

Principle of Communication System

Time : 3 Hours

Min. Passing Marks : 24

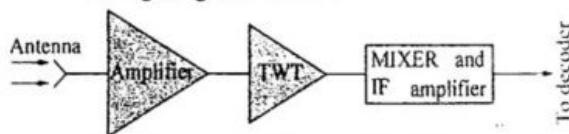
Maximum Marks : 80

Instruction-to-Candidates:-

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Unit-I

1. (a) Find the expressions for overall noise figure and overall noise temperature of a cascaded amplifier. [10]
- (b) Evaluate the overall noise- figure of the receiver and the overall equivalent temperature of the receiver of typical microwave receiver shown in the figure given below :



Gain $G_1 = 30\text{dB}$ $G_2 = 20\text{dB}$ $G_3 = 40\text{dB}$
 Noise Temp = 5°K Noise Figure = 6dB Noise Figure = 12dB
 Assume the ambient temperature is 17°C [6]

OR

1. (a) Explain the terms : noise bandwidth noise temperature, available power, signal to noise ratio and noise figure. [8]
- (b) A receiver with 80dB gain and an effective noise temperature of 3000K is connected to an antenna that has a noise temperature of 600K . Find the receiver noise power output over a 40MHz band. Given Boltzmann's constant = 1.38×10^{-23} . [6]

Unit-II

2. (a) Draw the block diagram of super-heterodyne receiver and give its merit over TRF. Why is it called super-heterodyne? Why is local oscillator frequency kept higher? [10]
- (b) Calculate the percent power saving of an SSB signal if the AM wave is modulated to a depth of. [6]
- (a) 100%
 (b) 50%

OR

2. (a) What is modulation index in AM? What is over modulation? How can you detect an over modulated signal? How can you measure modulation index using a CRO?

- (b) Show that an AM signal can be recovered irrespective of the value of percentage modulation by using synchronous detection technique. [6]

Unit-III

3. (a) Draw and explain the circuit diagram of Ratio detector. What are its merits and demerits? [10]
- (b) A carrier $E_c \cos \omega_c t$ is modulated by a signal-
 $f(t) = 2 \cos 2 \pi t + 6 \cos 10^3 2 \pi t + 7 \cos 10^3 4 \pi t$
 Find the bandwidth of FM using Carson's rule. Assume deviation sensitivity is $10 \cdot 10^3\text{Hz per Volt}$. Also find the 'deviation ratio'. [6]

OR

3. (a) Why is direct modulation not preferred for FM generation? How do you generate FM from PM? [10]
- (b) Show that the bandwidth of FM signal frequency varies by a factor 1:100. Assume frequency deviation is 75KHz . [6]

Unit-IV

4. Define the figure of merit and explain its significance? Derive an expression for the DSB-SC receiver. [16]
- OR**
4. Calculate figure of merit for single tone modulation in FM receiver. Take suitable assumptions if required. [16]

Unit-V

5. (a) Why is flat-flop sampling preferred over natural sampling? [4]
- (b) Write short note on any two of the following:
 (i) PAM
 (ii) PPM
 (iii) PWM [6×2 = 12]

OR

5. (a) With the help of neat circuit diagram explain the generation and detection of PPM signal. [12]
 PAM, PWM and PPM system. [4]