Registration No :

Total Number of Pages : 02   **B.Tech**

PEE7J004

7th Semester Regular Examination 2018-19
COMMUNICATION ENGINEERING
BRANCH : ELECTRICAL
Time : 3 Hours
Max Marks : 100
Q.CODE : E156
Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
**The figures in the right hand margin indicate marks.**

Part- I

Q1 **Short Answer Type Questions (Answer All-10)**   **(2 x 10)**
- **a)** What is the role of channel encoder and decoder in a digital communication system?
- **b)** How are the positive and negative Fourier coefficients of a periodic signal relate with each other?
- **c)** What is reason of aliasing? Explain one method to overcome this.
- **d)** Can diode detector be used to demodulate a DSB-SC signal? Justify.
- **e)** What is the carrier power and total transmit power of an amplitude modulated signal $v(t) = 10(1 + 0.5\cos\omega_m t)\cos\omega_c t$.
- **f)** If the modulation index of a frequency modulated signal is doubled, what would happen to the bandwidth of the signal?
- **g)** What is the frequency deviation and phase deviation of an angle modulated signal $x(t) = 12\cos(2\pi \times 10^6 t + 15\sin 2\pi \times 10^3 t)$?
- **h)** What are the steps involved in generating a Pulse code modulation signal?
- **i)** What is slope overload problem in delta modulation?
- **j)** What is the difference between flat-top sampling and natural sampling? Which one is preferred?

Part- II

Q2 **Focused-Short Answer Type Questions- (Answer Any EIGHT out of TWELVE)**   **(6 x 8)**
- **a)** Find the Fourier transform of $x(t) = \Pi(t-2) + \Pi(t-4)$ where $\Pi(t)$ is represented as
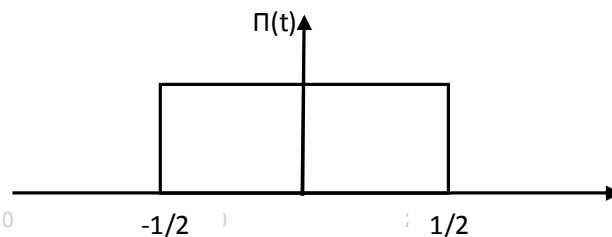
- **b)** State and prove frequency shifting and time shifting property of Fourier transform.
- **c)** Explain the filter method of generating SSB signal. What is(are) problem(s) associated with it?
- **d)** A single tone FM signal is given by $s(t) = 10\cos(16\pi \times 10^6 t + 20\sin 2\pi \times 10^3)$. Find the modulation index, modulating frequency, frequency deviation, carrier frequency, and the power of the FM signal.
- **e)** Represent the supreheterodyne AM receiver and explain the operation of each of the blocks.

f) A radio waveform of 12 V peak value amplitude modulates a carrier of 18 V peak amplitude. Calculate the total power, sidebands powers. How much power saving will be there if the carrier is suppressed?

g) How many sidebands (theoretically) are there in an FM signal? Practically how many sidebands are considered and why? What is the corresponding bandwidth requirement? If the modulating frequency is increased from 10 kHz to 20 kHz, what happens to the bandwidth? (Assume initial bandwidth of B Hz)

h) Prove the following for a PCM system with L quantization levels

$$(SNR)_{OdB} = \left(S/N_q\right)_{OdB} = 1.76 + 20\log L$$

i) 24 telephone channels each bandlimited to 3.4 kHz, are to be time division multiplexed by using PCM. Calculate the bandwidth of the PCM system for 128 quantization levels and an 8 kHz sampling frequency. What would happen if the number of quantization levels is doubled?

j) Explain the indirect method of generation of PTM signal.

k) What are the drawbacks in delta modulation? How can they be overcome?

l) Explain companding? How does it help in improving performance in quantization processes?

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Part-III

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Long Answer Type Questions (Answer Any TWO out of FOUR)

Q3 a) Find the Fourier transform of a double-sided exponential signal $e^{-b|t|}$ and draw the spectrum. **(8)**

b) Explain the operation of single-tune discriminator circuit or simple slope detector. Write down its demerits. **(8)**

Q4 a) Explain the synchronization demodulation technique for SSB-SC signal. What are the consequence of phase mismatch and frequency mismatch in synchronization demodulation technique? **(10)**

b) Explain the parameter variation method of generating FM signal. **(6)**

Q5 a) An amplitude modulated signal is represented as **(10)**

$$s(t) = 20(1 + 0.4\cos 2000\pi t + 0.5\cos 5000\pi t + 0.2\cos 4000\pi t)\cos 2 \times 10^6 \pi t$$

  i. What are the individual modulation indices and the resultant modulation index?
  ii. What are the peak amplitudes and frequency of the message signals and carrier signal?
  iii. What is the total power?
  iv. Write down the expression for the modulating signal.
  v. Draw the one-side frequency response of the signal.

b) Represent 1 0 1 1 0 1 in various line codes. **(6)**

Q6 a) Derive the output signal to quantization noise ratio of a pulse code modulated signal. **(8)**

b) Explain the adaptive delta modulation technique? How does the adaptive modulation help in overcoming the problem in delta modulation technique? **(8)**