Reg. No. :

Question Paper Code : 61476

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

First Semester

Applied Electronics

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

(Common to M.E. VLSI Design/M.E. VLSI Design and Embedded Systems/ M.E. Bio-Medical Engineering/M.E. Medical Electronics)

(Regulation 2009)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Write the conditional and unconditional fuzzy propositions.

2. Define quasicontradiction.

3. Find the QR factorization for the matrix $A = \begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix}$.

4. Write down the objective of least square method.

5. A CRV X that can assume any value between $x = 2$ and $x = 5$ has a density function given by $f(x) = k(1 + x)$. Find $P(X < 4)$.

6. State and prove the memoryless property of Exponential distribution.

7. Define dynamic programming.

8. Mention any two applications of dynamic programming.

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) Give an example from daily life of each type of fuzzy proposition and express the proposition in its canonical form. (16)

Or

(b) Explain about proposition that contain fuzzy quantifiers of the first kind with example. (16)

12. (a) Construct QR decomposition for the matrix. (16)

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

Or

(b) Construct a singular value decomposition for the matrix $A = \begin{pmatrix} 2 & 2 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 6 \end{pmatrix}$. (16)

13. (a) (i) The Cumulative distribution function of a random variable X is $F(X) = 1 - (1 + x)e^{-x}$, $x > 0$. Find the probability density function of X, mean and variance. (10)

(ii) Prove that the sum of two independent Poisson variates is a Poisson variate. (6)

Or

(b) (i) The number of Personal Computer (PC) sold daily at a computer world is uniformly distributed with a minimum of 2000 PC and a maximum of 5000 PCs. Find.

(1) The probability that daily sales will fall between 2500 and 3000 PC.

(2) What is the probability that the computer world will sell at least 4000 PC's?

(3) What is the probability that the computer world will exactly sell 2500 PC's? (10)

(ii) The saving bank account of a customer showed an average of Rs.150 and a standard deviation of Rs. 50. Assuming that the account balances are normally distributed

(1) What percentage of account is over Rs. 200?

(2) What percentage of account is between Rs. 120 and Rs. 170?

(3) What percentage of account is less than Rs.75? (6)

14. (a) Solve the LPP by dynamic programming : (16)

Maximize $Z = 50x_1 + 100x_2$,

subject to :

$10x_1 + 5x_2 \leq 2500$

$4x_1 + 10x_2 \leq 2000$

$x_1 + \frac{3}{2}x_2 \leq 450$

$x_1, x_2 \geq 0.$

Or

(b) Solve the following problem : (16)

Minimize $Z = y_1^2 + y_2^2 + ... + y_n$

subject to $y_1 y_2 .... y_n = b$.

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 mm 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.
