PVP 20

Code: 20EC3402

II B.Tech - II Semester – Regular Examinations – JULY 2022

COMMUNICATION THEORY
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) Explain the detection of DSB signals using COSTAS Loop. 7 M

   b) When a signal $m(t) = 3\,cos\,(2\pi \times 10^3 t)$ modulates a carrier $c(t) = 5\,cos\,(\pi \times 10^6 t)$, find the modulation index and transmission bandwidth if the modulation is AM. 7 M

OR

2. a) Discuss the generation of SSB signal using balanced modulator and phase shifter. 7 M

   b) Obtain a relationship between carrier and side band powers in an SSBSC wave and explain how power distribution takes place in SSBSC system. 7 M

UNIT – II

3. a) Describe the principle of Angle Modulation. Derive and explain phase deviation, Modulation index, frequency deviation and percentage of modulation. 7 M

b) With a neat block diagram explain the Armstrong method of FM generation. 7 M

OR

4. a) An angle modulated signal is represented in time domain as $s(t) = 10\,Cos\,(2\pi 10^6\,t + 3\,Sin\,2\pi 10^3 t)$. Assuming the given signal as PM, i) Calculate the frequency deviation, modulation index, B.W. and power. ii) Repeat the above calculations when the message frequency is doubled. 7 M

b) Draw the balanced frequency discriminator and discuss the process of detection of FM waves. 7 M

UNIT-III

5. a) State and prove the central limit theorem. 7 M

b) Consider two random processes
$X(t) = A\cos\omega_0 t + B\sin\omega_0 t$ and
$Y(t) = B\cos\omega_0 t - A\sin\omega_0 t$,
both A and B are independent random variables having zero mean and same variance. Determine $\mathrm{E}[X(t)]$, $\mathrm{E}[Y(t)]$ and cross correlation function $\mathrm{E}[X(t_1)Y(t_2)]$. 7 M

OR

6. a) State and prove, any three properties of Auto Correlation function. 7 M

b) A continuous random variable is uniformly distributed in the interval -2 to 10. Determine the statistical average. 7 M

UNIT – IV

7. a) Derive the expression for the figure of merit of DSBSC receiver that uses coherent detection. 7 M

   b) Explain in detail about Amplitude modulation Receiver Model. 7 M

OR

8. a) Discuss the threshold effect for AM with envelope detector. 7 M

   b) Discuss in detail about pre-emphasis and de-emphasis in FM. 7 M

UNIT – V

9. a) Explain the PPM generation from PWM, with a neat block diagram and necessary figures. 7 M

   b) State and prove sampling theorem for low pass signals. Sketch the spectrum of sampled signal at
   (i) $f_s=2f_m$; (ii) $f_s>2f_m$ and (iii) $f_s<2f_m$ 7 M

OR

10. a) For a PAM transmission of voice signal having maximum frequency $f_m = 3KHz$. The sampling frequency $f_s = 8KHz$ and the pulse duration $\tau = 0.1T_s$. Calculate the transmission bandwidth. 7 M

    b) Compare PAM, PWM and PPM systems. 7 M