\right)dx$ is stationary, given that $\int_0^1 y^2dx=2, y(0)=0, y(1)=0$. *16,K3,CO1*

OR

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

13\. a) In a bolt factory, machines A,B,C manufacture 25%, 35%, 40%, of the total output respectively. Out of their outputs 5, 4, 2 percent, respectively are defective blots. 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, and C? *16,K3,CO3*

OR

b) (i) Let X be a random variable with $E(X)=1, E(X(X-1))=4$. Find $\operatorname{var}(X), \operatorname{var}(2-3X)$ and $\operatorname{var}\left(\frac{X}{2}\right)$. *8,K3,CO3*

(ii) In a company the monthly break down of a machine is a random variable with Poisson distribution, with an average 1.8. Find the probability that the machine will function for a month (i) Without break down, (ii) With exactly one break down, (iii) With at least one break down. *8,K3,CO3*

14. a) Solve using the Big M method: *16,K3,CO4*
Minimize $Z = 2x_1 + 9x_2 + x_3$
subject to
$x_1 + 4x_2 + 2x_3 \geq 5$
$3x_1 + x_2 + 2x_3 \geq 4$
$x_1, x_2, x_3 \geq 0$

OR

b) A marketing manager has five salesmen and five sales districts. Considering the capabilities of the salesmen and the nature of districts, the marketing manager estimates that the sales per month (in hundred rupees) for each salesman in each district would be as follows: *16,K3,CO4*

		Districts				
		A	B	C	D	E
	1	32	38	40	28	40
Salesmen	2	40	24	28	21	36
	3	41	27	33	30	37
	4	22	38	41	36	36
	5	29	33	40	35	39

Find the assignment of salesmen to districts that will result in maximum sales.

15. a) Find the Fourier series representation of $f(t) = t^2,\ 0 < t < 1$, *16,K3,CO5*
(i) as a sine series with period $T = 2$.
(ii) as a cosine series with period $T = 2$.

OR

b) Find the eigen values and eigen functions of $y'' + \lambda y = 0,\ 0 < x < p,\ y(0) = y(p) = 0.$ *16,K3,CO5*