VIT

Reg. No. :

Final Assessment Test (FAT) - July/August 2023

gramme	**B.Tech.**	Semester	**Fall Inter Semester 22-23**
urse Title	**DIGITAL COMMUNICATION SYSTEMS**	Course Code	**BECE306L**
culty Name	**Prof. USHA RANI S**	Slot	**D1+TD1**
		Class Nbr	**CH2022232500085**
me	**3 Hours**	Max. Marks	**100**

Section-A (7 X 10 Marks)
Answer All questions

01. Which block would be utilized in a block diagram for digital communication- **[10]**
(a) Ensuring that the bits are recovered at the receiver with few changes as possible and ensuring that the transmitted data is difficult to intercept by eavesdroppers. (5 Marks)
(b) Ensuring that the transmissions from many users/applications can be sent out on a single data stream. In addition, draw the block diagram of the entire digital communication system to support your answer. (5 Marks)

02. A source encoding scheme which uses a single bit to encode changes in the sampled values. This single bit translates to an addition or subtraction of the voltage levels by a step, when recovering the analog signal. This "step" increases or decreases its value which is dynamically changed based on the input analog signal. Analyse the need for such a dynamically changing step value and support your analysis with detailed description. How would a change in the sampling rate affect the performance of system with respect to SNR? **[10]**

03. Considering a random binary sequence where bits are statistically independent and equally likely, derive an expression of power spectral density for Polar NRZ representation. Draw a rough sketch of the power spectral density obtained. **[10]**

04. Derive the expression for the Nyquist criterion for distortion less baseband transmission in the absence of noise in terms of time domain & Frequency domain representation. **[10]**

05. Consider the four signals given below and apply GSOP: **[10]**

$$S_1(t) = 1 \qquad (0 \le t \le 2)$$

$$S_2(t) = \begin{cases} 1 & (0 \le t \le 1) \\ -1 & (1 \le t \le 2) \end{cases}$$

$$S_3(t) = \begin{cases} 1 & (0 \le t \le 2) \\ -1 & (2 \le t \le 3) \end{cases}$$

$$S_4(t) = -1 \qquad (0 \le t \le 3)$$

(a) Determine the orthonormal basis functions. (5 Marks)
(b) Represent all the signals by using orthonormal basis functions. (5 Marks)

06. For a linear feedback shift register with three D flip flops (S–3). Calculate the maximum-length Pseudo random sequence for feedback taps (3, 1). Initial sequence (S1, S2, S3) can be taken as (1, 0, 0). Draw the schematic arrangement and verify all the properties of PN sequence. **[10]**

07. What is the use of Spread spectrum? Explain the types of spread spectrum and discuss the generation and detection of direct sequence spread spectrum (DSSS) with proper schematic diagram. [10]

Section-B (2 X 15 Marks)

Answer All questions

08. A quadrature signaling scheme modulates phase of the carrier based on the incoming Gray coded bits and the transmitted modulated signal will look like [15]

$$s_i(t) = \sqrt{\frac{2E_b}{T_b}}\cos(2\pi f_c t + \frac{(2i-1)\pi}{4}), \quad i = 1,2,3,4$$

(a) Identify the signaling scheme used and explain the operation of transmitter and receiver with neat diagram. (8 Marks)

(b) Identify the coordinates of the message points with necessary mathematical equations and draw the signal constellation diagram. (7 Marks)

09. In an LBC, the syndrome is given by [15]

$$S_1 = r_1 + r_2 + r_3 + r_5$$

$$S_2 = r_1 + r_2 + r_4 + r_6$$

$$S_3 = r_1 + r_3 + r_4 + r_7$$

(a) Find the parity check matrix [H] and the codeword for all input sequences. Also draw the encoder circuit. (8 Marks)

(b) How many errors it can detect and correct? What is the syndrome for the received data 1011011 ? Comment is it a hamming code or not with proper justification. (7 Marks)