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M.E. DEGREE EXAMINATIONS: DECEMBER 2009

First Semester

POWER ELECTRONICS AND DRIVES

MAT 505: Applied Mathematics for Electrical Engineers

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 2 = 20 Marks)

1. If $A = \begin{pmatrix} 1 & -2 & 3 \\ 0 & -1 & -4 \\ 2 & 1 & 2 \end{pmatrix}$. Find $\| A \|_a$

2. Explain the term: Singular Value Decomposition.

3. Define: Geodesics

4. State the Euler equation for the functional depends on several variables.

5. Find K, given that $f(x) = kx^2e^{-x}$, $x > 0$ is the probability density function.

6. If $e^t / (2-e^t)$ is the moment generating function of a random variable x, find its mean.

7. Give the classification of one- dimensional random process.

8. Prove that the difference of two poisson process is not a poisson process.

9. Define: Sigmoidal function.

10. List the aspects of genetic algorithm.

PART B (5 x 16 = 80 Marks)

11. (a) Determine the invariant polynomial and the elementary divisors of $(\lambda I - A)$ and also find the lower Jordan normal form of

$$A = \begin{pmatrix} 3 & 0 & -1 \\ 0 & 3 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

(OR)

(b) Obtain the least square solution of AX = b where

$$A = \begin{pmatrix} 0 & 1 \\ -3 & 0 \\ 0 & 2 \\ 4 & 10/3 \end{pmatrix}, \quad X = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}, \quad b = \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}$$

12. (a) i) Find the extreme of $I = \int_0^{\pi/4} ((y'')^2 - y^2 + x^2)dx$ with y (0) = 0, y' (0) = 1,

y (π/4) = 1/√2, y'(π/4) = 1/√2. (8)

ii) Solve y''-y + 1 = 0, $0 \le x \le 1$ with y(0) = 0 = y(1) by Ritz –Method. (8)

(OR)

(b) i) Find the curve passing through (x_1, y_1) and (x_2, y_2) which when rotated about the x-ax: gives minimal surface area . (8)

ii) Find the extrimal of $I = \int_0^{\pi/2} (y^2) - (y')^2)dx$ with y(0) = 0 can be achieved if th second boundary points is permitted to move along the straight line x = π/4 . (8)

13. (a) i) A random variable x has the following probability function

X	0	1	2	3	4	5	6	7
P(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Find x, p (x≥6), p (0<x<5). Also find the minimum value of k', if p (x ≤ k') > ½. (8)

ii) If a discrete random variable x has the probability function $p(x) = 1 / 2^x$, x = 0, 1, 2, 3 . Find the moment generating function and hence mean and variance. (8)

(OR)

(b) Obtain the moment generating function of Erlangian distribution and hence its mean and variance.

14. (a) i) The process { x(t): t∈ T } has probability distribution

$$p(x(t) = n) = \begin{cases} \dfrac{(at)^{n-1}}{(1+at)^{n+1}}, & n = 1, 2\ldots \\ \dfrac{at}{1+at}, & n = 0 \end{cases}$$

Show that it is not stationary. (12)

ii) The power spectral density of a signal x(t) in $s_{x(w)}$ and its power is P. Find the power of the signal $b_{x(t)}$. (4)

(OR)

(b) i) X(t) is the input voltage to a circuit and y(t) is the output voltage $\{x(t)\}$ is a stationary random process with $\mu_x = 0$, $R_{xx}(\tau) = e^{-\alpha|\tau|}$ .Find μ_y , $s_{yy}(w)$ and $R_{yy}(\tau)$ if the power transfer function is $H(w) = R / (R+iLw)$ (10)

ii) Assume a random process x(t) with four sample functions $x(t,s_1)=\cos t$, $x(t,s_2) = -\cos t$, $x(t,s_3) = \sin t$,$x(t,s_4) = -\sin t$ which are equally likely. Show that it is wid-sense stationary. (6)

15. (a) i) Explain Adaline network architecture. (8)

ii) Discuss the traditional and non-traditional method and compare them. (8)

(OR)

(b) Explain XOR problem using perception model

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