Question Paper

Exam Date & Time: 09-May-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

IV Semester End Semester Examination, April / May 2024

COMMUNICATION SYSTEMS [ICE 2225]

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

PART A

Answer all the questions.

1) Justify the role of the demodulator in FM signal transmission. Explain the working of the Foster Seeley demodulator used for FM demodulation. [CO1, PO1, PO2, PO3,PO7,PO8,PO12 BL3] . (4)

A)

B) An AM modulating signal 40sin(2 x 10^4 t) is used to modulate a carrier signal 60 sin(2 x 10^6 t). Find the following parameters: (4)

- Modulation Index
- Percentage of Modulation Index
- Frequency of the sideband components
- Amplitude of the sidebands
- Bandwidth for the modulated signal
- Draw the spectrum for the modulated wave **[CO1,** PO1, PO2, PO3,PO7,PO8,PO12 **BL4]**

C) Why DSB-SC signal is better than the DSB-FC? Mention the different generation processes of the DSB-SC signal. **[CO1,** PO1, PO2, PO3,PO7,PO8,PO12 **BL3]** (2)

2) The DPCM technique helps to avoid the aliasing effect and save bandwidth-Justify the above statement by explaining the DPCM generation method with a proper block diagram. **[CO2,** PO1, PO2, PO3,PO7,PO8,PO12 **BL3]** (4)

A)

B) What is the cloud service model? Demonstrate the different cloud service models with significant examples. **[CO3,** PO1, PO2, PO3,PO7,PO8,PO12 **BL3]** (4)

C) Justify the use of a sawtooth wave generator in the PWM signal generation. **[CO2,** PO1, PO2, PO3,PO7,PO8,PO12 **BL3]** (2)

3) What is the significance of the Rayleigh fading model in wireless and cellular communication? Formulate the Rayleigh fading model and identify the pdf of SNR, if the amplitude of the signal is ὰ, SNR is ϒ and the average SNR is $\overline{\Upsilon}$. **[CO3,** PO1, PO2, PO3,PO7,PO8,PO12 **BL3]** (4)

A)

B) What is large-scale fading? How is it related to path loss? Highlight the different path loss models used for wireless and cellular communication. **[CO3,** PO1, PO2, PO3,PO7,PO8,PO12 **BL3]** (4)

C) What is a product modulator? How does it help to generate the DSB-SC and SSB signals?**[CO1,** (2)

PO1, PO2, PO3,PO7,PO8,PO12 **BL3]**

4) What is the publish-subscribe model? How MQTT solves multiple client problems in a network with limited resources. **[CO4,** PO1, PO2, PO3,PO5,PO6,PO7,PO8,PO10,PO12 **BL3]** (5)

A)

B) Justify the need of spread spectrum techniques for cellular communication. Describe the working principle of the Frequency Hopping Spread Spectrum (FHSS) Transmitter using a proper block diagram. **[CO5,** PO1, PO2, PO3,PO5,PO6,PO7,PO8,PO10,PO12 **BL3]** (3)

C) What is the MIMO system how does it help to enhance data rate and SNR in wireless communication? **[CO3,** PO1, PO2, PO3,PO7,PO8,PO12 **BL3]** (2)

5) Justify the importance of Snell's law for optical fiber communication. Formulate the equation for Snell's law when the light ray passes through two different mediums having different refractive indexes. (4)

A)

Using the above relation solve the following problem:

A ray of light travels through air at an angle of 30degrees to the vertical. It passes into the water and halves its angle to the vertical. What is the index of refraction of water?

θair=1.00 **[CO5,** PO1, PO2, PO3,PO5,PO6,PO7,PO8,PO10,PO12 **BL4]**

B) Write down the significance of SONET in optical networks. Identify the different entities required for the establishment of a SONET network **[CO5, PO1, PO2, PO3,PO5,PO6,PO7,PO8,PO10,PO12 BL2]** (4)

C) What is Total Internal Reflection (TIR)? How does it depend on the critical angle and aperture of the optical fiber? **[CO5,** PO1, PO2, PO3,PO5,PO6,PO7,PO8,PO10,PO12 **BL2]** (2)

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