313326

24225

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.

Marks

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

(a) Define analog and digital signal with neat sketch.

(b) Differentiate between simplex and half duplex mode of communication.

(c) Draw a block diagram of high level AM transmitter.

(d) In AM, modulating signal frequency is 10 kHz and carrier frequency is 1 MHz, determine frequency components in AM wave.

(e) List different methods for detection of FM signal (FM receiver).

(f) List any four characteristics of ground wave propagation.

(g) Sketch radiation pattern of Yagi-Uda antenna.

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

(a) Choose correct frequency range for the following applications :

(i) Voice communication

(ii) Mobile communication

(iii) FM radio broadcasting

(iv) Satellite communication

(b) Explain the concept of Pre-emphasis with neat labelled diagram.

(c) Compare sky wave and space wave propagation w.r.t. following points :

(i) Frequency range

(ii) Effect of fading

(iii) Polarization

(iv) Applications

(d) In FM, if maximum deviation is 70 kHz and maximum modulating frequency is 10 kHz, calculate deviation ratio and bandwidth of FM.

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

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

(b) Explain the function of FM demodulator contains phase lock loop with neat block diagram.

(c) Name the different layers of atmosphere which satisfy following conditions :

(i) Reflects LF, absorbs MF & HF waves to some degree.

(ii) Particularly absorbs HF waves yet allowing them to reach upper layer.

(iii) Exists in day time only.

(iv) Exists in day time but merges with F2 layer at night time.

(d) Explain working of half wave dipole antenna with its radiation pattern.

(e) Find out type of propagation for the following applications :

(i) FM radio broadcasting

(ii) Ship to shore communication

(iii) Microwave links

(iv) Satellite communication

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

(a) A 12 kW carrier is amplitude modulated by two sine waves to a depth of 0.5 & 0.6 respectively. Calculate total power of modulated carrier.

(b) Compare narrow band FM & wide band FM w.r.t.

(i) Modulation index

(ii) Maximum deviation

(iii) Range of modulating frequency

(iv) Application

(c) Define the following terms w.r.t. sky wave propagation :

(i) MUF (Max. Usable Frequency)

(ii) Actual height

(iii) Virtual height

(iv) Critical frequency

(d) Explain the structure of rectangular Microstrip Patch antenna with its radiation pattern.

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

(a) (i) Define serial transmission with neat sketch.

(ii) Differentiate between synchronous and asynchronous transmission. (any four points)

(b) Define modulation index of AM wave. Explain effect of m on AM wave for $m < 1$, $m = 1$, $m > 1$ and $m = 0$ (m – modulation index).

(c) (i) Draw FM wave in time domain.

(ii) The equation of FM wave is $eFM = 10 \sin (10^6 t + 4 \sin 10^3 t)$. Calculate :

(1) Carrier frequency

(2) Modulating frequency

(3) Modulation index

(4) Power dissipated in 20 Ω resistor.

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

(a) (i) Define principle of superheterodyne receiver.

(ii) Explain working of AM superheterodyne receiver with the help of neat block diagram and waveforms.

(b) (i) Draw radiation pattern for following resonant dipole antenna :

(1) $l = \lambda/2$ (2) $l = \lambda$

(3) $l = 3\lambda/2$ (4) $l = 3\lambda$

where l is length of dipole antenna.

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

(c) Define antenna & explain following terms w.r.t. antenna :

(i) radiation pattern

(ii) beam width
