Con. 3758-10.   (REVISED COURSE)   **AN-4213**

(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 wherever **necessary** and **justify** it.

1. (a) Explain the following questions with proper illustration –   **10**

    (i) BFSK transmission can be orthogonal or non orthogonal.

    (ii) Phase continuity is maintained in MSK signal.

(b) Define the following terms –   **10**

    (i) Hamming weight and Hamming distance

    (ii) Systematic and non systematic code

    (iii) Code rate

    (iv) Entropy and redundancy.

2. (a) Define the term Random Variable and explain the meaning of the terms discrete RV and continuous RV.   **6**

(b) A three digit message is transmitted over a noisy channel having a probability of error $P(E) = \dfrac{2}{5}$ per digit. Find out the corresponding PDF and CDF. Also find the probability of more than one error.   **8**

(c) State and explain shannon Heartley theorem. Also explain bandwidth - S/N trade off.   **6**

3. (a) An analog signal is bandlimited to 4 KHz. It is sampled at Nyquist rate and the samples are quantized into 4 levels. The quantization levels Q_1, Q_2, Q_3 and Q_4 are independent messages and have probabilities $P_1 = P_2 = 1/8$ and $P_3 = P_4 = 3/8$. Find the information rate of the source.   **6**

(b) Find the Huffman code for a source alphabet of { A,B,.., H } with the probabilities of $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{16}, \dfrac{1}{16}, \dfrac{1}{32}, \dfrac{1}{32}, \dfrac{1}{32}, \dfrac{1}{32}$. Also calculate the average code length and code efficiency.   **8**

(c) Explain the necessity of line codes for data transmission. State different types of line codes.   **6**

[**TURN OVER**

4. (a) For a systematic linear block code, the three parity check digits, C_4, C_5 and C_6 are given by :　**10**

$C_4 = d_1 \oplus d_2 \oplus d_3$
$C_5 = d_1 \oplus d_2$
$C_6 = d_1 \oplus d_3$

  (i) Construct generator matrix

  (ii) Construct code generated by this matrix

  (iii) Determine error detecting and correcting capability.

  (iv) Decode the received word 10 11 00.

(b) For the convolutional encoder shown below sketch the code tree and trellis diagram.　**10**
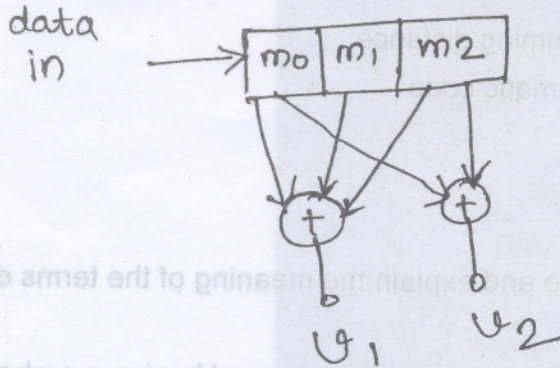
Obtain the convolution code for the input bit sequence 11 00 11.

5. (a) Explain the Nyquist criteria for distortionless baseband binary transmission.　**10**

(b) What is duo-binary encoding ? Explain with the neat block diagram. How the duo-binary encoding reduces the bandwidth requirements ?　**10**

6. (a) Draw block diagram of a generator of DPSK. Also show how data is recovered from DPSK signal.　**8**

(b) Explain 4-ary PSK alongwith the following points –　**12**

  (i) Offset and Non-offset QPSK

  (ii) Modulation and demodulation block diagram of offset QPSK.

  (iii) Plot of power spectral density

  (iv) Signal space representation and hence Eucledian distance.

7. Write short notes on any **four** :–　**20**

  (a) PN sequence generator

  (b) Viterbi algorithm

  (c) FH spread spectrum

  (d) Eye pattern.

  (e) Probability error of matched filter.