504

B.Tech.(Electrical) V SEM
Communication System

I Semester

Time: 1 hr. Total Marks=30

Note: Answer all questions. Each question is of 10 marks.

Q1. Give short and precise answer to the followings (2x5)

(a) Define frequency and Phase modulation. How FM could be generated from PM and vice-versa.

(b) Derive the expression for the instantaneous value of FM voltage.

(c) Explain why quantizing noise could affect small amplitude signal far more than large amplitude signals in a PCM system.

(d) A sinusoidal modulating signal of amplitude 4 V and frequency 1kHz is applied to an FM system that has modulator gain of 50Hz/V. Determine the maximum frequency deviation and modulation index.

(e) Write four important drawbacks of frequency modulation.

Q2 (a). The center frequency of an LC to which a capacitive reactance FET modulator is connected, is 70MHz. The FET has a g_m which varies linearly from 1-2 mS, and a bias capacitor whose reactance is 10 times the resistance of the bias resistor. If the fixed tuning capacitance across the oscillator coil is 25pf determine the maximum available frequency deviation. (5)

(b) Show that signal to quantization noise ratio in PCM system is approximately 6N dB. (5)

Q3. What is narrow band frequency modulation (NBFM) ? Drive an expression for a NBFM and draw its phasor diagram. Draw a block diagram for its generation. (10)

B.Tech (Electrical) V Semester

Communication Systems

Time: 1hr. MM = 30

I & Second

Note: Answer all questions

Q.1 Give short and precise answer [5x2]

(a) Differentiate between FM and PM

(b) State the merits of FM over AM

(c) What is Image frequency?

(d) Explain Quantization Noise.

(e) Explain why PPM system requires a synchronizing signal, whereas PAM and PWM can be detected without it.

Q.2 Answer in brief [2x6]

(a) A modulating signal, $m(t) = 5\cos 30\times10^{3}\pi t$, is frequency modulated with a carrier signal $A_c \cos w_c t$. determine the modulation index and bandwidth of FM system. If the modulating frequency f_m is reduced to 5 KHz, determine the change in the modulation index and the bandwidth. Asume $K_f = 40$kHz per volt.

(b) An audio signal with frequency band 300 Hz to 3000 Hz is sampled at a rate of 8 kHz to generate a PCM signal. Design an appropriate PCM system as follow.

(i) Draw a block diagram of the PCM system including transmitter, channel and receiver.

(ii) Determine the uniform quantization steps needed and the channel bandwidth required. Assume that average SNR at the receiver needs to be at least 40 dB.

Q.3 Explain delta modulation. Draw the circuit for the generation of Delta modulation and explain its working. Explain granular and slope over distortions in delta modulation. [8]

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Ist Sessional

Time: 1 hr. MM=30

Note: Answer all questions.

Q1. Give short and precise answer to the followings [4x3]

(a) A broadcast AM transmitter radiates 50kW of carrier power. What will be the radiated power at 75% modulation?

(b) A 100 kHz carrier is simultaneously amplitude modulated with 300 Hz, 800 Hz and 2 kHz audio sine wave. What will the frequencies present in the output wave? Draw the frequency spectrum of the output wave.

(c) Modulating frequency in an FM system is 400Hz, modulating voltage is 2.4V and the modulation index is 60. Calculate the maximum frequency deviation and approximate bandwidth of the FM signal.

(d) Derive relationship between frequency deviation of FM and amplitude and frequency of the modulating signal.

Q.2.(a) Describe narrow band frequency modulation (NBFM) and wide band frequency modulation. [4]

(b) Drive an expression for a NBFM and draw its phasor diagram. [4]

Q.3. The base band signal m(t) is recovered from modulated signal $s(t) = m(t)\cos 2\pi f_c t$, by multiplying s(t) by the signal $A_c\cos(2\pi f_c t + \theta)$. What is the value of the phase angle θ if the recovered signal is to be 90% of the maximum possible value? [10]

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Note: Attempt all questions **Time: 1 hr.**

Q.No-1: Define amplitude modulation and modulation index, using sketch of appropriate waveforms. Derive an expression for the standard AM waveform. (10)

Q.No-2: The base band signal m(t) is recovered from modulated signal $s(t) = m(t)\cos 2\pi f_c t$, by multiplying $s(t)$ by the signal $A_c\cos(2\pi f_c t + \theta)$. What is the value of the phase angle θ if the recovered signal is to be 90% of the maximum possible value? (10)

Q.No-3: Draw the circuit of phase discrimination method for the generation of SSB-SC waveform and explain it analytically. (10)

$A_c \cos(2\pi f_c t + \theta) \times m(t) \cos(2\pi f_c t)$

$\frac{A_c m(t)}{2} [2\cos(2\omega_c t + \theta)\cos\omega_c t$

$\frac{A_c m(t)}{2} [\cos\theta + \cos(2\omega_c t + \theta)] = \frac{A_c}{2}$

II Session

B.Tech (ELECTRICAL) V-Semester
Communication Systems (EES504)

Time:1 hr. MM:=30

Note: Answer all questions. All questions carry equal marks

Q.1 The AM signal

$$s(t) = A_c\left[1 + k_a m(t)\right]\cos(2\pi f_c t)$$

is applied to the system shown in Figure (a). Assuming that $|k_a m(t)| < 1$ for all t and the message signal $m(t)$ is limited to the interval $-W \le f \le W$ and that the carrier frequency $f_c > 2W$ shows that $m(t)$ can be obtained from the square-rooter output $v_3(t)$.

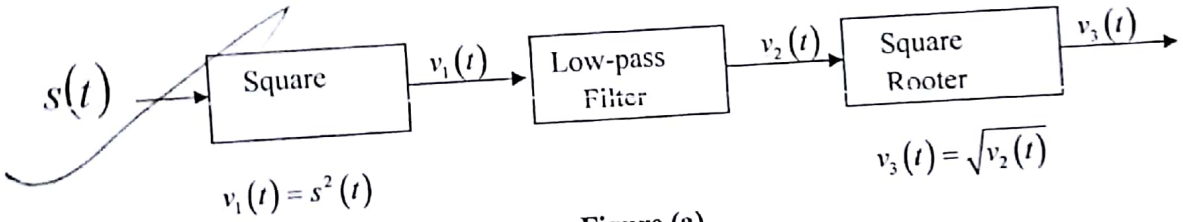

Figure (a)

Q.2 The local oscillator used for the demodulation of an SSB signal $s(t)$ has a frequency error Δf measured with respect to the carrier frequency f_c used to generate $s(t)$. Otherwise, there is perfect synchronism between this oscillator in the receiver and the oscillator supplying the carrier wave in the transmitter. Evaluate the demodulated signal for the following two situations:

(a) The SSB signal $s(t)$ consists of the upper sideband only.

(b) The SSB signal $s(t)$ consists of the lower sideband only.

Q.3 Draw the circuit of Costas receiver for the detection of DSB-SC signals. Explain it analytically

B.Tech (Electrical) V Semester
Communication Systems
Time: 1hr. MM = 30

Note: Answer all questions

Q.1 Give short and precise answer [5x2]

(a) Draw the phasor diagram of amplitude modulated signal

(b) The tuned circuit of the oscillator in a std. AM employs a 50 micron coil and a capacitor of 1nF. If the oscillator output is modulated by audio frequencies up to 10kHz,what is the frequency range occupied by the sidebands

(c) A 1000 kHz carrier signal is simultaneously modulated with 200Hz, 800 Hz and 3kHz audio signal. Draw the spectrum of the resultant AM signal.

(d) The output current of an AM transmitter is 8A when carrier is un-modulated, but it increases to 8.93 A when the carrier is modulated by a single sine wave of 3.5kHz. Determine the modulation index of AM transmitter.

(e) The output power of an AM transmitter is 1kW when sinusoidaly modulated to a depth of 100%. Calculate the power of each sideband if the modulation depth is reduced to 50%.

Q.2 Answer in brief [2x6]

(a) The base band signal m(t) is recovered from modulated signal $s(t) = m(t)\cos 2\pi f_c t$,by multiplying s(t) by the signal $A_c\cos(2\pi f_c t + \theta)$. What is the value of the phase angle θ if the recovered signal is to be 90% of the maximum possible value?

(b) Draw the circuit of phase discrimination method for the generation of SSB-SC waveform and explain it analytically.

Q.3 [8]

The AM signal

$$s(t) = A_c[1 + k_a m(t)] \cos(2\pi f_c t)$$

is applied to the system shown in Figure P2.7. Assuming that $|k_a m(t)| < 1$ for all t and the message signal $m(t)$ is limited to the interval $-W \le f \le W$ and that the carrier frequency $f_c > 2W$ show that $m(t)$ can be obtained from the square-rooter output $v_3(t)$.

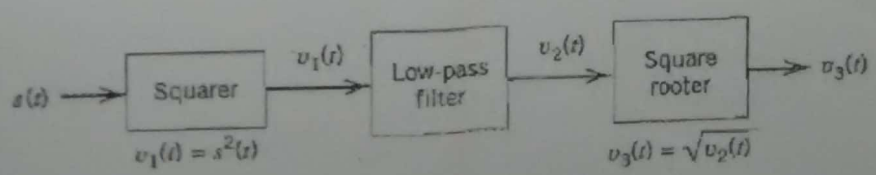

FIGURE P2.7

II Session

B.Tech.(Electrical) V SEM
Communication System

Note: Answer All questions. All Question carry equal marks.

Time: 1 hr. Total Marks=15

Q 1 What is narrow band frequency modulation (NBFM) ? Drive an expression for a NBFM and draw its phasor diagram. Draw a block diagram for its generation.

Q 2 Draw the circuit of phase discrimination method for the generation of SSB-SC waveform and explain it analytically

Q No-3

The AM signal

$$s(t) = A_c[1 + k_a m(t)] \cos(2\pi f_c t)$$

is applied to the system shown in Figure P2.7. Assuming that $|k_a m(t)| < 1$ for all t and the message signal $m(t)$ is limited to the interval $-W \leq f \leq W$ and that the cartier frequency $f_c > 2W$ show that $m(t)$ can be obtained from the square-rooter output $v_3(t)$.

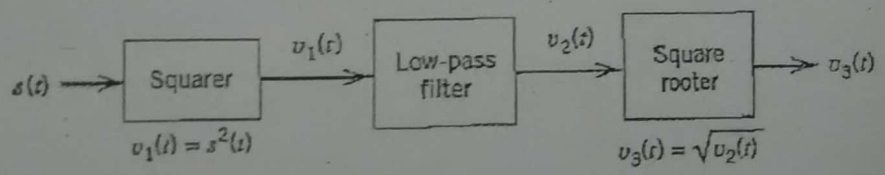

FIGURE P2.7