**2025**

COMMUNICATION ENGINEERING
Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) With a neat block diagram explain wireless communication for long distance.   6

   b) What is single tone amplitude modulation? If modulating signal is V_mCosW_mt and carrier signal is $ACosW_ct$ derive the single tone modulating signal expression and show its different frequency components.   1+4=5

   c) Determine the power content in carrier signal if $C(t)=V_cCosW_ct$ 2

   d) Determine the power content of each of the sidebands and of the carrier of an AM signal that has a percent modulation of 85% and contains 1200 W of total power.   4

   e) A 75 MHz carrier signal having an amplitude of 50 V is modulated by a 3 kHz audio signal having an amplitude of 20 V. What frequencies would be there in a spectrum analysis of the modulated wave?   3

2. a) Explain collector modulation to obtain AM wave.   7

   b) An audio signal given as $15sin2\Pi(1500t)$ amplitude modulates a carriergiven as

      $60\ sin2\Pi(100,000t)$ determine the following: 8

      (i)   Sketch the audio signal, carrier signal and modulated wave

      (ii)   Determine the modulation index and percent modulation

      (iii)   What are the frequencies of the audio signal and the carrier?

      (iv)   What frequencies would present in a spectrum analysis of the modulated wave?

   c) Show that a synchronous demodulator shown in figure can demodulate an AM signal $X_{AM}(t)=[A+m(t)]cosW_ct$ regardless of the value of A.   5
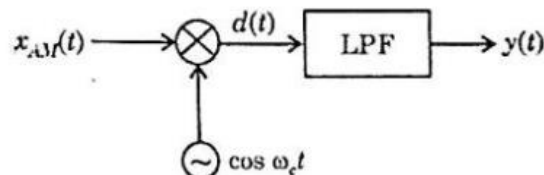
3. a) With the help of a balanced modulator explain the generation of the DSB-SC signal. Also draw the waveforms.   8

    b) Write the importance of SSB-SC. With a neat diagram explain Phase shift method to generate SSB-SC signal.   8

    c) With an example explain the limitation of frequency discrimination method.   4

4. a) Derive the expression of Narrowband FM and draw its spectrum.   10

    b) Explain Foster seeley demodulator with phasor diagrams. Also write its limitations.   10

5. a) What do you mean by sampling theorem? Explain different types of sampling methods.   4

    b) Explain sample and hold circuit to generate flat top sampled PAM.   6

    c) Explain generation detection of PWM signal.   10

6. a) Derive the equation for signal to quantization noise ratio for linear Quantization.   10

    b) A signal having bandwidth 4.2 MHz is transmitted using binary PCM system. If the number of quantization level is 512 then determine (i) code length (ii) transmission bandwidth (iii) Final bit rate (iv) output signal to quantization noise ratio.   5

    c) Explain Delta Modulation.   5

7. Write short notes *(any four)*

    (i)   TDM system

    (ii)   DPSK

    (iii)   Digital modulation techniques

    (iv)   PCM system

    (v)   Companding

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