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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

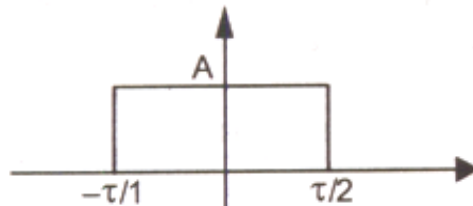
Time : 3 Hours

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

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

$$x(t) = \sum_{n=-\infty}^{\infty} x(nT_s) \text{sinc}\left(\frac{t}{T_s} - n\right) \quad 6$$

(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) Superhetrodyne AM receiver
 - (c) Narrowband FM
 - (d) VSB modulation.