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Question Paper Code : 81754

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

First Semester

Applied Electronics

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

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

(Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define tautology.

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

3. Define rank of a matrix.

4. Define orthogonal matrix.

5. In a binominal distribution mean = 4 and variance = 3. Find the value of p.

6. Give the distributions in which the memory less property holds good.

7. Give some applications of dynamic programming.

8. Define dynamic programming.

9. Define jockeying in queueing system.

10. Give the formula for effective arrival rate in (M/M/1): (k/FIFO) model.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Explain the classification of fuzzy propositions. (8)

(ii) Prove that $\neg(p \vee q) \Leftrightarrow \neg p \wedge \neg q$ (8)

Or

(b) (i) Let sets of values of variable x and y be X = $\{x_1, x_2, x_3\}$ and Y = $\{y_1, y_2\}$ respectively. Assume that a proposition "if x is A, then y is B" is given, where $A = .5/x_1 + 1/x_2 + .6/x_3$ and $B = 1/y_1 + .4/y_2$ Then, given a fact expressed by the proposition "x is A", where $A' = .6/x_1 + .9/x_2 + .7/x_3$, to derive the conclusion in the form "y is B". (8)

(ii) Show that $R \to S$ can be derived from the premises $P \to (Q \to S)$, $\neg R \vee P$ and Q. (8)

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

Or

(b) Solve the following system of equations in the least square sense:

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

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

$-2x_1 - 2x_2 + 6x_3 = 2$ (16)

13. (a) (i) Find the MGF corresponding to the distribution $f(\theta) = \begin{cases} \frac{1}{2} e^{\frac{-x}{2}} & x > 0 \\ 0 & \text{otherwise} \end{cases}$ and hence find its mean and variance. (8)

(ii) If the probability that an applicant for a driver's license will pass the road test on any given trial is 0.8. What is the probability that he will finally pass the test

(1) On the fourth trial and

(2) In less than 4 trials? (8)

Or

(b) (i) Find the MGF for Poisson distribution and hence find the mean and variance. (8)

(ii) The life of a 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.

(1) Find the probability that any one of their devices will have a life time more than 350 hours.

(2) What percentage will have life time between 220 and 260 hours? (8)

14. (a) Solve the following problem:

Minimize Z= $y_1^2 + y_2^2 + \ldots\ldots + y_n$ subject to $y_1 y_2 \ldots\ldots\ldots\ldots y_n = b$. (16)

Or

(b) The owner of a chain of four grocery stores has purchased six crates of fresh strawberries. The following table gives the estimated profits at each store when it is allocated various numbers of boxes.

		Stores			
		1	2	3	4
Numbers of boxes	0	0	0	0	0
	1	4	2	6	2
	2	6	4	8	3
	3	7	6	8	4
	4	7	8	8	4
	5	7	9	8	4
	6	7	10	8	4

The owner does not wish to split crates between stores, but is willing to make zero allocations. Find the allocation of six crates so as to maximize the profits. (16)

15. (a) Arrivals at a telephone booth are considered to be Poisson with an average time of 12 minutes between one arrival and the next. The length of the phone call is assumed to be distributed exponentially with 4 minutes.

(i) Find the average number of persons waiting in the system?

(ii) What is the probability that a person arriving at the booth will have to wait in the queue?

(iii) What is the probability that it will take him more than 10 minutes altogether to wait for the phone and compute his call?

(iv) Estimate the fraction of the day when the phone will be in use?

(v) The telephone department will install a 2nd booth, when convinced than an arrival has to wait on the average for at least 3minutes for phone. By how much the flow of arrivals should increase in order to justify a 2nd booth?

(vi) What is the average length of the queue that forms from time to time? (16)

Or

(b) A super market has 2 girls running up sales at the counters. If the service time for each customer is exponential with mean 4 minutes and if people arrive in Poisson fashion at the rate of 10 per hour, find the following:

(i) What is the probability of having to wait for service?

(ii) What is the expected percentage of idle time for each girl?

(iii) What is the expected length of customer's waiting time? (16)