

Registration No. :

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Total number of printed pages – 3

B.Tech  
PCEE 4304

Sixth Semester Examination – 2013

COMMUNICATION ENGINEERING

BRANCH : CSE / IT

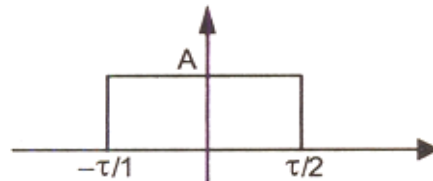
QUESTION CODE : A 270

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) What is the bandwidth of PCM system ?
  - (b) What are the differences between TDM and FDM ?
  - (c) What is pulse modulation ?
  - (d) What is bit guard time ?
  - (e) Draw the split phase code for the sequence 1101001.
  - (f) Use the convolution theorem to show that  $\text{sinc}(t) \otimes \text{sinc}(t) = \text{sinc}(t)$
  - (g) Draw the amplitude spectrum of the following waveform.



- (h) Explain the PWM modulator.

P.T.O.

- (i) Find the Fourier Transform of  $\cos(\omega_0 t)$ .
- (j) What do you mean by interpolation? Write the formula for it.
2. (a) A signal passed through an ideal low pass filter having frequency response

$$H(f) = \begin{cases} 1 & \text{for } |f| \leq W \\ 0 & \text{for } |f| > W \end{cases}$$

and output of the filter  $x(t)$  sampled at interval  $T_s = 1/2W$ . Show that the signal can be reconstructed using the relation.

$$x(t) = \sum_{n=-\infty}^{\infty} x(nT_s) \text{sinc}\left(\frac{t}{T_s} - n\right)$$



- (b) Differentiate between energy and power signals. 4
3. (a) Find the Fourier series expansion of the signal obtained by passing signal  $\cos(2\pi f_0 t)$  through a half wave rectifier. 5

- (b) Show that the Fourier transform of  $\frac{1}{2}\delta\left(f + \frac{1}{2}\right) + \frac{1}{2}\delta\left(f - \frac{1}{2}\right)$  is  $\cos(\pi t)$ .

Prove the following transform pair :

$$F[\cos(\pi t)] = \frac{1}{2}\delta\left(f + \frac{1}{2}\right) + \frac{1}{2}\delta\left(f - \frac{1}{2}\right) \text{ and}$$

$$F[\sin(\pi t)] = \frac{1}{2j}\delta\left(f + \frac{1}{2}\right) - \frac{1}{2j}\delta\left(f - \frac{1}{2}\right) \quad 5$$

4. The message signal  $m(t) = 10 \text{sinc}(400t)$  frequency modulates the carrier  $c(t) = 100 \cos 2\pi f_c t$ . The modulation index is 6. 10

- (a) Write an expression for the modulated signal  $u(t)$ .
- (b) What is the maximum frequency deviation?
- (c) What is the power content of the modulated signal?

5. An AM signal has the form 10  
 $u(t) = [20 + 2 \cos 3000 \pi t + 10 \cos 6000 \pi t] \cos 2 \pi f_c t.$   
 where  $f_c = 10^5 \text{ Hz}$
- (a) Sketch the spectrum of  $u(t)$ .
  - (b) Determine the power in each of the frequency component.
  - (c) Determine the modulation index.
  - (d) Determine the ratio of the sideband power to the total power.
6. (a) Two signals are bandlimited to 3 and 5 kHz, are to be time division multiplexed. Find the maximum permissible interval between two successive samples. 5
- (b) Explain the cross-talk in PAM due to HF and LF limitation of the channel. 5
7. (a) What do you mean by linear delta modulation, and what are the drawback of it? 5
- (b) How to overcome above drawbacks of LDM? 5
8. Write short notes on any **two**: 5×2
- (a) Demodulation of PAM
  - (b) Superheterodyne AM receiver
  - (c) Narrowband FM
  - (d) VSB modulation.

