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

Question Paper Code: 52183

M.E. DEGREE EXAMINATION, DECEMBER 2015

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. In three – valued logic, the indeterminacy is denoted by

   (a) 1　　(b) 0　　(c) $\frac{1}{2}$　　(d) $\frac{1}{3}$

2. A square matrix U is unitary matrix if

   (a) $UU^H = I$　　(b) $U = U^{-1}$　　(c) $U^H = U^{-I}$　　(d) $U = U^H$

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

   (a) $\sqrt{\frac{2}{\pi x}}\tan x$　　(b) $\sqrt{\frac{2}{\pi x}}\cos x$　　(c) $\sqrt{\frac{2}{\pi x}}\sin x$　　(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 queueing theory if mean interarrival time is 12 min. then λ is

(a) 12 (b) $\frac{1}{12}$ (c) 60 (d) 24

PART - B (5 x 3 = 15 Marks)

6. What is fuzzy proposition and give its classification.

7. Define singular value matrix.

8. What are the uses of Bessel's functions?

9. What sort of problems can be solved by dynamic programming?

10. What is open Jackson network?

PART - C (5 x 16 = 80 Marks)

11. (a) (i) Explain multi valued logics. (8)

(ii) Explain Unconditional and Qualified propositions with suitable example. (8)

Or

(b) (i) Explain fuzzy quantifier and various types. (8)

(ii) Explain conditional and unqualified propositions with suitable example. (8)

12. (a) State Singular value decomposition theorem. Also obtain the singular value decomposition of $A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \\ 1 & 3 \end{bmatrix}$. (16)

Or

(b) Construct a QR decomposition for the matrix $A = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$. (16)

13. (a) (i) Express $J_5(x)$ and $J_4(x)$ in terms of $J_0(x)$ and $J_1(x)$. (8)

(ii) Express $J_{\frac{5}{2}}\left(X\right)$ in finite form. (8)

Or

(b) (i) Express $4x^3 + 6x^2 + 7x + 2$ in terms of Legendre polynomials. (8)

(ii) Prove that $\frac{d}{dx}\left[x^n \ J_n \ (x)\right] = x^n \ J_{n-1} \ (x)$. (8)

14. (a) (i) In a Cargo loading problem, 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 og three items are as follows:

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

Develop the recursive equation for the above case and find the most valuable cargo load without exceeding the maximum cargo weight by using dynamic programming. (8)

(ii) What are the applications of dynamic programming? (8)

Or

(b) (i) Use dynamic programming to solve the following LPP:

Maximize $z = 3x_1 + 5x_2$ subject to the constrains: $x_1 \le 4$, $x_2 \le 6$, $3x_1 + 2x_2 \le 18$ and $x_1, x_2 \ge 0$. (8)

(ii) Using Dynamic programming solve

Min $z = y_1^2 + y_2^2 + y_3^2$ subject to the condition $y_1 + y_2 + y_3 \ge 15$ and $y_1, y_2, y_3 \ge 0$. (8)

15. (a) (i) Customers arrive at a one-man barber shop according to a Poisson process with a mean interarrival time of 12 min. Customers spend an average of 10 min in the barber's chair.

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

(2) Calculate the percentage of time an arrival can walk straight into the barber's chair without having to wait

(3) How much time can a customer expect to spend in the barber's shop? (8)

(ii) A supermarket has two girls attending to sales at the counters. If the service time for each customer is exponential with mean 4 min and if people arrive in Poisson fashion at the rate of 10 per hour,

(1) What is the probability that a customer has to wait for service?

(2) What is the expected percentage of idle time for each girl? (8)

Or

(b) (i) In a railway marshalling yard, goods train arrive at a rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes. Calculate the following.

(1) The average number of trains in the queue

(2) The probability that the queue size exceeds 10

If the input of trains increases to an average 33 per day, what will be the change in (1) and (2)? (8)

(ii) Prove that a Poisson Process is a Markov Process. (8)