Time : 3 Hrs   **Marks : 80**
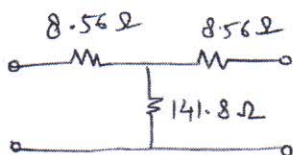
Note:

1. Question **No.1** is **compulsory**.
2. Attempt **any three** from the remaining questions.
3. Assume suitable data if required.
4. Figures on the right hand side indicate full marks.

1. a) Design Circulator using Magic Tee.   (05)
   b) Explain Amplification Process in TWT.   (05)
   c) Compare Isolator and Gyrator.   (05)
   d) Calculate S parameters for 3dB Attenuator. Assume $Z_o = 50\ \Omega$ (05)

2. a) Explain the significance of RWH theory and explain two valley models in GUNN diode.   (10)
   b) What is the importance of beam coupling coefficient? Derive the expression for velocity
   modulation in two cavity klystron.   (10)

3. a) Derive the expression for various parameters that describe the wave propagation in TE/TM mode in
   Rectangular Waveguide   (10)
   b) Explain Impedance measurement Technique in microwave.   (10)

4. a) Design a two lumped element matching network at frequency 500 MHz frequency to match
   $Z_L = 200-j100$ ohms with a transmission line of $Z_o=100$ ohms using Smith Chart.   (10)
   b) Draw and explain two-hole directional coupler and derive the S-parameter for the same. (10)

5. a) Design two single stub matching network (shunt- short) for a given load of 60-j80 ohms to match with
   a 50 ohms transmission line using Smith Chart.   (10)
   b) Compare HMICs and MMICs with suitable diagram.   (10)

6. Write short note on *any two*   (20)
   a) Magnetron
   b) Transit time diodes
   c) HEMT

****

E4166FBCBC26C4F0D54936B96AE4C5C3

(3 Hours)   [Total Marks : 80]

Please check whether you have got the right question paper.

N.B.:   1)   Question No. 1 is compulsory.
         2)   Attempt any three from remaining questions.

1. a) Define following terms.   (05)
        i)   Control channel
        ii)   Forward channel
        iii) Hand-off
        iv)   Reverse channel
        v)   Page

    b) What is frequency Re-use? Derive the relationship between capacity C and   (05)
        cluster size N.

    c) List and discuss factors influencing small scale fading.   (05)
    d) Explain soft-hand-off and power control in 3G.   (05)

2. a) For given path loss exponent (a) n = 4 and (b) n = 3, find the frequency re-use   (10)
        factor and the cluster size that should be used for maximum capacity. The S/I
        ratio of 15db is minimum required for satisfactory forward channel
        performance of a cellular system. There are six co-channel cells and all of them
        at same distance from mobile use suitable approximations.

    b) Draw the block diagram and explain GSM architecture in detail indicating all   (10)
        the interfaces.

3. a) Explain IS-95 forward and reverse channel structure in details.   (10)
    b) Describe GSM frame structure in detail.   (10)

4. a) Compare IS-95, W-CDMA and CDMA 2000 with respect to channel   (10)
        Bandwidth, chip rate, modulation schemes, data rates and frame size.
    b) Sketch UMTS Network Architecture and explain it in detail. Give in brief   (10)
        Features and services provided by UMTS.

5. a) Draw and explain 3GPP LTE architecture and also discuss frames and slots in   (10)
        LTE.
    b) Explain the concept of MIMO with respect to 4G technology.   (10)

6. Write short notes on **Any Two**:-   (20)
    a) Indoor propagation Models
    b) Rake Receiver
    c) Software defined radio

_____

8B9F53D3223144C74BCE2CC990AA08DE

Time : 3 Hours

Marks: 80

N.B. : (1) Question No. 1 is compulsory
       (2) Attempt any three questions out of the remaining five questions.
       (3) Figures to the right indicate full marks.
       (4) Assume suitable data wherever necessary and justify the same.

1. Solve **any four**
    (a) Differentiate LED and LASER.   5
    (b) Explain different types of fibers with their refractive index profile and mention its   5
        dimensions.
    (c) Draw and explain fusion splicing.   5
    (d) Explain the concept of Fiber Bragg Grating. Give its applications.   5
    (e) Derive expression for cut off wavelength for single mode step index fiber   5

2. (a) Explain in brief VAD and MCVD fiber fabrication techniques.   10

   (b) Explain linear and non-linear scattering losses in optical fiber.   10

3. (a) What are the different factors responsible for attenuation and dispersion in optical fiber.   10

   (b) Explain in detail working, principle of RAPD. Why it is called reach through APD   10
      and compare its working with PIN diode?

4. (a) Explain working principle of EDFA with diagram.   10

   (b) An analog optical fiber system using LASER with 3 dBm optical power into air. A   10
      coupling loss of 17.5 dB is present while launching power into fiber. Length of fiber
      is 6 km with a loss of 5dB/km. It is spliced at every 1.5 km with 1.1dB loss per splice.
      Connector loss at receiver is 0.8dB. The PIN receiver has sensitivity of -54 dBm.
      Estimated safety margin is 4 dB. Design the link power budget.

5. (a) If a multimode step index fiber having the core refractive index of 1.5, cladding   10
      refractive index of 1.38, core radius of 25 μm operates at a wavelength of 1300 nm.
      Calculate -
        (i) Numerical Aperture.
        (ii) Normalized frequency
        (iii) Solid acceptance angle.
        (iv) Total no. of modes entering the fiber.

   (b) Draw and explain block diagram of cutback method of attenuation measurement.   10

6. Write short note on: -   20
        (i) RF over Fiber
        (ii) Quantum Well Laser
        (iii) Solitons
        (iv) Optical Switches

****

A25758D617D7D65348366DA529A9EC21

[Time: 3 Hours]   [Marks: 80]

Please check whether you have got the right question paper.

N.B: 1. **Q.1** is **Compulsory**.
        2. Solve **any three** questions out of remaining.
        3. Draw neat labelled **diagram** whenever **necessary**.
        4. Assume suitable data if necessary.

1.   Answer any´four questions from the given questions.

   a)   Describe advantages of Fuzzy logic over crisp logic.   04

   b)   Compare RBFNN with FFNN   04

   c)   What is role of function in NN. State the types of activation functions 04

   d)   Find (i) $A \cap B$ (ii) $\bar{A} \cup B$ (iii) $A \cap \bar{B}$ (iv) $A \cup B$ for the given fuzzy sets.   04
        $$A = \left\{ \frac{0.4}{a} + \frac{0.2}{b} + \frac{0.9}{c} \right\} \text{ and } B = \left\{ \frac{0.1}{a} + \frac{0.5}{b} + \frac{0.8}{c} \right\}$$

   e)   Explain LMS algorithm.   04

2. a)   What is a use of membership function? Explain the different methods by which it is   10
        designed. Describe any two fuzzy membership functions with diagram and mathematical
        equations.

   b)   Explain perception learning algorithm and developed perception network to implement   10
        two inputs AND gate to function. Consider inputs and outputs as Unipolar. Assume
        initial weight and bias value equal to zero. Consider learning rate equal to one.

3. a)   Explain any Five methods of defuzzification in details.   10

   b)   Describe Delta Learning rule with diagram and equations.   10

4. a)   Explain Supervised Learning in detail with diagram and its applications. Compare   10
        Supervised and Unsupervised Learning.

   b)   Explain Fuzzy image contrast enhancement using INT operator with the help of 4×4 10
        pixel array.

5. a)   A Hopfield network has to store the following pattern   10
        $P1 = [1\ 1\ 1\ 1\ 1]^T$, $P2\ [-1\ -1\ -1\ -1\ -1]^T$ and $P3 = [1\ -1\ -1\ 1\ 1]^T$
        Evaluate the weight matrix for it.

   b)   Describe the application of Neural Network for handwritten character recognition.   10

6. a)   Design a fuzzy control system for washing machine by using triangular membership,   10
        five rules, mamdani inference and centroid as defuzzification method to obtain the
        output.

   b)   Explain in detail Error back propagation algorithm with block diagram and equations.   10

(3 Hours)   [Total Marks: 80]

Instructions:

1. Question No.1 is compulsory
2. Attempt any Three from the remaining
3. Figures to the right indicate full marks
4. Assume suitable data if necessary.

Q.1. (a) Compare Big Data Analysis with Traditional Data Mining and warehousing system   (5)
     (b) Explain "Shuffle & Sort" phase and "Reducer phase" in Map Reduce.   (5)
     (c) Find Jaccard Distance and Cosine Distance between the following pairs of set   (5)
         X=(0,1,2,4,5,3) & Y=(5,6,7,9,10,8)
     (d) Define Social Networks and Social Network Mining   (5)

Q.2 (a) Explain NoSQL Business drivers and also describe various architecture Patterns   (10)
        of NoSQL.
    (b) What is the MapReduce? Explain the role of Combiner with the help of   (10)
        an example.

Q.3. (a) Explain Page Rank algorithm with suitable example   (10)
     (b) Elaborate Collaborative Filtering System. How is the system different from a   (10)
         content based system.

Q.4. (a) Explain Park-Chen-Yu algorithm with suitable example.   (10)
     (b) Explain the Physical Architecture of Hadoop. State its Limitations.   (10)

Q.5. (a) Describe the Characteristics of Big Data with suitable example. State the types
         of Big data   (10)
     (b)Distinguish the following   (10)
         (i) Document store & Column family data store.
         (ii) RDBMS & NoSQL database.

Q.6. Write Short Note on.   (any two)   (20)
     (a)Hadoop Ecosystem
     (b)Data Sream Management System
     (c) Matrix Multiplication by MapReduce
     (d) Network Traffic Analysis.

_____

163A4613477425A40D6893384442F5D8

Choice Based

Time : 3 Hrs   Marks: 80

Instructions
1. Q1 is compulsory.
2. Attempt any three out of the remaining five questions.
3. Assume suitable data.

Q1. Attempt any **FOUR**.

(20)
   a) What is watchdog timer, its use and typical application for an embedded system.
   b) Explain I2C in brief.
   c) Explain various types of operating systems.
   d) Differentiate between embedded systems and general computing systems.
   e) Explain pre-emptive scheduling in RTOS.
   f) What is process and various states that a process can lie in an embedded system?

(10)
Q2.a) Explain various steps of design of digital camera using microcontroller and CCDPP.

   b) Describe any two wireless communication means for embedded systems.   (10)

Q3. a) Describe design metrics and optimization challenges for embedded systems.   (10)

   b) What is interprocess communication (IPC) in RTOS? Explain various IPCs.   (10)

Q4. a) Define finite state machine (FSM). Draw and explain FSM for automatic chocolate
       vending machine.   (10)

   b) Explain various task scheduling models in RTOS.   (10)

Q5. a) Write a note on program models: DFG, FSM, Petri-net, UML.   (10)

   b) Compare RISC and CISC architectures along with advantages and disadvantages. (10)

Q6. a) How to choose RTOS for a given embedded system application.   (10)

   b) What is CAN protocol. Describe topology and frame formats with significance of
      fields.   (10)

****

77383

163A4613477425A40D68933844491ECA

3 Hours   **Total: 80 marks**

N.B: (1) Question no 1 is compulsory
(2) Attempt any **three** out of remaining **five** questions
(3) Figures to the right indicate full marks
(4) Assume Suitable data if necessary
(5) Notations carry usual meaning

Q.1 Answer **any four** of the following questions:

a) Write the dual of the following LPP
Maximise $Z = 4x_1 + 2x_2$
Subject to ,
$x_1 - 2x_2 \geq 2$
$x_1 + 2x_2 = 8$
$x_1 - x_2 \leq 10$
Where $x_1 \geq 0, x_2$ is unrestricted in sign.   (05)
b) What are assumptions made in game theory   (05)
c) Write short note on special cases in Linear Programming Problem.   (05)
d) Enlist assumptions in sequencing problem.   (05)
e) Briefly explain Monte Carlo simulation with suitable example.   (05)

Q.2 a) Solve by Simplex Method:

Maximize $Z = 3x_1 + 2x_2$
Subject to
$x_1 + x_2 \leq 4$,
$x_1 - x_2 \leq 2$
Where $x_1, x_2 \geq 0$ (10)

b) Workers come to tool store room to receive special tools (required by them) for accomplishing a particular project assigned to them. The average time between two arrivals is 60 seconds and the arrivals are assumed to be in Poisson distribution. The average service time (of tool room attendant) is 40 seconds. Determine
1) Average queue length
2) Average length of non empty queue
3) Average number of workers in system
4) Mean waiting time of an arrival
5) Average waiting time of an arrival (worker) who waits.   (10)

Q.3 a) Solve the following by Vogel's Approximation Method (VAM) and find optimal transportation plan.   (10)

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	

78259

D1F9F7C36E6E62DC420FF76DB7278FAD

b) Iyengar Bakery keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given here: (10)

Daily Demand	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Consider the following sequence of random numbers:
48,78,19,51,56,77,15,14,68,09

Using this sequence simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decided to make 30 cakes every day. Also estimate the daily average demand for this cake on the basis of simulated data.

Q.4 a) Solve the following Assignment Problem. (10)

Contractors	Cost of Repairs (Rs.in Lakhs) of Roads			
	R_1	R_2	R_3	R_4
C_1	9	14	19	15
C_2	9	17	20	19
C_3	9	18	21	18
C_4	10	12	18	19
C_5	10	15	21	16

Rs.50 Lakhs is total cost of repair.
1) Find the best way of assigning the repair work to the contractors and cost.
2) If it is necessary to seek supplementary grants, then what should be the amount?
3) Which of the 5 contractors will be unsuccessful in his bid?

b) A distance network consists of eleven nodes which are distributed as shown in following table. Find the shortest path from node 1 to node 11 using dynamic programming. The corresponding distance are: (10)

Arc	Distance	Arc	Distance
1-2	8	5-8	12
1-3	7	5-9	7
1-4	1	6-9	9
2-5	5	7-9	6
3-5	9	7-10	13
3-6	2	8-11	4
3-7	8	9-11	2
4-7	10	10-11	15

Q.5 a) A and B play a game in which each has three coins a 5p, a 10p and 20p. Each player selects a coin without the knowledge of the others choice. If the sum of the coin is an odd amount, A wins B's coin; if the sum is even, B wins A's coin. Find the best strategy for each player and the value of the game. **(10)**

b) Solve by **Big-M or Charne's Penalty Method** **(10)**

Maximize $Z=4x_1 + x_2$
Subject to $3x_1 + x_2 = 3$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 4$$
Where $x_1, x_2 \geq 0$

Q.6 a) A book binder has one printing press, one binding machine and the manuscript of number of different books. The time required to perform the printing and binding operation for each book are given below. Determine the order in which book should be processed, in order to minimise the total time required to turn out all the books. Also find the idle time of binding machine. **(10)**

Books	1	2	3	4	5	6
Printing time (hr)	30	120	50	20	90	110
Binding time (hr)	80	100	90	60	30	10

b) Mini Computer Company purchases a component of which it has a steady usage of 1000 units per year. The ordering cost is Rs.50 per order. The estimated cost of money invested is 25% per year. The unit cost of the component is Rs.40. Calculate the optimal ordering policy and total cost of inventory system, including purchase cost of the components. If the component supplier agrees to offer price discounts of minimum lot supplies as per schedule given below, reassess the decision on optimal ordering policy and total cost. **(10)**

Lot size	Price
Upto 149	Rs.40
150-499	Rs.39
500 or More	Rs.38

---The End---