12425

3 Hours / 70 Marks   Seat No.

Instructions :
(1) All Questions are *compulsory.*
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
(8) Use of steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. **Attempt any FIVE of the following :**   **10**

(a) Define half duplex and full duplex type of communication.

(b) State the need of modulation.

(c) Draw the basic block diagram of communication system.

(d) State the IF frequency and bandwidth of FM receiver.

(e) State the need of de-emphasis circuit used with FM receiver.

(f) What is fading ? Write two reasons of fading.

(g) Draw radiation pattern of yagi-uda antenna.

2. **Attempt any THREE of the following :** **12**

   (a) State and explain the types of noise in communication system.

   (b) Draw block diagram of AM super-heterodyne receiver and explain its working principle.

   (c) Compare AM and FM on the basis of

      (i) Definition

      (ii) Modulation index

      (iii) Noise immunity

      (iv) No. of sidebands.

   (d) A 800 W carrier is amplitude modulated to a depth of 80%. Calculate

      (i) Total power in modulated wave

      (ii) Power in sidebands.

3. **Attempt any THREE of the following :** **12**

   (a) Draw FM signal in (i) Time Domain (ii) Frequency Domain.

   (b) Draw labelled sketch of ionosphere. What changes takes place in ionosphere at night ?

   (c) Compare between asynchronous and synchronous transmission mode (any four modes).

   (d) Draw practical AM diode detector circuit. Sketch its input and output waveforms.

4. **Attempt any THREE of the following :** **12**

   (a) Describe the term virtual height with the help of diagram showing ionized layer and path of wave.

(b) A single tone FM is represented by the voltage equation as V(t) = 12 cos $(6 \times 10^8 \, t + 5 \sin 1250 \, t)$. Determine the following :

   (i)   Carrier frequency
   (ii) Modulating frequency
   (iii) Modulation index
   (iv) Maximum deviation

(c) Redraw the block diagram by identifying the blank blocks. (Fig. 1)
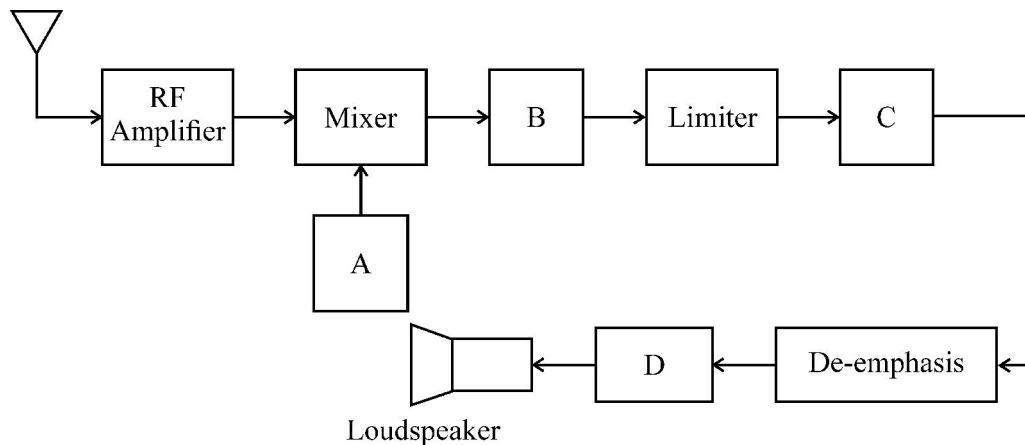
(Fig. 1)

(d) Explain the following terms :

   (i) Critical frequency
   (ii) Skip Distance

(e) Compare resonant and non-resonant antenna for the given parameter :

   (i)   Definition
   (ii) Direction or radiation
   (iii) Formation of standing waves
   (iv) Radiation pattern

5. **Attempt any TWO of the following :**   **12**

(a) Compare ground wave propagation, sky wave propagation and space wave propagation on the following parameter :

   (i)   Frequency of operation   (ii) Path followed
   (iii) Distance covered   (iv) Effect of fading
   (v)   Application   (vi) Disadvantage

(b) (i) Derive the expression of total power transmitted P_t in terms of P_C and ma.

(ii) Draw the AM wave for the given modulation index (ma) (i) ma = 1 (ii) ma < 1 (iii) ma > 1.

(c) Explain the following terms related to antenna :

(i) Polarization

(ii) Beam width

(iii) Antenna gain.

6. **Attempt any TWO of the following :** 12

(a) (i) Explain labelled structure of folded dipole antenna and its radiation pattern.

(ii) List any two applications of folded dipole antenna.

(b) For the given frequency band in electromagnetic spectrum, state frequency and application :

(i) Radiowave

(ii) Microwave

(iii) X-ray

(c) (i) An audio frequency signal $10 \sin (2\pi \times 10^3 t)$ is used to modulate amplitude of a carrier $20 \sin (2\pi \times 10^4 t)$. Calculate :

(1) modulation index

(2) sideband frequencies

(ii) In FM maximum deviation is 75 kHz and the maximum modulating frequency is 10 kHz, calculate the deviation ratio and bandwidth of FM.

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