(3 Hours) **[Total Marks : 80]**

N.B.: (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR **[20]**

a What is modulation? What are the types of modulation?

b Explain different error control systems

c Compare BASK, BPSK, BFSK, 4-ary FSK and 8-ary PS in terms of bandwidth

d Calculate 4-bits checksum for the data 110011111011

e Calculate CRC bits for the data 10000 using $g(x) = x^8 + x^2 + x + 1$

2 **a** Explain Shannon-Hartley Theorem and determine the channel capacity if the bandwidth is infinite **[10]**

b Write the algorithms for determining Huffman code and Shannon-Fano code and select a suitable example to show the code generation **[10]**

3 **a** What is line code? What are the parameters need to be considered for selecting a line code for a specific allocation. **[10]**

b Draw the shift register circuit for (7,4) systematic cyclic code encoder with $g(x) = x^3 + x^2 + 1$ and generate parity bits for the data 1000 and 1010 **[10]**

4 **a** Explain error detection and correction procedure for systematic linear block code **[10]**

b Derive the PSD of QPSK signal, draw the power spectrum and find the bandwidth **[10]**

5 **a** Sketch the signal space diagram of MSK and determine the error probability **[10]**

b Explain 16-ary QASK modulator and demodulator with suitable equations **[10]**

6 **a** Show that the performances of matched filter and correlator are identical **[10]**

b Explain Viterbi's decoding algorithm with a suitable example **[10]**