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Total No. of Questions : 08]

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Paper ID [EC504]

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M.Tech.

ADVANCED COMMUNICATION SYSTEMS (EC/ECE-504)

Time : 03 Hours

Maximum Marks : 100

Instruction to Candidates:

- 1) Attempt any **Five** questions.
- 2) All questions carry equal marks.

Q1) (a) Why digital communication systems are preferred over analog communication systems.

(b) A sinusoidal carrier has amplitude of 10 V and frequency 30 kHz. It is amplitude modulated by a sinusoidal voltage of amplitude 3V and frequency 1 kHz. Modulated voltage is developed across a 50Ω resistance.

(i) Write the equation for modulated wave.

(ii) Plot the modulated wave showing maxima and minima of waveform.

Q2) (a) Using Shannon's theorem, compute the maximum bit rate for a channel having a bandwidth of 3000 Hz and Signal-to-Noise ratio of 30dB. Also Calculate the number of levels required to transmit the maximum bit rate.

(b) What is companding explain with suitable example?

Q3) (a) The equivalent noise bandwidth of a system as

$$B_{eq} = \frac{1}{2\pi} \frac{\int_0^{\infty} |H(\omega)|^2 d\omega}{|H(\omega)|_{\max}^2} \text{ Hz} \quad \text{Where } |H(\omega)|_{\max}^2 = \max |H(\omega)|^2$$

Determine the equivalent noise bandwidth of the ideal bandpass filter (BPF) and that of a low pass RC filter.

(b) What is on board processing? How it is implemented.

Q4) What is multiplexing? Compare and contrast various multiplexing techniques used in communication.

Q5) For a bit stream 01001110, sketch the waveforms for each of the codes:

- (a) Non-Return-to-Zero-L
- (b) Non-Return-to-Zero-I
- (c) Bipolar AMI
- (d) Pseudoternary
- (e) Manchester

Assume that the signal level for the preceding bit for NRZ-I was high, the most recent preceding bit (AMI) has a negative voltage and the most recent preceding bit (Pseudoternary) has a negative voltage.

Q6) (a) What is WDM? How it is different from TDM.

(b) In a fiber optic network 256 nodes are to be connected using 256×256 star coupler. The star coupler is formed by interconnection of basic 2×2 couplers in M stages. The average loss per coupler (Insertion and splicing loss) is 0.25 dB. Find the number of 2×2 coupler required and the maximum permissible transmission distance if the average transmission loss (including connection loss) is 0.5 db/km. Assume a transmitter to receiver margin of 32 dB.

Q7) (a) Can a 4 port circulator be used as a 3 port circulator? Explain with the help of a suitable diagram.

(b) What is switching? How it is implemented.

Q8) What do you understand by protocol? List and explain various protocols used for transmission in mobile communication.