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

Question Paper Code: 52183

M.E. DEGREE EXAMINATION, JUNE 2016

First Semester

VLSI Design

15PMA123 - APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Fuzzy proposition is expressed by a number in the interval

   (a) [0, 2] (b) [1, 2] (c) [0, 1] (d) [1, 3]

2. If A is Unitary then

   (a) $AA^H = A^H A = I$ (b) $A = A^H$ (c) $A = A^T$ (d) $A^n = I$

3. For the Bessel function $J_{1/2}(x)$ is equal to

   (a) $\sqrt{\frac{2}{\pi x}}\tan x$ (b) $\sqrt{\frac{2}{\pi x}}\sin x$ (c) $\sqrt{\frac{2}{\pi x}}\cos x$ (d) $\sqrt{\frac{2}{\pi x}}\cot x$

4. When a positive quantity C is divided into five parts, the maximum value of their product is

   (a) 5C (b) $\left(\frac{c}{5}\right)^5$ (c) 55 x 5C (d) 0

5. In Kendal's notation d represents

   (a) Queue discipline
   (b) Capacity of the system
   (c) Probability law for arrival
   (d) Number of channels

PART - B (5 x 3 = 15 Marks)

6. Name the connectives used in Fuzzy logic.

7. What is meant by singular value of a matrix?

8. Write the generating function for the Bessel function.

9. State the applications of dynamic programming.

10. If a customer has to wait in a $(M/M/1) : (\infty/FIFO)$ queue system, what is his average waiting time in the queue, if $\lambda = 8$ per hour and $\mu = 12$ per hour?

PART - C (5 x 16 = 80 Marks)

11. (a) State and explain the properties of Fuzzy logic. (16)

Or

(b) Explain the concept of multi valued Fuzzy logic and Fuzzy quantifiers. (16)

12. (a) Obtain the singular value decomposition of $\begin{pmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{pmatrix}$. (16)

Or

(b) Construct the QR decomposition for the matrix $\begin{pmatrix} -4 & 2 & 2 \\ 3 & -3 & 3 \\ 6 & 6 & 0 \end{pmatrix}$. (16)

13. (a) (i) Derive the orthogonal property of the Bessel function. (8)

(ii) Derive the two recurrence relations for Bessel function. (8)

Or

(b) (i) Express $J_6(x)$ in terms of $J_0(x)$ and $J_1(x)$. (8)

(ii) Express $J_{\frac{3}{2}}(x)$ and $J_{\frac{5}{2}}(x)$ in a closed form. (8)

14. (a) An oil company has 8 units of money available for exploration of three sites. If oil is present at a 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	1.0

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) Solve the following LPP using dynamic programming approach Max $Z = 3x_1 + 5x_2$ subject to $x_1 \leq 4$, $x_2 \leq 6$, $3x_1 + 2x_2 \leq 18$ andx_1 , $x_2 \geq 0$. (16)

15. (a) There are three typists in an office. Each typist can type 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) Customers arrive at one man barber shop according to Poisson process with mean inter arrival time of 20 minutes. Customers spend an average of 15 minutes in the barber chair. If an hour is used as a unit of time, then

(i) What is the probability that a customer need not wait for a haircut?

(ii) What is the expected number of customers in the barber shop and in the queue?

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

(iv) Find the average time that the customer spends in queue?

(v) Estimate the fraction of the day that the customer will be idle. (16)

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