*R20 Regulation* *Subject code:3P5DC*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

## B.Tech V Semester Supplementary Examinations, June/July 2023

## DIGITAL COMMUNICATIONS

**(Electronics and Communication Engineering)**

*Maximum Marks: 70* Date:28.06.2023 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 Draw the ASK waveform for 1 0 1 1 0 0 1 1.

2 What is Flat Top sampling?

3 The mark and space frequencies are separated by 20 kHz in a coherent binary FSK transmission. What is the maximum allowed value of bit rate such that the orthogonality condition will prevail?

4 What is Shannon limit for information capacity?

5 Find the entropy of a source that emits one of the three symbols A, B and C in a statistically independent sequence with probabilities $\frac{1}{2}, \frac{1}{4}, \frac{1}{4}$ respectively.

6 Define Figure of merit.

7 What is convolutional code? How is it different from block codes?

8 List the properties of cyclic codes.

9 When is the PN sequence called as maximal length sequence?

10 Define frequency hopping.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 Explain briefly about the generation and detection of Delta modulation with neat diagram. [10]

OR

12 The signal g(t) = 10 cos(20πt) cos(200πt) is sampled at the rate of 250 samples per second. [10]
(a)Determine the spectrum of the resulting sampled signal.
(b)Specify the cut-off frequency of the ideal reconstruction filter so as to recover g(t) from its sampled version.
(c)What is the Nyquist rate for g(t).
d)Explain the reconstruction process of a message from its samples

13 A.Explain coherent and non-coherent ASK detectors. [5]
B.Explain FSK detection using PLL. [5]

OR

14 Write a note on the PSK modulator and demodulator. Draw its phasor and constellation diagram. Explain bandwidth consideration of PSK. [10]

15 A DMS X has five symbols $x_1, x_2, x_3, x_4$, and $x_5$ with $P(x_3) = 0.4$, $P(x_2) = 0.19$, $P(x_3) = 0.16$, $P(x_4) = 0.15$, and $P(x_5) = 0.1$ [10]

a. Construct a Shannon-Fano code for X and calculate the efficiency of the code.
b. Repeat for the Huffman code and compare the results.

OR

16 What is eye pattern and explain how the performance of a system is measured with the help of eye pattern? [10]

17 Consider a linear block code with a generator matrix [10]

$$\begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

(i) Enumerate the parity check matrix.
(ii) Trace the error detecting and capability of the code.
(iii) Draw the encoder and syndrome calculation circuits.
(iv) Write the syndrome for the received vector $r = [1 \quad 1 \quad 0 \quad 1 \quad 0 \quad 1 \quad 0]$.

OR

18 A.Describe the cyclic codes with the linear and cyclic property. Also represent the cyclic property of a codeword in polynomial notation. [5]
B.Determine how Viterbi decoding algorithm is used for convolutional code. [5]

19 Describe the working of direct sequence spread spectrum systems. [10]

OR

20 Explain the generation of frequency hopped spread spectrum signals. [10]