Reg. No. : | | | | | | | | | | |

Question Paper Code: 52554

M.E. DEGREE EXAMINATION, NOV 2016

First Semester

Power Electronics and Drives

15PMA126 - APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Every matrix of order m x n can be factor into two product of Q having vectors of its columns and matrix R

   (a) Upper triangular   (b) Lower triangular
   (c) Orthogonal   (d) Equivalent

2. When will you get unbounded solution in Two-Phase method

   (a) $Z_j = 0$ (b) $Z_j > 0$ (c) $Z_j < 0$ (d) none of these

3. A random variable X has E(X) = 1 and E(X(X-1)) = 4 then Var(X) is

   (a) 5   (b) 4   (c) 6   (d) 3

4. A continuous random variable x has a PDF $f(x) = kx^2e^{-x}$,   find k

   (a) 1   (b) 0   (c) 1/2   (d) 3/2

5. $\nabla^2 u = f(x, y)$ then it is called

   (a) Laplace   (b) Poisson
   (c) one dimensional heat equation   (d) none of these

PART - B (5 x 3 = 15 Marks)

6. Define Unitary matrix.

7. Distinguish between Transportation problem and Assignment problem.

8. If the r^{th} moment of a cumulative random variable X about the origin is r!, Find the MGF of X.

9. State convergence of the series.

10. Write down the SFPF for solving Laplace equation.

PART - C (5 x 16 = 80 Marks)

11. (a) Construct a 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)

Or

(b) Find the Pseudo inverse of $\begin{bmatrix} 0 & 0 & 1 & 2 \\ 1 & 2 & 2 & 3 \end{bmatrix}$. (16)

12. (a) Use Simplex method to minimize $Z=10x_1+x_2+2x_3$ subject to the constraints $x_1+x_2-2x_3 \leq 10$, $4x_1+x_2+x_3 \leq 10$, $x_1,x_2,x_3 \geq 0$. (16)

Or

(b) Using Vogel's Approximation Method:
(i) Find an initial feasible solution
(ii) Find an optimal solution using MODI method
(iii) Find the total transportation cost for the following Transportation problem.

	P	Q	R	S	Supply
A	21	16	25	13	11
B	17	18	14	23	13
C	32	27	18	41	19
Demand	6	10	12	15	

(16)

13. (a) If $p(x)=\begin{cases} Kx, & x = 1,2,3,4,5 \\ 0 & otherwise \end{cases}$ represents p.m.f

(i) Find the value of 'K'

(ii) Find P(x being a prime number)

(iii) Find $P\left(\frac{1}{2} < x < \frac{5}{2} \;/\; x > 1 \right)$

(iv) Find the distribution function. (16)

Or

(b) The probability distribution function of a random variable X is $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$

Find the MGF and hence find mean and variance . (8)

14. (a) Find the eigen values and eigen functions of $y'' + \lambda y = 0$, $0 < x < 1$, $y(0) = 0$, $y(1) + y'(1) = 0$. (16)

Or

(b) Find the DFT of the four point sequence {x(k)}={1, 1, 0, 0} and then calculate inverse DFT of the points. (16)

15. (a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ taking $\Delta x = 1$ for $t > 0$ and $u(x, 0) = x^2(25 - x^2)$, $u(0, t) = 0$, $u(5, t) = 0$. Find u(x, t) upto t = 5 by Bender-schmitt formula. (16)

Or

(b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ in $0 < x < 1$, $t \geq 0$ given that $u(x, 0) = 0$, $u(0, t) = 0$, $u(1, t) = t$. Compute u for the time step with h = ¼ by Crank-Nicholson method. (16)
