Reg. No. :

Question Paper Code : 71436

M.E. DEGREE EXAMINATION, JUNE/JULY 2013.

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, M.E. VLSI Design and Embedded Systems and M.E. Bio Medical Engineering)

(Regulation 2009)

Time : Three hours Maximum : 100 marks

Statistical tables be permitted.

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Find the complement of a fuzzy set F = {0.4 Ram, 0.6 Sita, 0.8 Jyot, 0.9 Raj}

2. Name some applications of fuzzy logic.

3. State the least square method to solve a system of equations in matrix theory.

4. Give the shifter QR algorithm.

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

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. Define dynamic programming.

8. State Bellman's principle of optimality.

9. Write Little's formulae in queueing theory.

10. Give Kendal's notation for representing queueing models.

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) Construct a QR decomposition for the matrix $A = \begin{pmatrix} -4 & 2 & 2 \\ 3 & -3 & 3 \\ 6 & 6 & 0 \end{pmatrix}$.

Or

(b) Determine the Cholesky decomposition for the given matrix $A = \begin{pmatrix} 16 & -3 & 5 & -8 \\ -3 & 16 & -5 & -8 \\ 5 & -5 & 24 & 0 \\ -8 & -8 & 0 & 21 \end{pmatrix}$.

13. (a) (i) Find the MGF of the Poisson distribution and hence find its mean and variance.

(ii) Find the first three moments of X if X has the following distribution.

x :	-2	1	3
$p(x)$:	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$

Or

(b) (i) The life of certain kind of electronic device has a mean of 300 hours and standard deviation of 25 hours. Assuming that the life times of the devices follow normal distribution. Find the probability that any one of these devices will have a life time more than 350 hours and what percentage will have life time between 220 and 260 hours?

(ii) If $Y = X^2$, where X is a Gaussian random variable with zero mean and variance σ^2, find the probability density function of the random variable Y.

14. (a) Minimize $Z = y_1^2 + y_2^2 + y_3^2$

subject to $y_1 + y_2 + y_4 \geq 15$

$y_1, y_2, y_3 \geq 0.$

Or

(b) Solve the following L.P.P. by the method of dynamic programming.

Maximize $Z = 2x_1 + 5x_2$

subject to
$$2x_1 + x_2 \le 430$$
$$2x_2 \le 460$$
$$x_1, x_2 \ge 0.$$

15. (a) A one-person barber shop has six chairs to accommodate people waiting for a hair cut. Assume customers who arrive when all six chairs are full leave without entering the barber shop. Customers arrive at the average rate of 3/hr and spend an average of 15 min in the barber chair.

(i) What is the probability that a customer can get directly into the barber chair upon arrival?

(ii) What percentage of time is the barber idle?

(iii) What is the expected number of customers waiting for hair cut?

(iv) What is the effective arrival rate?

(v) How much time can a customer expect to spend in the barber shop?

(vi) What fraction of potential customers are turned away?

Or

(b) A car servicing station has two bags where service can be offered simultaneously. Due to space limitation, only four cars are accepted for servicing. The arrival pattern is Poisson with a mean of one car every minute during the peak hours. The service time is exponential with mean 6 minutes. Find

(i) The average number of cars in the service station

(ii) The average number of cars in the system during the peak hours

(iii) The average waiting time of a car spends in the system

(iv) The average number of cars per hour that cannot enter the station because of full capacity.

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