Registration no:

B.Tech
PCEI4301

5th Semester Regular / Back Examination 2016-17
COMMUNICATION SYSTEM ENGINEERING
BRANCH(S): AEIE, BIOMED, EIE
Time: 3 Hours
Max Marks: 70
Q.CODE: Y440
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) What is the Fourier transform of a unit step signal?
  b) State and prove time-shifting property of Fourier transform.
  c) Draw the block diagram of a digital communication system. What is the role of channel encoder in it?
  d) Write down the sampling theorem. What is Nyquist sampling rate?
  e) Find the total power and sideband powers of an amplitude modulated signal which is represented as $s(t) = 20\,(1 + 0.5\cos 2000\pi t)\cos 2\times 10^{6}\pi t$.
  f) Draw the phasor diagram of conventional AM and DSB-SC AM signals.
  g) For the angle modulated signal $s(t) = \cos\left(2\times 10^{8}\pi t + 75\sin 2000\pi t\right)$ find the frequency deviation and bandwidth.
  h) Explain the relationship between phase modulation and frequency modulation.
  i) How many types of sampling methods are used to generate PAM signal? Which sampling technique is preferred?
  j) Explain the function of an equalizer in the demodulation of a flat-top sampled signal.

Q2 **a)** Find out the Fourier transform of $e^{-bt}u(t)$ and also represent the amplitude and phase spectra of the transform.   **(5)**
  b) Find out the Fourier series representation of a full-wave rectifier signal $x(t) = |\cos 2\pi f_0 t|$ and also represent the spectrum.   **(5)**

Q3 **a)** How can the Fourier transform of a periodic signal be found out? Find out the Fourier transform of a train of unit impulses with period T_0.   **(5)**
  b) What are the effects of phase and frequency errors in synchronous detection for DSB-SC signal?   **(5)**

Q4 **a)** An amplitude modulated signal is represented as **(5)**

$$s(t) = 50\left(1 + 0.3\cos 2000\pi t + 0.4\ \cos 3000\,\pi t + 0.5\cos 4000\pi t\right)\cos 2\times 10^6\,\pi t$$

    i.) Find the individual modulation indices.
    ii.) Find the total power.
    iii.) What are the frequency components and their amplitudes?
    iv.) Draw the one sided spectrum
    v.) What bandwidth is required to transmit this signal?

b) What is the role of a discriminator in demodulation of FM signal? **(5)**
Explain the operation of balanced slope discriminator.

Q5 **a)** Draw the block diagram of a superheterodyne FM receiver and explain **(5)**
its working principle. Why is it called as superheterodyne receiver?

b) A message signal $m(t) = 5\cos(2000\pi t)$ angle modulates a carrier signal **(5)**
$c(t) = 10\cos(1^5 0\,\pi t)$.

    i.) Write expression for the modulated signal if it is a PM.
    ii.) Write expression for the modulated signal if it is a FM.
    iii.) For FM signal find the frequency deviation and modulation index.
    iv.) What is the bandwidth requirement for the FM signal?

Q6 **a)** Explain delta modulation. What are the limitations of it? **(5)**

b) With necessary waveforms explain the demodulation of PWM and PPM **(5)**
signals.

Q7 **a)** Represent the block diagram of a PCM transmitter and receiver and **(6)**
explain the PCM operation.

b) Eight PCM channels, each bandlimited to 5kHz are to be time division **(4)**
multiplexed. If each sample is codes into a 6-bit word what is the output
data rates in bits/s and the required bandwidth?

Q8 **Write short answer on any TWO:** **(5 x 2)**
    a) Power-type and energy-type signal

    b) FM modulators

    c) Indirect method for generation of PTM signals.

    d) Line codes