UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

UPES

End Semester Examination, December 2017

Program: B. Tech (Instrumentation and Control Engineering)   **Semester – V**
Subject (Course): Analog and Digital Communication   **Max. Marks: 100**
Course Code   : ELEG338   **Duration: 3 Hrs**

No. of page/s:

NOTE: Attempt all questions

<div align="center">

Part A   **[5×4 = 20]**

</div>

1. State Carson's Rule for Frequency Bandwidth.

2. Three (03) Message signals each bandlimited to 5 kHz are multiplexed with modulation schemes AM, DSB, SSB-SC respectively using FDM. The Guard Band of 1 kHz is provided. Find multiplexed signal bandwidth.

3. Compare ASK, FSK and PSK on different parameters such as Probability of Error and Bandwidth.

4. Explain the need for modulation?

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Part B   **[4×10 = 40]**

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5. Define the criteria for choosing the suitable digital modulation technique? Compare BFSK and BPSK on these criteria and justify your choice

6. An AM signal is given by $4\cos 3200\pi t + 10\cos 4000\pi t + 4\cos 4800\pi t$.

   a) Find all possible parameters of AM.

   b) Plot AM spectrum and identify spectrum components.

7. A message signal given as: $m(t) = 10 \cos (4\pi \times 10^4) t$ is transmitted by using 4 bit PCM system. Find all possible parameters of PCM.

8. Assume we want to transmit the following binary string:1101001.Show the resulting signal on the one using the following line coding techniques:

   - Unipolar NRZ
   - Polar RZ
   - Polar NRZ
   - Manchester
   - AMI

9. Design a typical FM transmitter using Armstrong method operating at 90 MHz. Consider the carrier frequency of being 150 kHz, and the frequency deviation of 75 kHz. Write the notation of frequency at each point.

10. a.) Design a DM transmitter and receiver where step size of reconstructed message signal is equal to that of original message signal which is then equal to optimum step size so that error could be minimized.

   b.) Ten (10) sinusoidal message signal each having frequency of 20 kHz are multiplexed using TDM. Sampling rate is 2.5 times to Nyquist Rate. Maximum possible quantization error should be at most of 1% of peak amplitude of message signal. No. of control bits are given by 5. Find bit rate of multiplexed signal at the transmitting end.

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Part A   **[5×4 = 20]**

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1. Briefly explain the need for modulation?

2. State Carson's Rule for frequency Modulation.

3. Compare ASK, FSK and PSK on different parameters such as Probability of Error and Bandwidth.

4. Three (3) Message signal each bandlimited to 6 kHz are multiplexed using different modulation schemes as AM, DSB, SSB-SC respectively using FDM. The Guard Band is given by 0.5 kHz. Find multiplexed signal bandwidth.

<div align="center">

Part B   **[4×10 = 40]**

</div>

5. An AM signal is given by $4\cos3200\pi t + 10\cos4000\pi t + 4\cos4800\pi t$.

   a.   Find all possible parameters of AM.

   b. Plot AM spectrum and identify spectrum components.

6. A message signal of $M(t) = 20\cos(4\pi \times 10^4)t$ is transmitted by using 4 bit PCM system. Find all possible parameters of PCM.

7. Define the criteria of choosing the suitable digital modulation technique? Compare BFSK and BPSK on these criteria and justify your choice.

8.   Assume we want to transmit the following binary string:1101001.Show the resulting signal on the one using the following line coding techniques:

   • Unipolar NRZ

   • Polar RZ

   • Polar NRZ

- Manchester

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Part C   **[2×20 = 40]**

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9. Design a typical FM transmitter using Armstrong method operating at 90 MHz. Consider the carrier frequency of being 150 kHz, and the frequency deviation of 75 kHz. Write the notation of frequency at each point.

10. a. Design a DM transmitter and receiver where step size of reconstructed message signal is equal to original message signal which is equal to optimum step size so that error can be minimized.

    b. Ten(10) sinusoidal message signal each having frequency of 20 kHz are multiplexed using TDM. Sampling rate is 2.5 times to Nyquist Rate. Maximum possible quantization error should be at most of 1% of peak amplitude of message signal. No. of control bits given by 5. Find bit rate of the multiplexed signal at the transmitting end.

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