[Total No. of Questions - 9] [Total No. of Printed Pages - 2]

Dec-22-0159

EC-401 (Analog Communication)

B.Tech-4th (CBCS)

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt Five questions in all, selecting one question from each Section A, B, C and D. Section E is compulsory.

SECTION-A (10 Marks each)

1. What is Modulation? What is the need of modulation? What does actually modulation do to a message and carrier?

2. A signal $e^{-3t}u(t)$ is passed through an ideal low pass filter with cut-off frequency of 1 rad per second, (a) test whether the input is an energy signal, and (b) find the output energy.

SECTION-B (10 Marks each)

3. Discuss the types, causes and effects of the various forms of noise which may be created within a receiver.

4. A box contains 3 White, 4 Red and 5 Black balls. A ball is drawn at random. Find the probability that it is (a) Red, (b) not Black (c) Black or White.

SECTION-C (10 Marks each)

5. Derive the relation between the output power of an AM transmitter and the depth of modulation and plot its graph for values of the modulation index from zero to maximum.

6. A DSB modulated signal $\phi(t) = A\,m(t)\,Cos\,2\pi f_c t$ is multiplied with a local carrier $c(t) = Cos\left(\omega_c t + \theta\right)$ and the output is passed through a LPF with a bandwidth equal to the bandwidth of the m(t). If the power of the message signal m(t) is P_M. Determine

   (a) the power of the modulated signal.

   (b) the power of the signal at the output of the LPF.

SECTION-D (10 Marks each)

7. Show that noise and signal powers at the output of an FM discriminator can be calculated independently.

8. Show that the first order PLL with a negative slope $\theta(t)$ causes unstable operating point.

SECTION-E

9. Answer the following: (10×2=20)

   a. What is the need of wireless communication?

   b. Differentiate between cross correlation and auto correlation.

   c. What is White Noise?

   d. What are the types of external noise?

   e. Explain Random process.

   f. Define Amplitude Modulation and Modulation Index.

   g. Explain VSB Modulation and demodulation.

   h. Explain Costa's Receiver.

   i. What is FM stereo broadcasting?

   j. What are angle modulation detectors?