Question Paper

Exam Date & Time: 26-Jun-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

IV SEMESTER B.TECH (Electronics and Instrumentation Engineering) Makeup examination June 2024

COMMUNICATION SYSTEMS [ICE 2225]

Marks: 50 **Duration: 180 mins.**

Descriptive Questions

Answer all the questions.

1)	Analyze the operation of ring modulator for generating DSB-SC signals. Illustrate the generated doulble sideband signal. [CO1, PO 1, 2, 12, BL3]	(5)
2)	Examine the block diagram of a super-heterodyne FM receiver, delineating the functions of individual blocks and their contributions to receiving and demodulating FM signals. [CO1, PO 1, 2, 12, BL3]	(3)
3)	The tuned circuit of the oscillator in a simple AM transmitter employs a 50μH coil and 1nf capacitor. If the oscillator output is modulated by audio frequency upto 10 KHz, calculate the range occupied by the sideband. [CO1, PO 1, 2, 12, BL3]	(2)
4)	The binary sequence 11100101 is applied to an ASK modulator. The bit duration is 1μs, and the sinusoidal carrier wave used to represent symbol 1 has a frequency equal to 7 MHz. (a) Find the transmission bandwidth of the transmitted signal. (b) Plot the waveform of the transmitted ASK signal. Assume that the line encoder and the carrier-wave oscillator are controlled by a common clock. [CO3, PO 1, 2, 12, BL4]	(4)
5)	Analyze and derive the time domain and frequency domain representations of Double-Sideband Full Carrier (DSB-FC) modulation. [CO1, PO 1, 2, 12, BL3]	(3)
6)	Evaluate the role of the sampling block in the PCM block diagram. Discuss how the Nyquist theorem relates to sampling rates, aliasing prevention, and maintaining signal fidelity in PCM systems. [CO2, PO 1, 2, BL3]	(3)
7)	Examine the functionality and operation of delta modulation in digital transmission, considering both the transmitter and receiver components. [CO2, PO 1, 2, BL3]	(4)
8)	Evaluate various types of transmission media, such as guided and unguided, considering their advantages, limitations, and suitability for different applications. [CO5, PO 1, 2, 12, BL3]	(4)
9)	For a standard telephone circuit with a signal-to-noise power ratio of 1000 (30 dB) and a bandwidth of 2.7 kHz, calculate the Shannon limit for information capacity. [CO3, PO 1, 2, 12, BL4]	(2)
10)	Evaluate the significance of GSM architecture in providing seamless handover and roaming capabilities for mobile subscribers. Discuss how the Base Transceiver Station (BTS), Mobile Switching Center (MSC), and Visitor Location Register (VLR) work together to ensure uninterrupted communication during handovers between different cells and networks. [CO5, PO 1, 2, 12, BL3]	(3)

11)	Analyze the operational principles of Time Division Multiplexing (TDM), detailing how it facilitates the transmission of multiple signals over a single communication channel. [CO2, PO 1, 2, BL3]	(3)
12)	Analyze the modulation and demodulation methodologies employed in Frequency Shift Keying (FSK) within the context of digital communication systems. [CO3, PO 1, 2, 12, BL3]	(4)
13)	A 10 kilowatt transmitter amplitude modulates a carrier with a tone $m(t) = \sin(2000\pi t)$, using 50 percent modulation. Propagation losses between the transmitter and the receiver attenuate the signal by 90 dB. The receiver has a front-end noise with spectral density N_0 = -113 dBW/Hz and includes a bandpass filter with bandwidth $B_T = 2W$ = 10 kHz. What is the post-detection signal-to-noise ratio, assuming the receiver uses an envelope detector? [CO4, PO 1, 2, 12, BL4]	(5)
14)	Evaluate the operational procedures of a Differential Phase Shift Keying (DPSK) transmitter and receiver, elucidating their functionality in encoding and decoding binary input data '0110110110', while considering a reference bit of 1 and a reference phase of 0°. [CO3, PO 1, 2, 12, BL3]	(3)
15)	Compare the complexity and spectral efficiency characteristics of CDMA and FDMA techniques. [CO5, PO 1, 2, 12, BL3]	(2)

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