Reg. No. | | | | | | | | | | | | |

Question Paper Code : 81476

M.E. DEGREE EXAMINATION, MAY/JUNE 2016

First Semester

Applied Electronics

MA 9217/UMA 9125/MA 908 – 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. Biomedical Engineering)

(Regulations 2009/2010)

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

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What is the difference between classical proposition and fuzzy proposition ?

2. Give the truth table for $q \rightarrow p$.

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

4. Give the shifter QR algorithm.

5. The probability function of an infinite discrete distribution is given by $P(x = j) = \frac{1}{2^j}$, $j = 1, 2, \ldots\ldots\infty$. Verify that the total probability is one.

6. The mean and second moment of uniform distribution U(a, b) are 1 and $\frac{1}{3}$ respectively. Find the interval (a, b) of uniform distribution.

7. Write down two applications of Dynamic Programming.

8. Define the Principle of optimality for Dynamic Programming.

9. State Bellman's principle of optimality.

10. Give an example of self service model.

PART – B (5 × 16 = 80 marks)

11. (a) Write elaborate notes on logic functions of two variables. **(16)**

OR

(b) Write detailed notes on unconditional and quantifiers proposition. **(16)**

12. (a) Solve the following system of equations in the least square sense : **(16)**

$2x_1 + 2x_2 - 2x_3 = 1$

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

$-2x_1 - 2x_2 + 6x_3 = 2.$

OR

(b) Determine the Cholesky decomposition for $A = \begin{bmatrix} 4 & 2i & -i \\ -2i & 10 & 1 \\ i & 1 & 9 \end{bmatrix}$. **(16)**

13. (a) (i) Find the MGF of the Poisson distribution and hence find its mean and variance. **(16)**

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

x :	2	[illegible]	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. **(16)**

14. (a) An oil company has 8 units of money available for exploration of three sites. If oil is present at site, the probability of finding it depends upon the amount allocated for exploiting the site, as given below :

Units of money allocated

	0	1	2	3	4	5	6	7	8
Site 1	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.0
Site 2	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.8	1.0
Site 3	0.0	0.1	0.1	0.2	0.3	0.5	0.8	0.9	1.9

The probability that oil exists at the sites 1, 2 and 3 is 0.4, 0.3 and 0.2 respectively. Find the optimal allocation of money. **(16)**

OR

(b) Using Dynamic Programming Technique, **(16)**

Maximize $Z = 4x_1 + 14x_2$

subject to

$2x_1 + 7x_2 \leq 21$

$7x_1 + 2x_2 \leq 21$

$x_1, x_2 \geq 0.$

15. (a) There are three typists in an office. Each typist can type an average of 6 letters per hour. If letters arrive for being typed at the rate of 15 letters per hour.

(i) What fraction of the time all the typists will be busy ?

(ii) What is the average number of letters waiting to be typed ?

(iii) What is the average time a letter has to spend for waiting and for being typed ?

(iv) What is the probability that a letter will take longer than 20 min waiting to be typed and being typed ? **(16)**

OR

(b) A 2-person barber shop has 5 chairs to accommodate waiting customers potential customers, who arrive when all 5 chairs are full, leave without entering barber shop. Customers arrive at the average rate of 4 per hour and spend an average of 12 min. in the barber's chair. Compute P_0, P_1, P_7, $E(N_q)$ and $E(W)$. **(16)**