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Paper Code: EC-502

B. Tech.
FIFTH SEMESTER EXAMINATION, 2016-17
PRINCIPLES OF COMMUNICATION

[Time: 3 hrs.] [Max. Marks: 100]

Note:- Attempt all questions. All questions carry equal marks.

1. Attempt any FOUR parts of the following:- **(5x4=20)**

(a) What is the need of modulation in communication system? Discuss the single tone Amplitude modulation.
(b) With the help of a block diagram explain the working of a super-heterodyne AM receiver.
(c) Discuss any method of generation of SSB waves.

(d) The antenna current of an AM broadcast transmitter, modulated to a depth of 40 percent by an audio sine wave, is 11A. It increases to 12A as a result of simultaneous modulation by another audio sine wave. What is the modulation index due to this second wave?

(e) An amplitude modulated wave $10[1+.6\cos 2\pi\times 10^3 t]\cos 2\pi\times 10^6 t$ is detected by a linear diode detector. Find (a) the time constant (b) the value of resistance R if the capacitor used is 100μF.

(f) Find the transmission power efficiency for a tone modulated signal when modulated index is 0.25, 0.5 and 0.75.

2. Attempt any FOUR parts of the following:- **(5x4=20)**

(a) Discuss the FM modulation circuit using Varactor diode.
(b) Drive an expression for figure of merit for conventional AM System using envelope detection.

(c) What is the basic difference between AM and FM superhetrodyne receiver? A receiver is tuned to 750 KHz and IF =450 KHz, find (i) Image frequency (f_{si}) (ii) IRR if Q=50.

(d) An FM wave is given by $s(t)= 20\sin(6\times 10^8 t+7\sin 1250t)$ find (a) the carrier & modulating frequencies, the modulation index, and maximum deviation. (b) Power dissipated by this FM wave in 100ohm resistor.
(e) An angle modulated signal is given by S (t) = $\cos 2\pi(2\times 10^6 t + 30 sin 150t + 40 cos 150t)$ Find maximum frequency and phase deviation.
(f) Discuss frequency discriminator method in FM.

3. Attempt any TWO parts of the following:- **(10x2=20)**

(a) State sampling theorem. Explain 'Flat-top sampling'. A signal $x(t) = 100\cos(24\pi\times 10^3)t$ is ideally sampled with a sampling period 50μsec and then passed through an ideal low pass filter with cut off frequency of 15 kHz. Find the frequencies at the filter output.

(b) Discuses the companding used in PCM with two common companding laws. A message signal of $10\sin(4\pi \times 10^3)t$ is passed through a PCM system such that SQNR should be at most of 20dB. Given that sampling frequency is twice of Nyquist rate. Find transmission BW and SQNR in dB.

(c) Compare TDM and FDM techniques. Explain TDM with the help of diagram if 10 signal each band limited to 5 kHz are multiplexed used in TDM transmission B.W.

4. Attempt any four parts of the following:- **(5x4=20)**

(a) Define SNR and noise-figure of a receiver and drive relation them.

(b) The first stage of a two stage RF amplifier has output resistance 29kΩ and voltage gain of 10. The input resistance and the noise resistance are 500Ω and 2Ω, respectively. The second stage has an output resistance of 400kΩ, a voltage gain of 20, an input resistance of 80kΩ and noise resistance of 10kΩ. Compute equivalent noise resistance of the two-stage amplifier and noise figure. The amplifier is driven by generator whose output impedance is 40Ω.

(c) How delta modulation defers from PCM and PAM. Enlist the different type of errors in Delta modulator?

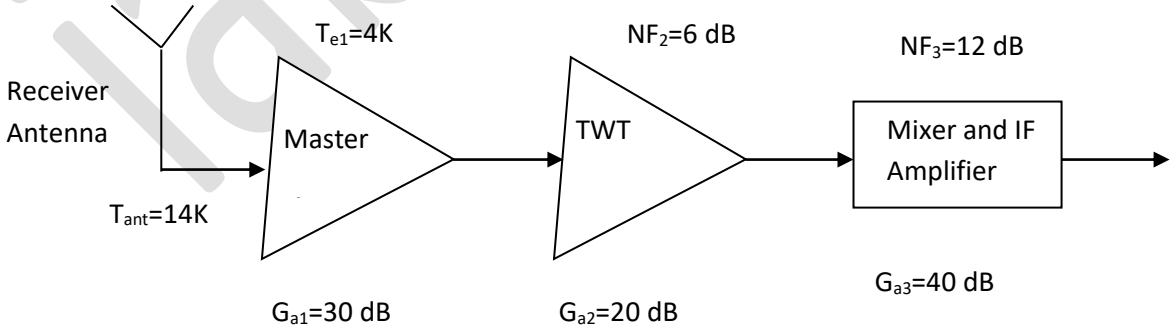
(d) A message signal of $10\cos 4\pi.10^3 t$ is transmitted through Delta modulator, whose pulse rate is 500per second, find output of Delta modulator?

(e) A speech signal is sampled with 8 kHz sampling frequency and then quantized with 256 levels. Calculate the data rate and bandwidth required to transmit this signal.

(f) Three signals m_1, m_2 and m_3 are to be multiplexed. m_1 and m_2 have a 5-KHz bandwidth and m_3 has a 10 KHz bandwidth. Design a commutator switching system so that each signal is sampled at its Nyquist rate.

5. Attempt any four parts of the following:- **(5x4=20)**

(a) A typical satellite microwave communication receiver is shown in figure below. Calculate the overall noise figure of the receiver, neglecting effect of receiving antenna.



(b) Explain with the waveforms how PWM and PPM can be derived from PAM signal.

(c) Write the short note on the Pre-emphasis and De-emphasis.

(d) Discuses PLL with block diagram.

(e) Draw and explain the block diagram of transmitter and receiver of DPCM system.

(f) Write down the objectives of design of vocoders.