

JK Lakshmipat University, Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2022

B. Tech. (ECE), Semester V, 2022-23

Roll No.....

EE1109: Analog and Digital Communications

Time: 3 hours

Max. Marks: 30

Instructions to students: Answer ALL questions

1. Do not write anything other than your roll number on question paper
2. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever required are an integral part of the answer
3. Use of programmable calculator, class lecture notes/handouts, etc., are not allowed
4. Assume suitable data wherever required and mention it clearly

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- Q. 1 Draw the basic circuit diagram of a non-coherent AM envelope detector and show graphically the envelope tracing process for $0 \leq m \leq 1$. Write the equation of the envelope. 3
[CO 1,2]
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- Q. 2 (i) Using phase and frequency modulator, show the relationship between FM and PM w.r.t. angle modulation. 5
[CO 1, 2]
- (ii) Obtain the transfer characteristics (along with basic circuit diagram) of pre-emphasis and de-emphasis filters. Designate the pre-emphasis sub-bands for a Dolby noise reduction system.
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- Q. 3 Using full scale sinusoidal signal voltage, derive the rms noise error, peak voltage, pdf and variance of quantization error and dynamic range for SNR of quantization. 6
[CO 4, 6]
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- Q. 4 8 message signals are sampled and multiplex with TDM whose output is passed through LPF before transmission. 6 of the input signals have bandwidth of 4 KHz and the other 2 are bandlimited to 12 KHz. 7
[CO 3, 4]
- (a) Identify the minimum sampling rate of the composite signal and calculate the overall sampling rate.
- (b) Design an asynchronous TDM for this application assuming commutator switch speed is 8000 rotations/sec.
- (c) Compare the transmission bandwidth requirements for above (a) and (b).
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- Q. 5 (i) For an FSK system, separate carriers are used for 0 and 1 data transmission and the available bandwidth of 100 KHz spans from 200 to 300 KHz. Calculate the carrier frequency required and the bit rate if data is modulated with $d = 1$. (ii) Show an FSK modulator using two ASK modulators. Illustrate graphically a FSK scheme using separate carriers for 0 and 1 data transmission. 5 [CO 4, 5]
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- Q. 6 Illustrate using equations and graphs the principle of Minimum Shift Keying. Why is MSK preferred over PSK? Assuming AWGN channel, justify that orthogonality makes signal more uncorrelated to easily separate at the receiver. 4 [CO 5, 6]