USN

**17EC44**

### Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
## Principles of Communication Systems

Time: 3 hrs.                                                                                       Max. Marks: 100

**Note:** *Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

1   a.   Explain the generation of AM wave using square – law modulator with relevant equations and wave form. **(08 Marks)**
    b.   With a neat block diagram, explain the balanced modulate method of generating DSB – SC wave. **(07 Marks)**
    c.   With the functional block diagram, describe the salient features of QAM receiver. **(05 Marks)**

### OR

2   a.   An audio frequency signal $10 \sin 2\pi \times 500t$ is used to amplitude modulate a carrier of $50 \sin 2\pi \times 10^5$. Assume modulation index = 0.2. Determine side band frequency, amplitude of each sideband frequency, Bandwidth required, total power delivered to the load of $600\Omega$. **(07 Marks)**
    b.   Discuss the concept of Costas loop with block diagram. **(07 Marks)**
    c.   Explain the scheme of frequency division multiplexing system in detail. **(06 Marks)**

### Module-2

3   a.   Define Modulation index, deviation ratio and transmission bandwidth of a FM signal. **(06 Marks)**
    b.   Explain narrow band FM generation using Indirect method. **(06 Marks)**
    c.   An angle Modulated signal is defined by $s(t) = 10\cos[2\pi10^6 t + 0.2\sin[2000\pi t]]$ volts. Find the following :
         i)   Power in the modulated signal
         ii)  Frequency deviation $\Delta f$
         iii) Phase deviation
         iv)  Transmission bandwidth. **(08 Marks)**

### OR

4   a.   With schematic and frequency response explain the operation of balanced slope detector. **(07 Marks)**
    b.   Explain linear module PLL. **(06 Marks)**
    c.   With the help of block diagram, explain the working of FM 'stereo' multiplex. **(07 Marks)**

### Module-3

5   a.   A computer becomes inoperative, if 2 components A and B both fail. The probability that A fails is 0.01 and probability that B fails is 0.005. However the probability that B fails increases by a factor of 4, if A has failed. Calculate the probability that the compute become inoperable. Also find the probability that 'A' will fail if B has failed. **(06 Marks)**
    b.   Define mean, covariance and auto correlation function. **(06 Marks)**
    c.   Determine Noise equivalent bandwidth for RC LPF. **(08 Marks)**

**OR**

6  a. Explain the properties of auto correlation function.    **(06 Marks)**
  b. Distinguish between random variable and random process.    **(06 Marks)**
  c. Define noise along with sources of noise. Explain the types of noise which occur in an electronic devices.    **(08 Marks)**

## Module-4

7  a. Show that the figure of merit of DSBSC receivers is unity.    **(10 Marks)**
  b. Find the figure of merit of AM when the depth of modulation is :
    i) 100%    ii) 50%    iii) 30%    **(06 Marks)**
  c. Write a note on capture effect in FM.    **(04 Marks)**

**OR**

8  a. Show that the figure of merit of FM receiver, using single tone modulation is $1.5\beta^2$.    **(08 Marks)**
  b. An FM signal with a deviation of 75 KHz is applied to an FM demodulator when the input SNR is 15dB, the modulating frequency is 10KHz, estimate the SNR at the demodulator output.    **(06 Marks)**
  c. Explain function of De-emphasis and de-emphasis in FM systems.    **(06 Marks)**

## Module-5

9  a. Find the Nyquist rate and Nyquist internal for the following signals.

    i)   $m(t) = \dfrac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$

    ii)   $m(t) = \dfrac{\sin(5000\pi t)}{\pi t}$.

   **(08 Marks)**

  b. Explain the generation of PAM signal.    **(06 Marks)**
  c. With block diagram, explain the concept of VOCODERS.    **(06 Marks)**

**OR**

10  a. With the help of neat sketches, describe the generation, reconstruction and regenerative repeaters of PCM system.    **(10 Marks)**
  b. Distinguish between PAM and PPM techniques.    **(10 Marks)**

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