Registration No :

Total Number of Pages : 02   **B.Tech**
                                                                                                                     PEL6I101

6th Semester Regular / Back Examination 2018-19
COMMUNICATION ENGINEERING
BRANCH : EEE
Max Marks : 100
Time : 3 Hours
Q.CODE : F986
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   **Only Short Answer Type Questions (Answer All-10)**   **(2 x 10)**

   a) Illustrates the signal attenuation in dB/mile due to precipitation for frequencies in the range of 10–100GHz and derive at least one conclusion.

   b) Write Dirichlet sufficient conditions for the existence of the Fourier series expansion.

   c) For a low-pass signal with a bandwidth of 4000 Hz, what is the minimum sampling frequency for perfect reconstruction of the signal? What is the minimum required sampling frequency if a guard band of 800 Hz is required?

   d) Show that the energy content of a signal is equal to the energy content of its Hilbert transform.

   e) Which modulation techniques are used for transmission of picture and speech signals in commercial TV broadcasting in India and why?

   f) Five telemetry signals, each of bandwidth 2 kHz, are to be transmitted simultaneously by binary PCM. The maximum tolerable error in sample amplitudes is 0.2% of the peak signal amplitude. The signals must be sampled at least 20% above the Nyquist rate. Framing and synchronizing requires an additional 1% extra bits. Determine the minimum transmission bandwidth.

   g) A super heterodyne radio receiver with an intermediate frequency of 455 KHz is tuned to a station operating at 1100 KHz. Calculate the image frequency.

   h) What are the significances of eye pattern taken by a CRO?

   i) In a DSB system the carrier is $c(t)= 5 \cos 2\pi f_c t$ and the message signal is given by $m(t)=$sinc$(t) +$ sinc$2(t)$. Find the frequency domain representation and the bandwidth of the modulated signal.

   j) A TDM link has 10 signal channels and each channel is sampled 8000 times/sec. Each sample is represented by seven binary bits and contains an additional bit for synchronization. Find out the total bit rate for the TDM link in kbps.

Part- II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 x 8)**

   a) Let $X(f) \equiv 0$ for $|f| \geq W$. Let $x(t)$be sampled at multiples of some basic sampling interval T_s, where $\mathbf{T_s} \leq \frac{1}{2W}$, to get the sequence $\{\mathbf{x(nTs)}\} \, ^{+\infty}_{n=-\infty}$ Then reconstruct the original signal x(t)from the sampled values by using the reconstruction formula.

   b) Determine the Fourier transform of the following signals (α is positive).
$$te^{-\propto t}sinc^3 2t$$

   c) A linear time-invariant system with impulse response $h(t)=2e^{-\alpha t} \cos(\beta t)u_{-1}(t)$ is driven by the input $x(t) =e^{-\beta t}u_{-1}(t)$. It is assumed that α, β >0. Using frequency domain analysis, find the output of the system. Is the output power-type or energy type? Find its power or energy.

   d) Explain the Armstrong method of FM generation.

e) Using suitable diagram / reasons answer the following questions:-
  (i) What is interlaced scanning pattern?
  (ii) What is the maximum bandwidth of the video signal and why it is as such?
  (iii) What is the total channel bandwidth required to transmit the video and audio signals and why?

f) A SSB AM signal is generated by modulating an 500-kHz carrier by the signal m(t)=cos 1000πt +4 sin 1000πt. The amplitude of the carrier is A_c =30.
  (i) Determine the signal $\widehat{m}(t)$.
  (ii) Determine the (time domain) expression for the lower sideband of the SSB AM signal.
  (iii) Determine the magnitude spectrum of the lower sideband SSB signal. .

g) Find the transmission rates of T1,T2,T3,T4& T5 carrier systems.

h) What is quadrature carrier multiplexing? Explain with neat block diagram.

i) A unipolar NRZ line code is converted to a multilevel signal for transmission over a channel. The number of possible values in the multilevel signal is 64, and the signal consists of rectangular pulses that have a pulse width of 0.3472 ms. For the multilevel signal,
  (i) What is the baud rate?
  (ii) What is the equivalent bit rate?
  (iii) What is the null bandwidth?

j) Describe the pulse modulation scheme of PAM,PPM& PWM. Does these modulation scheme comes under digital modulation technique? Justify the answer.

k) In a single integration DM system, the voice signal is sampled at a rate of 64 kHz. The maximum signal amplitude is 1.
  (i) Determine the SNR of the system, assuming the voice signal to be sinusoidal, with rms bandwidth of 1.3 kHz.
  (ii) Determine how many similar voice channels can be transmitted over the same communication link for maximum utilization of the link under an acceptable level of SNR.

l) Design a TDM PCM system that will accommodate four 200-bits (synchronous) digital inputs and one analog input that has a bandwidth of 600 Hz. Assume that the analog samples will be encoded into 4-bit PCM words. Draw a block diagram for your design, indicating the data rates at the various points on the diagram. Explain how your design works.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Analyze the frequency domain characteristics of band-pass signal and sketch the phasor of band-pass signal. With suitable explanation draw the envelope and phase of a bandpass signal. **(16)**

Q4 Which modulation will be suitable for transmitting audio signal? Assume appropriate audio frequency and obtain its spectrum response. Is there any transformation required for transmission of this audio signal to a long range i.e. above 100 km? Summarize the modulation analysis and explain. Why and how this modulation suits? **(16)**

Q5 **a)** Derive the relationship between signaling rate and transmission bandwidth in PCM system. **(8)**

b) Formulate the expression for signal to quantization noise ratio for PCM system that employs linear quantization technique. Assume that input to the PCM system is a sinusoidal signal. **(8)**

Q6 Explain the Performance of binary and S-ary system **(16)**