

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS- May2022

B.Tech-IV Semester (ECE/CSE/IT)

COURSE CODE (CREDITS): 18B11EC413(4)

MAX. MARKS: 35

COURSE NAME: Modern Analog and Digital Communication

COURSE INSTRUCTOR: Dr. Pardeep Garg

MAX. TIME: 2 Hours

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*Note: All questions are compulsory. Marks are indicated against each question in square brackets. CO stands for Course Outcomes.*

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**Q1(a).** It is believed that the features 'Selectivity and Sensitivity' of Superheterodyne receiver are much better than Tuned Radio Frequency (TRF) receiver. Justify this statement by i) drawing the block diagram of Superheterodyne receiver and TRF receiver ii) discuss the functioning of both in detail iii) compare the above said features of both receivers.

CO-5 (1.5+1.5+2=5 marks)

**Q1(b).** A radio receiver is tuned at 650 kHz and the local oscillator frequency is adjusted at 1105 kHz. Compute the image signal frequency.

CO-5 (2 marks)

**Q2(a).** An analog signal is sampled at a rate less than Nyquist criteria.

- i) What problem/distortion will occur because of it, define and discuss it in technical context using suitable diagram?
- ii) Is it required/not required? Justify your answer with suitable technical point.
- iii) Suggest a suitable solution to the problem/distortion stated in part (i).

CO-3 (2+1+1=4 marks)

**Q2(b).** An analog signal is represented by the following expression:

$$X(t) = \frac{1}{2\pi} \sin(3000 \pi t) \sin(500 \pi t)$$

Compute the Nyquist rate and Nyquist interval for X(t).

CO-3 (1+1=2 marks)

**Q2(c).** Define Sampling Theorem.

CO-3 (1 mark)

**Q3(a).** A communication system has to be designed in such a way that 'n' users who want to access a common communication channel can access it without experiencing any interference. Which techniques will be employed for this situation, discuss in detail? CO-5 (3 marks)

**Q3(b).** Discuss the modulation and demodulation of pulse position modulation (PPM) signal with suitable diagrams. CO-2 (2+2=4 marks)

**Q4(a).** A digital signal having binary values **10111001** has to be transmitted on transmission line. Sketch the waveforms corresponding to following line coding schemes:

- i) Differential Manchester
- ii) Manchester
- iii) Unipolar non return to zero (UNRZ)
- iv) Unipolar return to zero (URZ)
- v) Bipolar NRZ (BNRZ)
- vi) Bipolar RZ (BRZ)

CO-4 (0.5\*6=3 marks)

**Q4(b).** A pulse code modulation (PCM) system uses a uniform quantizer followed by an encoder which uses 128 quantization levels. The bit rate of the system is equal to  $50 \times 10^6$  bits/sec.

- i) What is the maximum message signal frequency for which the system operates satisfactorily?
- ii) Calculate the output signal to quantization noise ratio when a full load sinusoidal modulating wave of frequency 1 MHz is applied to the input. CO-4 (2+2=4 marks)

**Q5(a).** Elaborate the shortcomings of delta modulation in detail with suitable diagrams. Which technique can be used to overcome these, discuss in detail. CO-2 (1.5+1.5 = 3 marks)

**Q5(b).** Out of ASK, BFSK, BPSK digital modulation schemes; which scheme is the most complex but has the best performance in the presence of noise. Draw the block diagram of the transmitter and receiver of that scheme and describe its functioning in detail.

CO-2 (2+2 = 4 marks)