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Reg. No. :

Question Paper Code: 51Z26

M.E. DEGREE EXAMINATION, NOV 2018

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 — CO1- R

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

2. When will you get unbounded solution in Two-Phase method — CO2 -R

(a) $Z_j = 0$ (b) $Zj > 0$ (c) $Zj < 0$ (d) None of the above

3. A random variable X has E(X) = 1 and E(X(X-1)) = 4 then Var(X) is — CO3- R

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

4. What is the classification of $f_x + 2 f_{xx} = 0$? — CO4 -R

(a) Parabolic (b) Ellipse (c) Hyperbolic (d) None of these

5. $\nabla^2 u$ = f(x, y) then it is called — CO5- R

(a) Laplace (b) Poisson

(c) One dimensional heat equation (d) None of these

PART – B (5 x 3= 15 Marks)

6. Define Topeplitz matrix with example. — CO1-U

7. Define Feasible Solution. — CO2-U

8. If X has the pdf C03-App

$$f(x) = \begin{cases} cxe^{-x}, x > 0 \\ 0 \quad otherwise \end{cases}$$ Find the value of c and cumulative distribution of X.

9. State convergence of the series. CO4-U

10. Write down the SFPF for solving Laplace equation. CO5-U

PART – C (5 x 16= 80 Marks)

11. (a) **Construct a QR decomposition for the matrix** CO1- App (16)

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

Or

(b) **Find the Pseudo inverse of** CO1- App (16)

$$\begin{bmatrix} 0 & 0 & 1 & 2 \\ 1 & 2 & 2 & 3 \end{bmatrix}$$

12. (a) Solve the LPP CO2- App (16)

Minimise $Z = 3x_1 + 2x_2 + 2x_3$

Subject to $5x_1 + 7x_2 + 4x_3 \le 7; -4x_1 + 7x_2 + 5x_3 \ge -2; x_1, x_2 \ge 0$

Or

(b) Use Two Phase method, Solve CO2- App (16)

Minimise $Z = 60x_1 + 80x_2$

Subject to $20x_1 + 30x_2 \ge 900; 40x_1 + 30x_2 \ge 1200; x_1, x_2 \ge 0$

13. (a) (i) Find the M.G.F of Poisson distribution and hence find mean and variance CO3-App (8)

(ii) Find the M.G.F of Exponential distribution and hence find mean and variance CO3-App (8)

Or

(b) The probability distribution function of a random variable X is CO3-App (16)

$$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$$

Find the MGF and hence find mean and variance.

14. (a) Find the eigen values and eigen functions of CO4 -App (16)
$y'' + \lambda y = 0, 0 < x < 1, y(0) = 0, y(1) + y'(1) = 0.$

Or

(b) Find the DFT of the four point sequence {x(k)}={1, 1, 0, 0} and then calculate inverse DFT of the points. Faddeev-Leverrier method. CO4 -App (16)

15. (a) Solve CO5-App (16)

$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ 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

Or

(b) 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. CO5-App (16)