

(3 Hours)

[ Total Marks : 100

- N.B.:** (1) Question No. 1 is **compulsory**.  
 (2) Attempt any **five** questions in **all**.

1. (a) State and explain with an example— 20  
 (i) Conditional Probability (ii) Joint Probability.  
 (b) Define the expectation of continuous and discrete random variables with an example.  
 (c) Define random process. State four classes of random processes giving one example each.  
 (d) Define the moment generating function and characteristic function of a random variable. Give the significance of each.
2. (a) State and explain Baye's theorem with an example. An urn contains 10 white and 3 black balls. Another urn contains 3 white and 5 black balls. Two balls are drawn at random from the first urn and placed in the second urn and then 1 ball is taken at random from the latter. What is the probability that it is a white ball ? 10  
 (b) The distribution function of a RVX is given by 10  

$$F_x(x) = 1 - (1+x)e^{-x} \quad x \geq 0$$
 Find the mean, variance and density function of X.  
 Also if  $f_x(x) = K(1+x) \quad 2 \leq x \leq 5$ .  
 Find  $P(X < 4)$
3. (a) If X is a Gaussian random variable with mean zero and variance  $\sigma^2$ . Find the pdf of  $Y = |X|$ . Also if  $f_x(x) = 2x \quad 0 < x < 1$  10  
 $= 0 \quad \text{otherwise}$   
 Find the pdf of  $Y = 8x^3$ .  
 (b) If X and Y are independent RVs each following  $N(0, 2)$ , prove that  $Z = X/Y$  follows a Cauchy's distribution. 10  
 Also if X and Y each follow an exponential distribution with parameter 1 and are independent, find the pdf of  $U = X - Y$ .
4. (a) The joint pdf of (X, Y) is given by— 10  

$$f_{xy}(xy) = 24xy \quad x > 0, y > 0 \text{ and } x + y \leq 1.$$

$$= 0 \quad \text{elsewhere}$$
 Find the conditional mean and variance of Y given X.  
 (b) Prove the following :— 10  
 (i)  $E(X + Y) = E(X) + E(Y)$   
 (ii)  $E(XY) = E[X] E[Y]$  if X and Y are independent RVs.  
 (iii)  $E[Y/X] = E[Y]$  If X and Y are independent RVs  
 $E[X/Y] = E[X]$

29 Dec 2010

T.E. / Electronic & Telecommunication  
Sem VI

Con. 6076-10.

Micro Electronic  
( REVISED COURSE )

GT-7638

( 3 Hours )

[ Total Marks : 100

**N.B. :** (1) Question No. 1 is **compulsory**.

(2) Solve any **four** questions from **remaining** questions.

(3) Assume **suitable** data whenever **necessary** and mention the **same** in answer sheet.

1. Solve any **four** :—

20

(a) Define LSI, MSI, and VLSI.

(b) Draw various configurations of monolithic planar diode. Which one is best and why ?

(c) Explain hot carrier effects in MOSFET.

(d) List different types of resistors used in monolithic Integrated circuits.

(e) Differentiate between MOSFET and BJT.

2. (a) What are different types of single crystal growth technique ? Explain one of them in detail. 10

(b) Explain with neat diagram, how ion implantation is used to create junctions in monolithic Integrated circuits. 10

3. (a) Explain with neat cross-sectional views fabrication process of BJT. 10

(b) What are different isolation techniques used in Integrated circuits ? Explain one of them in detail. 10

4. (a) Explain operation of MOSFET with the help of its current-voltage characteristics. 10

(b) Explain fabrication process of NMOS transistor with neat diagrams. 10

5. (a) Explain operation of TTL NAND gate, with the help of voltage transfer characteristics. 10

(b) Discuss different parasitic effects in MOS transistors. 10

6. (a) Implement following function using standard CMOS logic :— 10

$$(i) Y = \overline{ABC + AD}$$

$$(ii) Y = \overline{A \cdot (B + D) + C}$$

(b) Draw the layout of CMOS inverter using  $\lambda$  design rules. 10

7. Write short notes on any **four** :—

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(a) Lateral and Vertical transistor.

(b) Photolithography.

(c) IC crossovers.

(d) Transient response of CMOS Inverter.

(e) IC Inductors.

Con. 6354-10.

Sem VI

(3 Hours)

[ Total Marks : 100

- N.B.:** (1) Question No. 1 is compulsory.  
 (2) Attempt any four questions out of remaining six questions.  
 (3) Assume suitable data if required.

1. (a) 
$$\underline{A} = \left\{ \frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{5} \right\}$$
 5

$$\underline{B} = \left\{ \frac{0.5}{2} + \frac{0.7}{3} + \frac{0.2}{4} + \frac{0.4}{5} \right\}$$

Calculate :

(i)  $\underline{A} \cup \underline{B}$     (ii)  $\overline{\underline{A}} \mid \overline{\underline{B}}$     (iii)  $\underline{A} \cap \underline{B}$

- (b) Explain any two types of De-fuzzification. 5  
 (c) Explain in brief delta learning rule. 5  
 (d) Explain salient features of Kohonen self organizing map. 5
2. (a) Prove the following properties of  $\lambda$ -cut on fuzzy relation. If  $\underline{R}$  &  $\underline{S}$  are the fuzzy relation :— 8

(i)  $(\underline{R} \cup \underline{S})_{\lambda} = R_{\lambda} \cup S_{\lambda}$

(ii)  $(\underline{R} \cap \underline{S})_{\lambda} = R_{\lambda} \cap S_{\lambda}$

(iii)  $(\overline{\underline{R}})_{\lambda} = \overline{R}_{\lambda}$

- (b) Draw the architecture of simple perceptron network. Explain briefly perceptron learning algorithm and develop a perceptron network to implement AND function. 12
3. (a) What is self-organizing map ? Explain the Kohonen self-organizing map with learning algorithm. 8  
 (b) Explain the various methods of De-fuzzification in detail. 8  
 (c) How is Hopfield network converted to Boltzman machine. 4

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4. (a) The following three membership functions of power transistors has given for 12 average current, average voltage and cost in Rs.

$$\underline{I} = \left\{ \frac{0.4}{0.8} + \frac{0.7}{0.9} + \frac{1}{1} + \frac{0.8}{1.1} + \frac{0.6}{1.2} \right\}$$

$$\underline{V} = \left\{ \frac{0.2}{30} + \frac{1}{45} + \frac{1}{60} + \frac{0.9}{75} + \frac{0.7}{90} \right\}$$

$$\underline{C} = \left\{ \frac{0.4}{0.5} + \frac{1}{0.6} + \frac{0.5}{0.7} \right\}$$

Find the following :—

(i) Fuzzy Cartesian product  $\underline{P} \cong \underline{V} \times \underline{I}$

$$\underline{T} \cong \underline{I} \times \underline{C}$$

$$r \cong \underline{P} \circ \underline{T} \text{ (max-min)}$$

$$q \cong \underline{P} \cdot \underline{T} \text{ (max-product)}$$

- (b) What is meant by simulated annealing ? Explain Boltzman machine with its training phase. 8
5. (a) Classify the given samples in to two cluster using Kohonen self-organizing map. (1100), (0001), (1000), (0011). Assume the learning rate as 0.2. 10
- (b) Using Perceptron learning rule, find the weights required to perform following classifications. Vector (1111) and (-1 -1 -1 -1) are the members of first class. Vectors (111 -1) & (1 -1 -1 1) are the member of second class. Use two output neurons. Assume learning rate as 0.9 and initial weight of 0.25. Using training vectors, test the response of the net. 10
6. (a) Explain the following terms : 10
- (i) Brain -state-in-a-box model.
- (ii) ANFIS.
- (b) Explain Genetic algorithm used for optimization with suitable example. 10
7. (a) Draw and explain Discrete Hopfield network. 10
- (b) Explain Forward modeling and Inverse modeling in training the neural network. 10

**N.B. :** (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) **Figures** to the **right** indicate **full marks**.

1. (a) Explain the mechanism of range tracking of a moving target. 5
- (b) Explain the factors which govern the pulse repetition frequency. 5
- (c) What are the properties of Sea and Land clutter ? 5
- (d) Explain Doppler shift and its role in pulsed and CW RADAR. 5
  
2. (a) What do you mean by RCS fluctuations ? Explain different Swerling's model for RCS fluctuations. 10
- (b) Explain the methods for the integration of radar pulses to improve detection. Define the term integration improvement factor. How does this factor affect the radar range equation ? 10
  
3. (a) Draw the block diagram of a FM-CW radar using sideband superheterodyne receiver and explain its principle of operation. 10
- (b) Discuss the major techniques available to radar designer to enable detection of desired targets in the presence of undesired clutter echoes. 10
  
4. (a) Draw the functional block diagram of an MTI radar system and explain its operation. Define the terms range tracking and MTI improvement factor. 10
- (b) What do you mean by blind speed ? Explain in detail how this problem is overcome in pulse doppler radar. 10
  
5. (a) Explain the working of two coordinate amplitude comparison monopulse tracking RADAR and sketch the ideal feed-aperture illumination for sum and difference channels. 10
- (b) Draw the block diagram of CW radar using IF stage in the receiver and explain its operation. What is the necessity for IF stage and the doppler bank filter ? 10
  
6. (a) Derive the radar range equation as governed by minimum detectable signal to noise ratio. Enumerate the system losses that might occur in a long range surveillance radar and indicate the typical value of the losses due to each factor. 10
- (b) What are the advantages of phased array antennas over conventional antennas for RADAR applications ? 10
  
7. Write short note on :—
- (a) Function of a duplexer in a radar system. 5
- (b) Conical scan tracking. 5
- (c) Factors which influence the bandwidth of a radar receiver. 5
- (d) Delay line canceler. 5

Con. 5749-10.

(REVISED COURSE)

GT-7635

[Total Marks : 100

Digital <sup>(3 Hours)</sup> Telephony.

- N.B. : (1) Question No. 1 is compulsory.  
 (2) Attempt **four** questions out of **six** questions.  
 (3) **Figures** to the **right** indicate **full** marks.  
 (4) Assume **suitable** data wherever **required** with **justification**.

- Q.1> 1) Differentiate Between Time Division Switching and Space Division Switching. (05)  
 2) Write a note on Waiting Time Jitter. (05)  
 3) Explain working principle of Telephone using DTMF. (05)  
 4) Write a short note on RSVP. (05)
- Q.2> 1) In a Group of 10 Servers, each is occupied for 30 minutes in an observation interval of two hours. Calculate the traffic carried by the group. (10)  
 2) What is Digital Subscriber Loop (DSL)? State various DSL Technologies in detail. (10)
- Q.3> 1) Describe ATM Protocol Stack in detail, clearly mentioning Adaptation Layer. (10)  
 2) A subscriber makes three phone Calls of three minutes, four minutes and two minutes duration in a one-hour period. Calculate the subscriber traffic in Erlangs, CCS and CM. (10)
- Q.4> 1) Explain following terms with respect to Digital Switched Networks: 'Network Management' and 'Network Control'. (10)  
 2) a) State Advantages and Disadvantages of 'Digital Voice Networks'. (05)  
 b) Master-Slave Synchronization and Packetization. (05)
- Q.5> 1) Explain TCP /IP Protocol Architecture in detail. (10)  
 2) What is VOIP? Explain detailed architecture of H.323 Protocol. (10)

- Q.6>**
- 1) Describe ISDN, its categories, content and working in detail. (10)
  - 2) Write a short note on : (05)
    - a) Network Blocking Probability.
    - b) Master-Slave Synchronization and Packetization (05)

- Q.7>**
- 1) Explain SS7 Protocol Architecture in detail. (10)
  - 2) a) Compare between STS and TST (05)  
b) Explain the Benefits of ATM (05)
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