b) For the encoder shown in figure below for a rate r=1/2, constraint length K = 4, Convolutional code. Determine the encoder output produced by the message sequence 10111 ... using time domain approach and transform domain approach. **(15)**

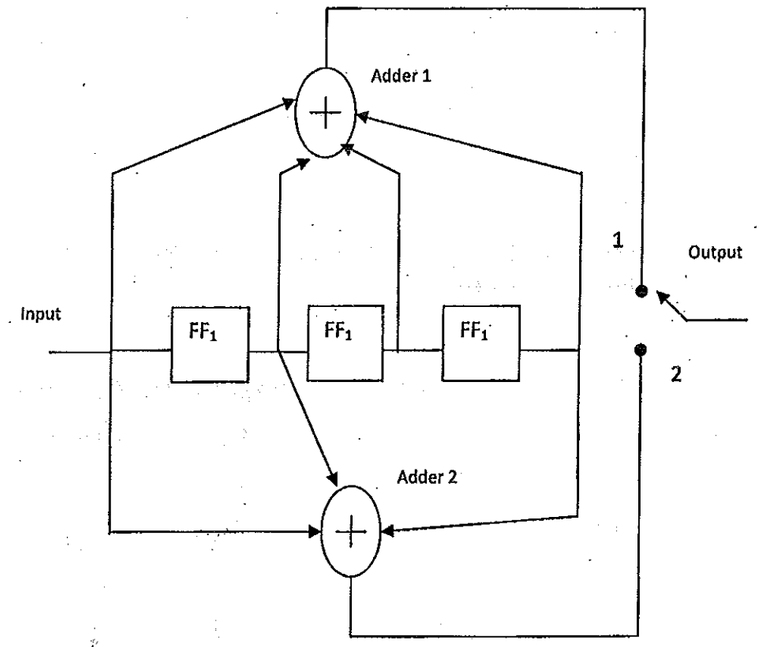

Fig. 16(b)

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90181

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Third/Fourth Semester
Computer Science and Engineering
EC 8395 – COMMUNICATION ENGINEERING
(Common to Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)
(Regulations 2017)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. For an AM-DSBFC wave with a peak unmodulated carrier voltage Vc = 10 Vp, a load resistance R_L = 1 ohm and a modulation coefficient m = 1. Determine power of the carrier and the USB, LSB, total sideband power.

2. A carrier wave of amplitude 10 V and frequency 100 MHz is frequency modulated by a sinusoidal voltage. The modulating voltage has amplitude of 5 V and frequency fm = 20 KHz. Frequency deviation constant is 2 KHz/V. Given : $J_0 = 0.94$, $J_1 = 0.24$, $J_2 = 0.03$. Draw the FM spectrum.

3. Define sampling theorem.

4. Bandwidth of the input to PCM system is restricted to 4 KHz. The input varies from 3.8 V to –3.8 V and has average power of 30 mW. The required signal to quantization noise power ratio is 20 dB. The modulator produces binary output. Assume uniform quantization. Calculate the number of bits required / sample.

5. Consider the data bit sequence 10111010. Sketch the nature of wave transmitted by BPSK transmitter.

6. State the necessity of equalizers.

7. A message source generating four message with probabilities 0.5, 0.25, 0.125 and 0.125. Calculate the entropy of source.

8. A discrete memory less source has the letters A, B, C, D, E, F and G with corresponding probabilities {0.08, 0.2, 0.12, 0.15, 0.03, 0.02, 0.4}. Devise a Huffman code for the above source and determine the average length of the code word.

9. List the advantages of spread spectrum modulation.

10. What do you mean by jamming margin ?

PART – B **(5×13=65 Marks)**

11. a) With a neat sketch, explain the working of a super heterodyne receiver.

(OR)

b) Outline the principle of slope detector and explain the operation of balanced slope detector method of FM demodulation technique.

12. a) Explain the basic elements of a PCM system in detail.

(OR)

b) Outline Delta modulation transmitter and receiver blocks in detail and comment on the quantization noise.

13. a) Discuss on the operation of balanced modulator, and say how the second order harmonics are eliminated in the QPSK receiver.

(OR)

b) Explain Duobinary signaling scheme. Draw the frequency response and impulse of duobinary scheme. How modified Duobinary scheme overcomes the basic method ?

14. a) The parity check matrix of a particular (7,4) linear block code is given by

$$[H] = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

i) Find the generator matrix (G).

ii) List all the code vectors.

iii) What is the minimum distance between code vectors ?

iv) How many errors can be detected ? How many errors can be corrected ?

(OR)

b) For a data compression technique, performance of Huffman coding and Shannon-Fano coding are essential.

Given :

$p(x_1) = 0.3$, $p(x_2) = 0.25$, $p(x_3) = 0.2$, $p(x_4) = 0.12$, $p(x_5) = 0.08$, $p(x_6) = 0.05$.

Calculate entropy of the source, average length of the code, efficiency and reduncy of the code and compare them.

15. a) Explain the generation of PN sequence and prove its properties.

(OR)

b) With a neat sketch describe the principle of CDMA technique.

PART – C **(1×15=15 Marks)**

16. a) A communication channel matrix for the ternary channel is given as

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & p & 1-p \\ 0 & 1-p & p \end{bmatrix}$$ Assuming source probabilities as $P(X_1) = P$ and $P(X_2) = P(X_3)$.

Determine the source entropy H(X) and the mutual information I(X; Y). Also determine the capacity of the channel. **(15)**

(OR)