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Total Number of Pages : 02

B.Tech  
PEI4I101

4<sup>th</sup> Semester Regular / Back Examination 2018-19  
COMMUNICATION SYSTEM ENGINEERING  
BRANCH : AEIE, EIE, IEE

Time : 3 Hours

Max Marks : 100

Q.CODE : F253

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)

- Write the Fourier Transform of an impulse function,  $f(t) = \delta(t)$ .
- Draw the block diagram of Electrical Communication System.
- State the Rayleigh's Energy Theorem.
- Analyze the output of a Hilbert Transformer if the input is,  
 $m(t) = \cos 2\pi 1000t + \cos 2\pi 2000t$ .
- Illustrate the relationship between phase and frequency modulation.
- Draw the circuit diagram of an Envelope Detector and its output waveform.
- Determine the instantaneous frequency of a wave having a total phase angle given by,  
 $\psi(t) = 2000t + \sin 10t$ .
- Define Carson's rule for single tone and multi tone FM signal.
- What is TDM system? State the application of TDM system for any modulation technique.
- State Sampling Theorem.

Part- II

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

- Find the Fourier Transform of a double-sided exponential signal  $e^{-b|t|}$  and draw the spectrum.
- Illustrate that the normalized Gaussian Pulse is its own Fourier transform.
- Justify the simplicity in AM modulation comes with a major burden of high power budget.
- Formulate the Fourier transform of,
  - Sinusoid signal,  $g(t) = \sin(2\pi f_c t)$
  - squared sinusoidal signals,  $s(t) = \sin^2(2\pi f_c t)$
- Discuss the operation of a PLL with its proper equivalent circuit?
- Discuss a Superheterodyne System with respect to AM system.
- Explain the Armstrong method of generating FM signal. Why is it called indirect method?
- Design a system to multiplex many baseband signals over a single communication channel and recovery of these message signals.
- Explain the SSB generation using balanced modulators and phase shifters.
- An amplitude modulated voltage is given by,  
 $v(t) = 50(1 + 0.2 \cos 100t + 0.01 \cos 3500t) \cos 10^6 t$ . State all frequency component (in Hz) present in the modulated signal and find the modulation index for each modulating voltage term. What is the effective modulation index of  $v(t)$  ?
- Discuss the demodulation of FM signal using balanced frequency discriminator.
- Explain the different types of PAM signals. Illustrate how Sample and hold Circuit helps in signal recovery in PAM system?

**Part-III**

**Only Long Answer Type Questions (Answer Any Two out of Four)**

**Q3** Calculate the energy and the energy spectral density of the *sinc* pulse defined by, **(16)**  
 $g(t) = A \text{sinc}(2Wt)$ . Find the autocorrelation function of the *sinc* pulse. 210 210

**Q4** Discuss the phase discrimination method for generation of VSB modulated signal. What **(16)**  
are its advantages over DSB and SSB modulation? Mention its applications.

**Q5** Consider a modulating signal  $m(t) = 2\sin(2\pi 10^3 t)$  is used to modulate a carrier of **(16)**  
frequency  $10^6$  Hz. Find the bandwidth for,  
a) Phase modulation and frequency modulation for the above also,  
b) When modulating frequency is doubled 210 210 210 210  
c) When amplitude of modulating signal is halved, thereafter. Use  $\beta_p = 10$  and  $\beta_f = 10$   
unit.

**Q6** Describe the generation of PWM and PPM signal and draw the waveforms justifying your **(16)**  
block diagram.