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Question Paper Code : 11473

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

First Semester

Applied Electronics

MA 9217/ MA 908/ UMA 9125 — APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS

(Common to M.E. VLSI Design/ M.E. Medical Electronics)

(Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define EG and UG rule.

2. Give the standard four classification of fuzzy proposition.

3. Write the different types of matrix factorization.

4. Given $A = \begin{bmatrix} 4 & 0 \\ 0 & 2 \\ 1 & 1 \end{bmatrix}$, $b = \begin{bmatrix} 2 \\ 0 \\ 11 \end{bmatrix}$, $\hat{x} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, determine the least square error in the least square matrix $A\hat{x} = b$.

5. If X has the probability density function $f(x) = Ke^{-3x}$, $x > 0$, find the value of K and $P[0.5 \le X \le 1]$.

6. A continuous random variable X has probability density function $f(x) = 2(1-x)$, $0 < x < 1$. Find the r^{th} moment about origin.

7. If a customer has to wait in a $(M/M/1):(\infty/FIFO)$ queue system, what is his average waiting time in the queue, if $\lambda = 8$ per hour and $\mu = 12$ per hour?

8. Define effective arrival rate with respect to an $(M/M/s):(K/FIFO)$ queuing model.

9. Define steady state and transient state in queuing theory.

10. How much number of servers is allowed in self service queueing model?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the classification of fuzzy propositions with suitable examples.

Or

(b) (i) What type of operators are used in Fuzzy expressions?

(ii) Explain the different types of fuzzy quantifiers with examples.

12. (a) Obtain the singular value decomposition of $A = \begin{pmatrix} 2 & -1 \\ -2 & 1 \\ 4 & -2 \end{pmatrix}$. (16)

Or

(b) Find the Cholesky decomposition for the matrix $A = \begin{pmatrix} 4 & 2 & -2 \\ 2 & 10 & 2 \\ -2 & 2 & 5 \end{pmatrix}$. (16)

13. (a) (i) A discrete random variable has the following probability distribution

x	0	1	2	3	4	5	6	7	8
$p(x)$	a	$3a$	$5a$	$7a$	$9a$	$11a$	$13a$	$15a$	$17a$

(1) find the value of a

(2) find $P(X < 3)$.

(3) $P(0 < X < 3)$

(4) $P(X \geq 3)$. (8)

(ii) Find the MGF of exponential distribution and hence find its mean and variance. (8)

Or

(b) (i) Let X be a continuous random variable with PDF $f(x) = \begin{cases} x; & 0 < x < 1 \\ 2 - x; & 1 < x < 2 \\ 0; & elsewhere \end{cases}$. Find (1) MGF; (2) Mean and Variance. (8)

(ii) State and prove memoryless property of geometric distribution. If X has follows geometric distribution then for any two positive integers 'm' and 'n' $P[X > m + n / X > m] = P[X > n]$. (8)

14. (a) (i) What are the essential characteristics dynamic programming problems? (8)

(ii) What is dynamic programming? How a problem is solved using the dynamic programming method? (8)

Or

(b) Solve the following LPP using dynamic programming approach: (16)

Max $Z = 3x_1 + 5x_2$

Subject to $x_1 \leq 4$

$x_2 \leq 6$

$3x_1 + 2x_2 \leq 18$

and $x_1, x_2 \geq 0$.

15. (a) Customer arrive at a one man barbershop according to Poisson process with a mean inter arrival time of 20 minutes customers spend an average of 15 minutes in the barber chair. If an hour is used as a unit of time, then

(i) What is the probability that a customer need not wait for a hair cut?

(ii) What is the expected number of customers in the barbershop and in the queue?

(iii) How much time can a customer spend in the queue?

(iv) Find the average time that the customer spends in the queue.

(v) What is the probability that there will be 6 or more customers waiting for service? (16)

Or

(b) A car servicing station has 2 bays offering service simultaneously. Because of space constraint, only 4 cars are accepted for servicing. The arrival pattern is Poisson with 12 cars per day. The service time in both the bays is exponentially distributed with μ = 8 cars per day per bay. Find the average number of cars in the service station, the average number of cars waiting for service and the average time a car spends in the system. (16)