

B.Tech 5th Semester Exam., 2017

INTRODUCTION TO COMMUNICATION
SYSTEM

Time : 3 hours

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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. Fill in the blanks/Choose the correct option of the following (any seven) : $2 \times 7 = 14$

- (a) The input signal to a coherent detector is the DSB-SC and noise. At the detector output, the noise is low
- (b) Which of the following modulation (analog) schemes requires the minimal channel bandwidth?
 - (i) VSB akubihar.com
 - (ii) SSB ✓
 - (iii) DSB-SC
 - (iv) DSB-C

(c) Consider that an envelope detector is used to detect an AM signal. Let the carrier frequency and the message signal frequency are 1 MHz and 2 kHz respectively. The suitable value of the time constant of the envelope detector is

- (i) 500 μ s akubihar.com
- (ii) 20 μ s
- (iii) 0.2 μ s
- (iv) 1000 μ s

(d) Let a band limited signal is sampled at the Nyquist rate. This signal can be recovered by passing the sample through _____. akubihar.com

(e) Assume that a sinusoidal carrier signal with frequency 1 MHz is amplitude modulated by a symmetrical square wave with time period of 100 μ s. Which of the following frequency components will not be present in the modulated signal?

- (i) 990 kHz akubihar.com
- (ii) 1030 kHz
- (iii) 1080 kHz
- (iv) 1010 kHz

(f) The PAM signals can be detected by using _____.

(3)

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(g) PLL can be used to demodulate _____ signals.

(h) The image channel selectivity of a superheterodyne communication receiver is determined by _____.

(i) The signal

$$\cos 2\pi f_c t + \frac{1}{2} \cos 2\pi f_m t \cos 2\pi f_c t$$

is basically

(i) AM signal

(ii) FM signal

(iii) both AM signal and FM signal

(iv) None of the above

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(j) A Hilbert transformer is belonging to which of the following systems?

(i) Linear system

(ii) Non-causal system

(iii) Time-varying system

(iv) Low-pass system

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2. (a) Let $x(f) = 0.1 \sin C(3f)$. Find $x(t)$. 7

(b) Obtain the complex Fourier series for

$$x(t) = \cos \omega_c t + \sin^2 \omega_c t \quad 7$$

(4)

3. (a) Explain the method for frequency translation. akubihar.com 6

(b) Using suitable diagram, explain the working of power-law modulator and mention for what kind of AM it can be used. 8

4. (a) Explain the relation between the frequency and phase modulation. Use the necessary diagrams. 7

(b) Using suitable diagram, explain frequency division multiplexing of multiple signals. 7

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5. (a) Using the varactor diode, explain the direct method for FM generation. 7

(b) Explain the method for FM demodulation with some suitable examples of FM demodulators. 7

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6. (a) Determine the instantaneous frequency (in Hz) of each of the following signals : 6

(i) $50 \cos \left(300\pi t + \frac{\pi}{4} \right)$

(ii) $20 \cos(50\pi t + \pi t^2)$

(iii) $\cos(200\pi t - 5 \sin 2\pi t)$

- (b) Show that for angle modulation, the modulated carrier can be represented by

$$x(t) = A_c \sum_{n=-\infty}^{\infty} J_n(\beta) \cos(\omega_c + n\omega_m)t$$

where, $J_n(\beta)$ = Bessel function of first kind of order n and β = modulation index.

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7. (a) Using the suitable diagrams/expressions, discuss the concept of multiplexing luminance and chrominance signals in context of compatible Color Television.

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- (b) Discuss the preemphasis and deemphasis in an FM system.

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8. (a) With the help of suitable block diagrams, explain briefly the basic monochrome TV-transmitter and receiver.

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- (b) Describe the working principle of a non-linear DSB-SC modulator.

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9. (a) Calculate the SNR for SSB-SC signal.

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- (b) With the help of necessary block diagram(s), explain the working principle of a superheterodyne receiver for FM radio system.

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