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SEAT No. _____

Sardar Patel University
Vallabh Vidyanagar

M.Sc. (SEM II) (Electronics & Communication)

PS02CELC01: Analog and digital communication

Date: 10/04/2017

Day: Monday

Time: 10:00 am to 1:00 pm

Total Marks: 70

- Note:**
1. State and assume the necessary data, wherever required.
 2. Figures to the right indicate full marks.

Q-1 Choose the correct answer.

[08]

1. Which of the following is amplitude modulation technique?

(a) ASK	(b) PWM
(c) PM	(d) PCM
2. The transmission bandwidth for line codes, must be as _____ as possible

(a) small	(b) large
(c) medium	(d) none
3. If η is efficiency then which is the correct order?

(a) $\eta_{FM} < \eta_{AM} < \eta_{DSBSC}$	(b) $\eta_{AM} < \eta_{DSBSC} < \eta_{FM}$
(c) $\eta_{AM} < \eta_{FM} < \eta_{DSBSC}$	(d) $\eta_{DSBSC} < \eta_{AM} < \eta_{FM}$
4. If cross correlation is taken at origin is zero the two signals are _____.

(a) parallel	(b) orthogonal
(c) skew	(d) none
5. In audio communication and data transfer. When better signal quality is required WBFM) is used at the expense of greater spectrum usage.

(a) WBFM	(b) NBFM
(c) PM	(d) None
6. Bipolar NRZ code is also known as _____.

(a) AMI	(b) pseudoternary
(c) both (a) and (b)	(d) none
7. The quantizing and encoding are performed in the circuit which is called _____.

(a) D to A converter	(b) A to D converter
(c) A to A converter	(d) D to D converter
8. Which of the following is phase shift keying modulation technique?

(a) QPSK	(b) BPSK
(c) both a and b	(d) PCM

- Q-2 Answer in short[ANY SEVEN] [14]
- 1 Determine the signal energy for $x(t)=e^{-3|t|}$.
 - 2 Define the term: Modulation index.
 - 3 What is sampling Theorem? State Nyquist criteria for sampling without aliasing.
 - 4 Give the block diagram of ASK transmitter.
 - 5 Derive the bandwidth for BPSK signal.
 - 6 Give the difference between PCM and DM.
 - 7 What are the relationship between FM and PM?
 - 8 State the properties of autocorrelation for periodic signals.
 - 9 Explain NRZ and RZ encoding.
- Q-3 A Prove the Parseval's Theorem for power signal. [06]
 B Explain balance modulator with necessary diagram. [06]
- OR**
- B Explain Power spectral density with necessary equation. [06]
- Q-4 A Write a note on WBFM. [06]
 B Explain different type of line encoding methods. [06]
- OR**
- B Determine the Fourier transform of the Gaussian pulse $x(t)= e^{-\pi t^2}$. [06]
- Q-5 A Write a detail note on PCM modulation. State advantages and disadvantages of PCM. [06]
 B State and prove time convolution theorem. [06]
- OR**
- B Write a detail note on Delta modulation. [06]
- Q-6 A Explain Frequency Shift keying (FSK) modulation in detail. [06]
 B Write a short note on source encoding. [06]
- OR**
- B Write a short note on Companding method. [06]

SEAT No. _____

1. Figure to the right indicate maximum marks for the question

Q-1

- A) A circuit that adds two single digit binary number is known as
 i. Full Addder ii. Half Addder
 iii. Addder with Carry iv. Double Addder
- B) In SSI chip number of gates are
 i. < 10 ii. 10 to 99
 iii. 99 to 1000 iv. more than 1000
- C) In n variable k-map has
 i. n^2 cell ii. n^n cells
 iii. 2^n cells iv. $n2n$ cells
- D) A 9 square will eliminate how many variable?
 i. 2 ii. 4
 iii. 9 iv. 3
- E) Which among the following is transparent latch?
 i. JK ii. D
 iii. RS iv. None
- F) A 6-bit ripple counter has how many stable states?
 i. 64 ii. 16
 iii. 32 iv. 6
- G) In a RS flip-flop $R=S=1$, the state Q_{n+1} of the flip flop after the clock pulse will be
 i. 0 ii. Q_n
 iii. 1 iv. Invalid
- H) An 8-bit synchronous counter uses flip-flop with propagation delay time of 50 ns each. The maximum possibilities time required for change of state will be _____.
 i. 200ns ii. 100ns
 iii. 50ns iv. 25ns

[08]

Q-2 Answer any **seven**, in short. (Two marks each)

[14]

- 1 Show the circuit diagram of X-NOR gate.
- 2 State the De-morgan's First and Second theorem.
- 3 What is K-map? State it's advantages and disadvantages.
- 4 What is Multiplexer? Explain in brief.
- 5 Show how to obtain the all the basic gates using NAND gate.
- 6 What do you understand by the word modulus in MOD-N counter?
- 7 Differentiate between Synchronous and asynchronous counter circuits.
- 8 What is *lock-out* condition in counter circuit?
- 9 List and explain shortly, the two methods to represent the clocked sequential circuits.

P.T.O.

1/2

Q-3 [a] Do as directed: [06]
 1. Convert $(10111.101)_2$ to decimal
 2. Convert $(4ABC)_{16}$ to binary
 3. Convert $(2598.675)_{10}$ to hexadecimal

Q-3 [b] Reduce the expression $F = \sum m(0, 1, 2, 3, 4, 6, 10, 11, 14)$ by SOP & POS. Also find which one requires lesser hardware. [06]

OR

Q-3 [b] With neat sketch diagram explain the Johnson Counter circuit in detail. [06]

Q-4 [a] Reduce the expression $F = \prod M(0, 1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14, 15)$ by POS and implement in to NOR logic. [06]

Q-4 [b] Perform the followings: [06]
 1. Subtract 24 from 46 using 8-bit 2's complement technique.
 2. Carry out XS-3 addition of 57 with 18.
 3. Transform $(11100111)_2$ to Gray Code

OR

Q-4 [b] With necessary circuit diagram, truth table and waveforms explain MOD-9 synchronous counter. [06]

Q-5 [a] Reduce the following Boolean expression: $\overline{\overline{A}B + ABC + A(B + \overline{A}B)}$ [06]

Q-5 [b] Perform the following. [06]
 (I) Perform the BCD addition of 25 & 13.
 (II) Subtract 275 from 367 using XS-3 code.
 (III) Convert gray 1100111 to binary.

Q-5 [b] What is Digital Comparator circuit? Explain 1-bit magnitude comparator, in detail. [06]

Q-6 [a] What is triggering? Give different types of triggering mechanisms used in digital circuit and explain the working of edged triggering D flip-flop? [06]

Q-6 [b] Give detail account of clocked RS flip-flop. [06]

OR

Q-6 [b] What is PLA? Show how PLA circuit can be programmed to implement the 3-bit binary to Gray converter. [06]

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(2)

1. Figure to the right indicate maximum marks for the question

Q-1

[08]

- A) Which topology needs a central controller or Hub?
 i. Star ii. Bus
 iii. Mesh iv. Ring
- B) Transmission media is usually categorized as _____.
 i. guided or unguided ii. determined or undetermined
 iii. fixed or unfixed iv. metallic or non-metallic
- C) A set of rules that governs data communication
 i. Protocols ii. Standards
 iii. RFCs iv. None of the mentioned
- D) Which error detection method uses 1's compliment?
 i. Parity check ii. Two dimensional parity check
 iii. CRC iv. Checksum
- E) The most primitive random access method _____.
 i. ALOHA ii. Token Passing
 iii. CSMA RS iv. Channelization None
- F) A telephone network is an example of _____.
 i. Packet switching ii. Circuit switching
 iii. Message switching iv. All of above
- G) Which of the following is connecting device?
 i. Bridge ii. HUB
 iii. Repeater iv. All of above
- H) The _____ traffic shaping method gives a host credit for it's idle time.
 i. Token Bucket ii. Bursty Bucket
 iii. Leaky Bucket iv. Traffic Bucket

Q-2 Answer any **seven**, in short. (Two marks each)

[14]

- 1 What is Network?
- 2 Differentiate between guided media from unguided media?
- 3 Why the co-axial cable is superior to Twisted pair cable?
- 4 How the Automatic Repeat Request (ARQ) does correct the error?
- 5 What is Multiple Access? List out the different multiple accesses.
- 6 Discuss about Interconnecting Device Gateway.
- 7 What do you mean by congestion?
- 8 Give the advantages and disadvantages of cryptography.
- 9 Compare and contrast between WWW and HTTP.

P.T.O.

- Q-3 [a] Give the classification of Network. What is Topology, Discuss, in detail, the concept of Topology with its merits and de-merits. [06]
- Q-3 [b] What is Transmission media? Discuss about guided transmission media. [06]
- OR**
- Q-3 [b] With a block diagram explain the functions of different layers in OSI reference model. [06]
- Q-4 [a] Discuss the selective repeat ARQ sliding window at both the sender and the receiver side. [06]
- Q-4 [b] Discuss the CSMA protocol with persistent strategies. [06]
- OR**
- Q-4 [b] Explain, in brief, the mechanism of Go back n ARQ with figure. [06]
- Q-5 [a] What is Switching? Explain the concept of circuit switching, in brief. [06]
- Q-5 [b] What is firewall? Explain different types of firewall. [06]
- Q-5 [b] Describe different open and closed congestion control and also explain Leaky bucket and Token bucket briefly. [06]
- Q-6 [a] What is Cryptography? Explain the Secret key and the public key cryptography with suitable example. [06]
- Q-6 [b] Generate cipher text for the plain text "COMMUNICATION" using RSA algorithm. Also decrypt the cipher text and obtain the original plain text. (Take $p=5$ & $q=7$) [06]
- OR**
- Q-6 [b] With key components and necessary flows, describe how email works. Identify key standards that apply. [06]

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