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B.TECH
PCEE 4304

Sixth Semester (Back) Examination – 2013
COMMUNICATION ENGINEERING(NEW)
BRANCH:EEE
Time: 3 Hours
Max marks: 70

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) Represent the data bits 101001 by the Bipolar NRZ, RZ waveform.

b) Express the periodic sequence x(n) with periodic N as discrete Fourier series.

c) Determine the total energy (E) of the given signal ,

$$x(t) = e^{-t}.u(t)$$

What is the energy of the signal x(2t).

d) What is delta modulation? Mention its limitations.

e) Abbreviate the following terms and distinguish between
(i) PAM (ii) PWM and (iii) PPM.

f) Define selectivity and sensitivity of a radio receiver.

g) What do you understand by significant sideband pairs in Frequency Modulation? Does the bandwidth depend on significant sideband pairs? Justify your answer.

h) Explain the merits of VSB system over normal AM in the case of video transmission.

i) What is the need for modulation and how do you define modulation?

j) A device with input x(t) and output y(t) is characterized by : $y(t) = x^2(t)$. An FM signal with frequency deviation of 90KHz and modulating signal bandwidth of 5KHz is applied to this device. Find the bandwidth of the output signal.

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Q2 a) The complex exponential Fourier series representation of a signal f(t) over the interval (0,T) is : (5)

$$f(t) = \sum_{n=\infty}^{\infty} \left(\frac{3}{4+(n\pi)^2}\right) e^{-jn\pi t}$$

(i) Determine the numerical value of T.

(ii) One of the components of *f(t)* is A*cos*(3πt) . What is the numerical value of A .

b) Explain the principle and operation of envelope detector used for AM detection. Give its advantages and disadvantages. (5)

Q3 a) An AM radio transmitter gives a power output of 8kW when modulated to a depth of 80%. If after modulation by a speech signal, which produces an average depth of 30%, the carrier and one sideband are suppressed, determine the average power in the (5)

remaining output.

b) Distinguish between TDM and FDM techniques with brief description and sketches where ever required. (5)

Q4 a) Derive the expression of AM signal, its modulation index and its power associated with sidebands and carrier. Also, express the total power in terms of modulation index and carrier power. (5)

b) Consider an angle modulation signal $f(t) = A\cos(\omega_c t + 10\cos\omega_m t)$. (5)

(i) If $\phi(t)$ is a PM signal, $K_p = 2$rad/V , Derive the message signal f(t) and maximum frequency deviation of the PM signal.

(ii) If $\phi(t)$ is a FM signal, $K_f = 2$KHz/V , Derive the message signal f(t) and maximum frequency deviation of the FM signal.

Q5 a) What do you understand by FM to AM conversion technique? Where is it used and why? (5)

b) Why the maximum allowable frequency deviation in FM broad cast system is 75 KHz. If modulation is due to a single tone sinusoid of 6KHz, find the BW of FM signal. What will be the change in BW if the frequency and the amplitude of the modulating signal is doubled. Find the new BW. (5)

Q6 a) Derive the expression for signal to noise ratio of PCM system. (5)

b) A PCM system is to have a signal to noise ratio of 35dB. For the speech signal, an RMS to peak ratio of -10dB is allowed. Find the number of bits required for coding. (5)

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Q7 a) What is Companding? Why is it used? Explain different types of companding techniques used in digital modulation. (5)

b) Three signals m1, m2, m3 and m4 are multiplexed. These signals have different bandwidths of 10KHz, 20KHz, 30KHz and 50KHz respectively. Design a TDM system so that each signal is sampled at its Nyquist rate. (5)

Q8 Write short notes on any **TWO** :- (5 x 2)

a) Pre-emphasis and De-emphasis

b) Adaptive Delta Modulation

c) Channel Equalization

d) Super Heterodyne receiver of AM