Registration No. :

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B. Tech

PCEE 4304 (New)

## Sixth Semester (Back) Examination – 2013
## COMMUNICATION ENGINEERING
### BRANCH : CSE, IT
### QUESTION CODE : B233
#### Full Marks – 70
#### Time : 3 Hours

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

1.  Answer the following questions :                                            2 ×10

    (a) Write Dirichlet's condition for fourier series.

    (b) Prove that both frequency and phase modulation belong to angle modulation.

    (c) Determine the average power and total energy of the given signal :

    $$X(t) = e^{-2t}.u(t)$$

    (d) Why do we need modulation in communication system?

    (e) What is quantization error and how can it be minimized?

    (f) Differentiate between PCM and DM in digital communication system.

    (g) What is matched filter and what is its importance ?

    (h) Is it necessary that the sampling frequency for a band pass signal need not be more than double the maximum frequency present in the signal ? Justify your answer.

    (i) What do you understand by significant sidebands in FM communication ? Does the bandwidth depend on significant sideband pairs ? Justify your answer.

    (j) Why SSB-SC is preferred over DSB-SC ?

2.  (a) Define modulation theorem using fourier transform concept and show its spectrum.                                                                      5

    (b) State and prove any two properties of fourier transform.                5

P.T.O.

3.  (a)  Explain why double sideband with carrier in AM system is wasteful. How do you notice the change in percentage of power when modulation index varies from 0 to 100 % ?                                                                                5

    (b)  Design a PCM multiplexing system using a 256 level signal quantizer for the transmission of three signals m1, m2, m3 band limited to 5 KHz, 10 KHz and 5 KHz respectively. Assuming that each signal is sampled at its nyquist rate and 8-bits are transmitted simultaneously. Compute :                                       5

         (i)    Maximum bit duration

         (ii)   Channel bandwidth required to pass the PCM signal

         (iii)  The increase in the channel bandwidth if 512 quantization levels are used.

4.  (a)  What is a Varactor diode ? Using varactor diode, provide the circuit for frequency modulator. Explain the circuit in detail.                                              5

    (b)  For a broadcast superheterodyne AM receiver, if intermediate frequency is 455 KHz , then determine the image frequency for signal frequency of 1000 KHz. Also determine Quality factor Q .                                                       5

5   (a)  Derive Carson's formula for bandwidth of FM signal.                                        5

    (b)  The maximum deviation in FM broadcast system is 75 KHz. If modulation single tone sinusoid of 5 KHz, 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

6.  (a)  Vestigial sideband modulation is preferred for TV broadcasting. Why ?        5

    (b)  What do you understand by multiplexing in communication system ? Explain Time Division Multiplexing of PCM signals with sketches if required.
                                                                                                              5

7.  (a)  What is the role of pre-emphasis and de-emphasis filter in FM broad-casting ?
                                                                                                              5

    (b)  What is envelope detector ? How is it useful for amplitude demodulation ?
                                                                                                              5

8.  Write short notes on any **two** :                                                          5×2

    (a)  Adaptive Delta Modulation

    (b)  DPCM

    (c)  Companding

    (d)  Channel Equalization.