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.

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. a) Attempt any SIX of the following: 12
   
i) Define with suitable example: Simplex and Duplex communication system.

   ii) Represent AM wave in time domain and frequency domain.

   iii) Define pulse modulation and state its types.

   iv) State the function of limiter circuit used in FM receiver.

   v) State any two advantages and disadvantages of balanced slope detector.

   vi) What is single stub transmission line?

   vii) Why electromagnetic waves are said to be transverse waves?

   viii) Define plane of polarization.

P.T.O.
b) Attempt any **TWO** of the following:  

i) Draw and explain the block diagram of communication system.

ii) Explain with neat diagram half wave dipole antenna.

iii) Describe any three features of ground wave propagation along with neat sketch.

2. Attempt any **FOUR** of the following:  

a) Draw and explain: Horn antenna.

b) Define modulation and explain need of modulation.

c) Draw and explain the electromagnetic spectrum.

d) Draw and explain block diagram of superheterodyne AM radio receiver.

e) Define characteristic impedance and explain how to calculate it?

f) A 500 watts carrier is modulated to depth of 80%. Calculate:

   i) Total power in AM wave

   ii) Power in sidebands.

3. Attempt any **FOUR** of the following:  

a) Explain the effect of modulation index on AM wave with waveforms for following values of M:

   i) \( m < 1 \)

   ii) \( m = 1 \)

b) Explain the function of mixer in AM receiver with neat diagram.

c) Explain space wave propagation with sketch. List its advantage and disadvantage.
d) How the primary constant R.G.L.C. affect distortionless and minimum attenuation conditions of transmission line?

e) Compare resonant antenna and non-resonant antenna on the basis of:
   i) Definition
   ii) Circuit
   iii) Reflection Pattern
   iv) Radiation Pattern

f) Explain with neat diagram and waveform the generation of PPM using IC555.

4. Attempt any FOUR of the following: 16
   a) Explain the concept of De-emphasis with neat circuit diagram.
   b) Draw and explain the block diagram of Armstrong method to generate FM wave.
   c) Derive the relation between reflection coefficient and VSWR.
   d) Explain ionospheric propagation with proper sketch.
   e) Explain the following terms related to antenna:
      i) Beamwidth
      ii) Directivity
   f) State four features of the following:
      i) Quarter wavelength line and
      ii) Half wavelength line
5. **Attempt any FOUR of the following:**

   a) A frequency modulated signal is represented by the voltage equation \( \Phi_{FM} = 10 \sin (6 \times 10^8 t + 5 \sin 1250t) \)

   Calculate:
   i) Carrier frequency \( f_c \)
   ii) Modulating frequency \( f_m \)
   iii) Maximum deviation \( \delta \)
   iv) What power will this FM wave dissipates in 20\( \Omega \) resistor?

   b) Draw a neat circuit diagram of two stage if amplifier and explain its working.

   c) State and explain any four properties of quarter wave transformer.

   d) Explain with neat sketch of Yagi-uda antenna.

   e) What is the need of AGC? Explain simple AGC with its characteristics graph.

   f) Give the need of stub and explain double stub matching with neat diagram.

6. **Attempt any FOUR of the following:**

   a) Explain the generation of PWM using timer IC555 with neat circuit diagram.

   b) Draw the block diagram of FM receiver and explain the function of any three blocks.

   c) Draw and explain the balanced slope detector.

   d) Draw the circuit diagram and explain the working of phase discriminator.

   e) Draw the neat circuit diagram of FET amplitude limiter used in FM receiver.

   f) Explain with neat sketch the working of parabolic dish antenna.