

Registration No.

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M.E./M.Tech. Degree Examinations, January 2017

First Semester

POWER ELECTRONICS AND DRIVES

MA16188 –APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

(Regulation 2016)

(Statistical tables are Permitted)

QP Code: 618233

Time: Three hours

Maximum : 100 marks

Answer ALL questions

PART A - (10 X 2 = 20 Marks)

1. Define a canonical basis of a square matrix of order n.
2. Check whether the matrix $A = \begin{pmatrix} 2 & 10 & -2 \\ 10 & 5 & 8 \\ -2 & 8 & 11 \end{pmatrix}$ is positive definite.
3. Find the extremal of $\int_0^{\pi/2} (y'^2 - y^2) dx ; y(0) = 0 ; y(\pi/2) = 1$.
4. Give Euler Poisson equation.
5. A continuous random variable X has a pdf $f(x) = kx^2 e^{-x}; x > 0$. Find k.
6. Define geometric distribution.
7. Give the characteristics of the standard form of LPP.
8. Define non degenerate basic solution of a LPP.
9. Define average power of a signal.
10. State Parseval's relation.

PART B - (5 X16 = 80 Marks)

11. (a) (i) Find the generalized Eigen vector of rank 3 corresponding to the Eigen value $\lambda = 7$ for the matrix $A = \begin{pmatrix} 7 & 1 & 2 \\ 0 & 7 & 1 \\ 0 & 0 & 7 \end{pmatrix}$. (8)

- (ii) Using least square approximation, solve the following system of equations: (8)

$$x_3 + 2x_4 = 1$$

$$x_1 + 2x_2 + 2x_3 + 3x_4 = 2$$

(OR)

- (b) Construct singular value decomposition for the matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 1 & 3 \end{pmatrix}$. (16)

12. (a) Find the path on which a particle in the absence of friction will slide from one point to another in the shortest time, under the action of gravity. (16)

(OR)

- (b) Find an approximate solution to the problem of the minimum of the functional $J(y) = \int_0^1 (y'^2 - y^2 + 2xy) dx$ with $y(0)=0=y(1)$ using Ritz method and compare it with the exact solution. (16)

13. (a) (i) Out of 800 families with 4 children each, how many families would be expected to have (1) 2 boys & 2 girls (2) at least 1 boy (3) at most 2 girls and (4) children of both sexes. (8)

Assume equal probabilities for boys and girls.

- (ii) In a continuous distribution, the probability density is given by $f(x) = k \times x \times (2 - x)$, for $0 < x < 2$. Find k, mean, and variance. (8)

(OR)

- (b) (i) State and prove the memoryless property of the exponential distribution. (8)

- (ii) Find moment generating function of poisson distribution and find its mean & variance. (8)

14. (a) Solve the following LPP by simplex method: (16)

$$\text{Maximize } Z = 4x_1 + 10x_2$$

$$\text{Subject to } 2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1, x_2 \geq 0$$

(OR)

- (b) Solve the following transportation problem: (16)

| | A | B | C | D | Supply |
|--------|----|----|----|----|--------|
| 1 | 21 | 16 | 25 | 13 | 11 |
| 2 | 17 | 18 | 14 | 23 | 13 |
| 3 | 32 | 27 | 18 | 41 | 19 |
| Demand | 6 | 10 | 12 | 15 | |

15. (a) (i) Find the exponential Fourier series of $f(t) = \begin{cases} A, & 0 < t < T/2 \\ 0, & T/2 < t < T \end{cases}$ (8)

- (ii) Calculate the following average power of the periodic signal (period $T = 2$) using time domain analysis and frequency domain analysis. (8)

(OR)

- (b) (i) Find the Eigen values and Eigen functions of

$$y'' + y' + \lambda y = 0, 0 < x < 3, y(0) = 0, y(3) = 0. \quad (16)$$