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

Question Paper Code: 52511

M.E. DEGREE EXAMINATION, MAY 2017

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. In a simplex method if the net evaluation $(Z_j - C_j) \geq 0$, then the current solution is
   (a) feasible (b) not optimal (c) optimal (d) not feasible
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. What is the classification of $f_x + 2f_{xx} = 0$?
   (a) parabolic (b) ellipse (c) hyperbolic (d) none of these
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. List any two basic differences between a transportation and assignment problem.

8. Find the moment generating function of Poisson distribution.

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 a generalized eigen vector of rank 3 corresponding to the eigen value $\lambda = 7$ for the matrix $A = \begin{bmatrix} 7 & 1 & 2 \\ 0 & 7 & 1 \\ 0 & 0 & 7 \end{bmatrix}$. (16)

12. (a) Solve the LPP using simplex method $Max\ Z = 5x_1 + 4x_2$ subject to the constraints $4x_1 + 5x_2 \le 10$, $3x_1 + 2x_2 \le 9$, $8x_1 + 3x_2 \le 12$, $x_1, x_2 \ge 0$. (16)

Or

(b) Solve the transportation problem. (16)

Destination

Source		A	B	C	D	Availability
	I	21	16	25	13	11
	II	17	18	14	23	13
	III	32	27	18	41	19
Requirement		6	10	12	15	43

13. (a) The density function of a r.v X is given by $f(x) = k\,x(2-x),\ 0 \le x \le 2$. Find the value of K, mean, variance. (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. (16)

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 the Poisson equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0 = y$, $x = 3 = y$ with $u = 0$ on the boundary and mesh length is 1. (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)
