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Total Number of Pages: 02

**B.TECH**  
**PCEI 4301**

**5<sup>th</sup> Semester Regular / Back Examination 2015-16**  
**COMMUNICATION SYSTEM ENGINEERING**

**BRANCH: AEIE, BIOMED, EIE, IEE**

**Time: 3 Hours**

**Max marks: 70**

**Q.CODE: T254**

**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 a linear time-invariant channel? Give an example.
- b) If  $X(\omega)$  is the Fourier transform of  $x(t)$ , find the Fourier transform of  $2x\left(\frac{t}{2}-5\right)$ .
- c) Prove that for a real, periodic signal the positive and negative coefficients are conjugates.
- d) Can a diode detector used to demodulate a DSB-SC amplitude modulated signal? Justify.
- e) A carrier is amplitude modulated to a depth of 40 %. What is the percentage increment in the power compared to the unmodulated carrier power?
- f) A carrier signal of  $c(t) = 20 \cos \omega_c t$  is modulated by a modulating signal  $m(t) = 40 \cos(2000\pi t)$ . Write down the expression for the modulated signal if the carrier is (i) frequency modulated (ii) phase modulated.
- g) Explain flat-top and natural sampling. Which one of these two is preferred and why?
- h) What is aliasing? What is cause of it?
- i) Find the maximum frequency and phase deviation of an angle-modulated signal is given by  $s(t) = \cos(2 \times 10^8 \pi t + 75 \sin 2 \times 10^3 \pi t)$ .
- j) If the number of bits per sample in a PCM system is increased from 8 to 16, what will happen to the bandwidth? Justify.

**Q2 a)** Find the Fourier series representation of a periodic Gate function with time period  $T_0=2$  and represent its spectrum. **(6)**

**b)** Find the Fourier transform of  $x(t)$  as shown in Fig.1 **(4)**

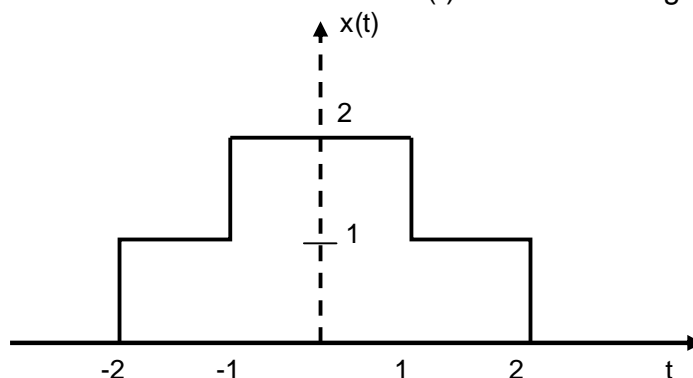


Figure. 1

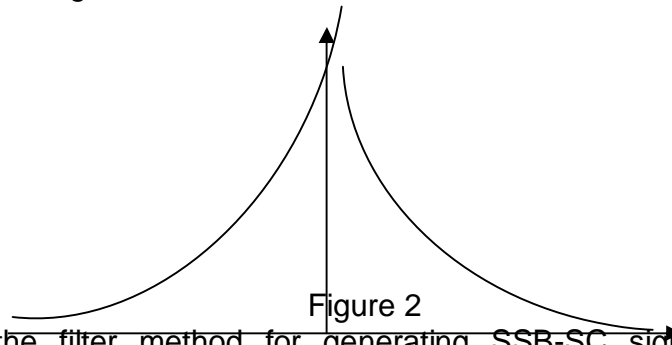
**Q3 a)** Explain the synchronous demodulation technique to demodulate the DSB-SC waveform. What are the effects of phase and frequency errors in synchronous detection? **(5)**

**b)** An amplitude modulated voltage is given by **(5)**

$$s(t) = 60(1 + 0.4 \cos 100\pi t + 0.3 \cos 3000\pi t) \cos 10^5 t$$

- i) State all the frequency components present in the voltage.
- ii) Find the modulation index for each of the modulating voltage.
- iii) What is the effective modulation index?
- iv) Draw the one –sided spectrum of the signal.
- v) Evaluate the total and sideband powers.

**Q4 a)** Find the Fourier transform of the two-sided exponential decaying signal as shown in Fig. 2 **(6)**



**b)** Explain the filter method for generating SSB-SC signal. Why do multiple stages used in this method? **(4)**

**Q5 a)** A single-tone FM signal is given by **(5)**

$$s(t) = 10 \cos(16\pi \times 10^6 t + 20 \sin 2\pi \times 10^6 t)$$

Find the modulation index, modulating frequency, deviation, carrier frequency, and power of the FM signal.

**b)** Explain the operation of balanced slope discriminator and write down its disadvantages **(5)**

**Q6 a)** With appropriate waveforms explain the direct and indirect method of generating PTM signals. **(6)**

**b)** Explain the various techniques/ steps involved in generation and reproduction of PCM signal. **(4)**

**Q7 a)** Find out the expression for signal to quantization noise ratio in PCM. **(6)**

**b)** Explain about the disadvantages in Delta modulation. **(4)**

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

- a) Balanced modulator using diode.
- b) Chopper modulator
- c) Line codes
- d) Adaptive delta modulation