

6. (a) Explain the generation and detection of a PWM signal. 7
- (b) Compare among PAM, PWM and PPM systems. 7
7. (a) Draw the block diagram of a super-heterodyne receiver and explain the function of each block. 7
- (b) Define the following for a receiver : 7
- (i) Sensitivity
  - (ii) Selectivity
  - (iii) Fidelity
  - (iv) Tracking
  - (v) Double spotting
  - (vi) Image frequency and its rejection
8. (a) Evaluate the noise performance of FM system. 7
- (b) Evaluate the figure of merit of an AM receiver operating on single-tone AM. 7
9. (a) Sketch the composite video signal waveform for three lines and explain various components in brief. 7
- (b) Draw the block diagram of a monochrome TV transmitter and describe each block in brief. 7

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Code : 041603

## B.Tech 6th Semester Exam., 2015

## INTRODUCTION TO COMMUNICATION SYSTEMS

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct option/Answer the following (any seven) : 2×7=14

(a) The highest modulating frequency used in AM broadcast system is

(i) 10 kHz

(ii) 15 kHz

(iii) 5 kHz

(iv) 2 MHz

(b) Radio signals are made up of

(i) voltages and currents

(ii) electric and magnetic fields

(iii) electrons and protons

(iv) noise and data

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(c) The Fourier transform of convolution of signals in the time domain will be transformed into the — of their Fourier transforms in the frequency domain.

- (i) addition
- (ii) subtraction
- (iii) division
- (iv) multiplication

(d) The trigonometric Fourier series of a periodic time function can have only — term(s).

- (i) d.c. and cosine
- (ii) cosine
- (iii) sine
- (iv) sine and cosine

(e) In AM

- (i) sideband power is always constant
- (ii) total transmitted power is constant
- (iii) carrier power is constant
- (iv) bandwidth is infinite

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(f) With increase in the modulation index of an FM wave, the number of sidebands having significant amplitude

- (i) will increase
- (ii) will decrease
- (iii) remains constant

(g) The frequency deviation in PM is proportional to

- (i) modulating voltage
- (ii) modulating frequency
- (iii) modulating frequency and voltage

(h) In FM, when the modulating frequency is 1000 Hz and AF voltage is 2 V, the deviation is 4 kHz. If the modulating voltage is increased to 3 V, the new deviation is given by

- (i) 4 kHz
- (ii) 2 kHz
- (iii) 6 kHz
- (iv) 10 kHz

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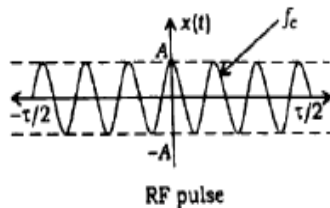
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- (i) The noise immunity of PAM signal is
  - (i) better than PWM and PPM
  - (ii) better than PWM but worse than PPM
  - (iii) poorer than PWM as well as PPM
- (j) Write the advantage of super-heterodyning.

2. (a) Write down the trigonometric form of the Fourier series representation of a periodic signal. State the necessary and sufficient conditions for the existence of the Fourier series representation for a signal.

(b) Find the PSD for  $x(t) = A \cos(2\pi f_c t)$  and hence find the average power of the signal  $x(t)$ .

3. (a) Obtain the Fourier transform and amplitude spectrum of the RF pulse shown in the figure below :



(b) Define amplitude modulation. Derive the relationship between the total transmitted power and carrier power in an AM system when several frequencies simultaneously modulate a carrier.

4. (a) Show that if the output of a phase-shift modulator is an SSB signal, (i) the difference of the signals at the summing junction produces the upper-sideband SSB signal and (ii) the sum produces the lower-sideband SSB signal. That is

$$x_c(t) = x_{USB}(t) = m(t) \cos \omega_c t - \hat{m}(t) \sin \omega_c t$$

is an upper-sideband SSB signal and

$$x_c(t) = x_{LSB}(t) = m(t) \cos \omega_c t + \hat{m}(t) \sin \omega_c t$$

is a lower-sideband SSB signal.

(b) What is DSB-SC modulator? Explain how the ring modulator for generation of DSB-SC wave acts as a demodulator.

5. (a) Compare between wideband FM and narrowband FM. Use Carson's rule to compare the bandwidth that would be required to transmit a baseband signal with frequency range from 300 Hz to 3 kHz using (i) NBFM with maximum deviation of 5 kHz and (ii) WBFM with maximum deviation of 75 kHz.

(b) Draw the circuit diagram of balanced slope detector and explain it for demodulation of FM signal.