CBCS Scheme

USN | | | | | | | | | | |

15EC45

Fourth Semester B.E. Degree Examination, June/July 2017

Principles of Communication Systems

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain with the help of a neat sketch and analysis, how switching modulator is used to generate amplitude modulation. **(06 Marks)**

b. Explain how Costas receiver can be used for demodulating the DSB-SC signal. **(06 Marks)**

c. Consider a message signal m(t) containing frequency components at 100, 200 and 400 Hz. This signal is applied to an SSB modulator together with a carrier at 100 kHz, with only the upper sideband retained. In the coherent detector used to recover m(t), the local oscillator supplies a sine wave of frequency 100.02 kHz.

i) Determine the frequency components of the detector output.

ii) Repeat the analysis assuming that only the lower sideband is transmitted. **(04 Marks)**

OR

2 a. Explain the operation of envelope detector with neat diagrams and waveforms. Bring out the significance of the RC time constant of the circuit in detection of the message signal without distortion. **(06 Marks)**

b. Derive an expression for SSB modulated wave for which upper side band is retained. **(06 Marks)**

c. Using the message signal $m(t) = \frac{1}{1+t^2}$, determine and sketch the modulated wave for amplitude modulation with the following values. (i) μ = 50%, (ii) 100%. **(04 Marks)**

Module-2

3 a. Derive the equation for frequency modulated wave. Define modulation index, maximum deviation of a frequency modulated signal. **(06 Marks)**

b. Explain generation of frequency modulated signal using direct method. **(05 Marks)**

c. The equation for a FM wave is $s(t) = 10\sin[5.7\times10^8 t + 5\sin 12\times10^3 t]$. Calculate :

i) Carrier frequency

ii) Modulating frequency

iii) Modulation index

iv) Frequency deviation

v) Power dissipated in 100Ω **(05 Marks)**

OR

4 a. With neat circuit diagram, explain FM demodulation using balanced slope detector. **(06 Marks)**

b. With relevant block diagram, explain FM stereo multiplexing. **(05 Marks)**

c. Explain the linear model of phase locked loop (PLL). **(05 Marks)**

Module-3

5 a. What is conditional probability? Prove that $P(B/A) = \frac{P(A/B) \cdot P(B)}{P(A)}$. **(05 Marks)**

b. With an example, explain what is meant by statistical averages. **(06 Marks)**

c. Define white noise. Plot power spectral density (PSD) and autocorrelation function (ACF) of white noise. **(05 Marks)**

OR

6 a. What do you mean by probability density function? Prove that the total volume under the surface of a probability density function (pdf) is always 1. **(05 Marks)**

b. Define mean, autocorrelation and auto-covariance function. **(06 Marks)**

c. What is noise equivalent band width? Derive an expression for the same. **(05 Marks)**

Module-4

7 a. With relevant equations, explain how noise is produced in a receiver model. **(08 Marks)**

b. Show that the figure-of-merit for DSB-SC system is unity. **(08 Marks)**

OR

8 a. Derive the expression for figure-of-merit of an AM receiver. **(08 Marks)**

b. Explain pre-emphasis and de-emphasis in frequency modulation (FM). **(08 Marks)**

Module-5

9 a. State sampling theorem for band limited signals. Explain the process of sampling. **(07 Marks)**

b. With neat block diagram, explain the generation of pulse-position modulation (PPM) waves. **(05 Marks)**

c. Twelve different message signals, each with a bandwidth of 10 kHz are to be multiplexed and transmitted. Determine the minimum bandwidth required for each method if the multiplexing/modulation method used is (i) FDM, SSB; (ii) TDM, PAM. **(04 Marks)**

OR

10 a. With relevant diagram, explain the generation and reconstruction of pulse code modulation (PCM) signal. **(06 Marks)**

b. With neat diagram, explain the concept of time division multiplexing (TDM). **(06 Marks)**

c. Determine the Nyquist rate and the Nyquist interval for :

(i) $g(t) = \sin c(200t)$ (ii) $m(t) = \frac{1}{\pi t}[\sin(500\pi t)]$. **(04 Marks)**

* * * * *