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

Question Paper Code : 13651

M.E. DEGREE EXAMINATION, JANUARY 2015.

First Semester

Applied Electronics

MA 7157 — APPLIED MATHEMATICS FOR ENGINEERS

(Common to M.E. VLSI Design, M.E. Medical Electronics and M.E. Biomedical Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write short notes on logic function.

2. Construct the truth table for $\overrightarrow{(a \to b)} \to \vec{b}$

3. Obtain the symmetric matrix of the quadratic form $x_1^2 + 2x_1x_2 - 4x_1x_3 + 6x_2x_3 - 5x_2^2 + 4x_3^2$.

4. Find the singular value decomposition of $A = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}$.

5. Find the moment generating function of $f(x) = 2e^{-2x}; x > 0$.

6. Find the mean and variance of binomial distribution.

7. Write down the characteristics of dynamic programming.

8. Write the algorithm for dynamic programming problem.

9. Define the transient state and steady state probabilities.

10. Define the memoryless property of the exponential distribution.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the first and second kind of fuzzy quantifiers with suitable examples.

Or

(b) Define logic formula and list the properties of classical logic.

12. (a) Find the singular value decomposition of

$$A=\begin{pmatrix} 5 & -2 & 0 \\ -2 & 6 & 2 \\ 0 & 2 & -3 \end{pmatrix}.$$

Or

(b) Find the Cholosky decomposition of the matrix

$$A=\begin{pmatrix} 2 & 1 & -1 \\ 1 & -3 & 5 \\ -1 & 5 & 4 \end{pmatrix}.$$

13. (a) Derive the recurrence relation for the moments of the Poisson distribution. Also obtain the first four moments.

Or

(b) Find the mean, variance and mode of the normal distribution.

14. (a) A vessel is to be loaded with stocks of 3 items. Each unit of item i has a weight w_i and value r_i. The maximum cargo weight the vessel can take is 5 and the details of the three items are as follows: Develop the recursive equation and find the most valuable cargo load without exceeding the maximum cargo weight by using the dynamic programming.

i	w_i	r_i
1	1	30
2	3	80
3	2	65

Or

(b) Use dynamic programming to solve the following problem:

Minimize $z=y_1^2+y_2^2+y_3^2$, subject to the constraints ; $y_1+y_2+y_3\geq 15$ and $y_1+y_2+y_3\geq 0$.

15. (a) Obtain the steady state solution for the number of customer in the M/M/1 queue. Find, also, the average number of customer in the M/M/1 queue and the average waiting time of a customer in-the M/M/1 queue.

Or

(b) A tax consulting firm has 3 counters in its office to receive people who have problems concerning their income, wealth and sales taxes. On the average 48 persons arrive in an 8-hour day. Each tax advisor spends 15 minutes on the average on an arrival. If the arrivals are Poisson distributed and service times are according to exponentional distribution, find

(i) The average number of customers in the system.

(ii) The average number of customers wait to be served,

(iii) The average time a customer spends in the system,

(iv) The average waiting time for a customer in the queue,

(v) The number of hours each week a tax advisor spends performing his job,

(vi) The expected number of idle tax advisors at any specified time,

(vii) The probability that a customer has to wait before he gets service.
