3 Hours/100 Marks   Seat No. ☐☐☐☐☐☐☐☐

Instructions : *(1)* **All** *questions are* **compulsory***.*
(2) *Illustrate your answers with* **neat** *sketches* **wherever** *necessary.*
(3) *Figures to the* **right** *indicate* **full** *marks.*
(4) *Assume* **suitable** *data, if* **necessary***.*

MARKS

1. A) Attempt **any three**.   **(4×3=12)**

   i) Explain the necessity of modulation in electronic communication system.

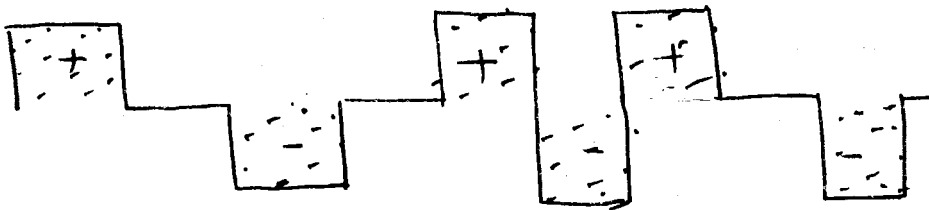   ii) Find out the digital data from given waveforms of Bipolar AMI encoding.

Fig. 1.1

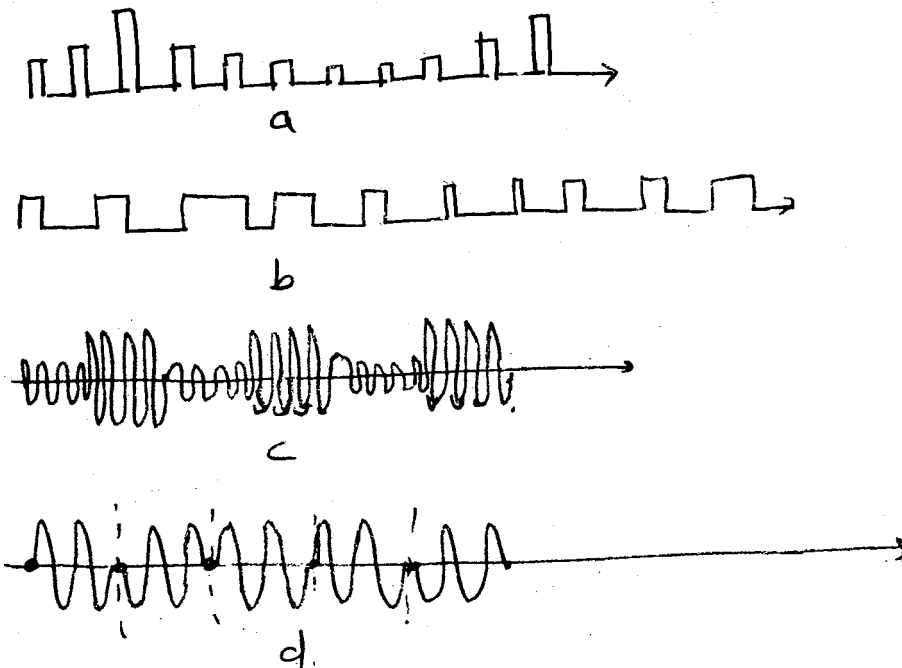   iii) Identify following waveforms belongs to which modulation technique.

Fig. 1.2

P.T.O.

    iv) An AM transmitter uses carrier freq. of 1600 KHz with 8 Volt amplitude. It is modulated to depth of 75% with signal of 2000 Hz. Determine amplitude and frequencies of side bands.

1. B) Attempt **any one** :   **(6×1=6)**

    i) Write the difference between AM and FM on the basis of definition, waveform, bandwidth and noise immunity, modulation index and frequencies used for transmission.

    ii) Draw and explain method of PWM generation using comparator with w/f.

2. Attempt **any four** :   **(4×4=16)**

    i) With neat sketch explain ionospheric propagation.

    ii) Give bandwidth equations for AM and FM signal in frequency domain with neat sketch.

    iii) Draw circuit diagram of PAM generation to obtain flat top sampling. Explain operation with help of waveforms.

    iv) Draw QPSK signal for data

       1 1 0 1 1 0 0 1

    v) What are uplink and downlink frequencies in satellite system ? List range of uplink and downlink frequency range of s band and c band.

    vi) Draw block diagram of transponder and explain operation.

3. Attempt **any four** :   **(4×4=16)**

    i) What is virtual height ? Explain actual height and virtual height with waveforms.

    ii) Describe space wave propagation and state advantages and disadvantages of space wave propagation.

    iii) Describe generation of PPM from PWM with dia. and waveforms.

    iv) Draw block diagram of BPSK generation and explain with w/f.

    v) Explain concept of FDM using block diagram of FDM transmitter and receiver.

4. a) Attempt **any three** : (3×4=12)

   i) Draw simple diode detector for AM detection, describe its working with waveforms.

   ii) Define Bit rate and Band rate. In digital to analog modulation system signal carries 4 bits per signal element. If no. of signal elements per second are 500, calculate bit rate.

   iii) How PWM is demodulated ? Explain with block diagram and waveforms.

   iv) Explain methods of satellite stabilization viz spiz stabilization and 3 Axes stabilization.

4. b) Attempt **any one** : (6×1=6)

   i) Describe Duct Propagation and ionospheric scatter propagation with diagram.

   ii) Draw Polar RZ and split phase Manchester data encoding for data 10110100.

5. Attempt **any four** : (4×4=16)

   i) Describe ground wave propagation. State its applications.

   ii) Draw super heterodyne receiver block diagram and show waveforms at intermediate points.

   iii) Draw block diagram of PCM transmitter and explain function of sampler, quantizer and A to D conversion.

   iv) Calculate Bits per second of PCM system in which sampling frequency is 8 KHz and each sample is converted into 8 bits with A.D.C.

   v) Explain FSK modulation and demodulation with block diagram.

   vi) Draw multiplexing hierarchy in FDM.

6. Attempt **any four** : **(4×4=16)**

   i) Define MUF and critical frequency in respect to sky wave propagation.

   ii) Derive expression of AM wave and prove that it contain 3 discrete freq. components fc, fc + fm and fc – fm.

   iii) A 16 KW carrier is amplitude modulated at 75% depth by audio signal. Calculate the sideband power and total transmitted power.

   iv) Explain B8Z5 and HDB3 encoding techniques with waveforms.

   v) Explain concept of frequency reuse and cell splitting in mobile communication.

   vi) Define Handoff mechanism and list different types of handoff. Explain any one.

_____