# GURU NANAK INSTITUTE OF TECHNOLOGY
## An Autonomous Institute under MAKAUT
## 2020-2021
## ANALOG AND DIGITAL COMMUNICATION THEORY (Backlog)
## EI502

**TIME ALLOTTED:3Hours**                                    **FULL MARKS:70**

*The figures in the margin indicate full marks.*
*Candidates are required to give their answers in their own words as far as practicable*

### GROUP – A
### (Multiple Choice Type Questions)

Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

|  |  |  | Marks | CO No |
|---|---|---|---|---|
| 1. | (i) | The positive half of an AM modulated wave has maximum amplitude 12 Volt and minimum 4 Volt. If the modulation is single tone modulation, the modulation index is<br>a) 1/3<br>b) 1/2<br>c) 1/4<br>d) 1/5 | 1 | CO1 |
|  | (ii) | In a commercial FM broadcasting, there is a channel 98.3 MHz, this is<br>a) Modulating frequency<br>b) Carrier frequency<br>c) Image frequency<br>d) Frequency deviation | 1 | CO1 |
|  | (iii) | Calculate the Nyquist rate for sampling when a continuous time signal is given by<br>$x(t) = 5 \cos 100\pi t + 10 \cos 200\pi t - 15 \cos 300\pi t$<br>a) 300Hz<br>b) 600Hz<br>c) 150Hz<br>d) 200Hz | 1 | CO4 |
|  | (iv) | SSBSC means<br>a) Signal Side Band Suppressed Carrier<br>b) Single Side Band Suppressed Carrier<br>c) Sample Side Band Sigmoid Carrier<br>d) Signal Sample Band Suppressed Carrier | 1 | CO1 |
|  | (v) | The following transform is often referred as "$\pi/2$ phase shifter"<br>a) Hilbert Transform<br>b) Fourier transform<br>c) Laplace Transform<br>d) Discrete Fourier Transform | 1 | CO2 |
|  | (vi) | AMI means<br>a) Alternate Mark Inversion<br>b) Amplitude Modulation Inversion<br>c) Analog Modulation Inversion<br>d) Amplitude Modulation Induction | 1 | CO4 |

| | | | | |
|---|---|---|---|---|
| (vii) | Frequency domain of square or rectangular wave is<br>a) Sine function<br>b) Sinc function<br>c) Cosine function<br>d) Impulse function | | 1 | CO4 |
| (viii) | In Delta modulation system, Slope overload distortion increases when modulating signal<br>a) increases rapidly with time<br>b) increases slowly with time<br>c) become zero<br>d) None of the above | | 1 | CO2 |
| (ix) | QAM needs phase shifter of phase shifting amount in radian<br>a) $\pi/2$<br>b) $\pi/4$<br>c) $\pi/6$<br>d) $\pi/8$ | | 1 | CO1 |
| (x) | How many bits required to represent 256 quantization levels in PC<br>a) 16<br>b) 8<br>c) 12<br>d) 14 | | 1 | CO1 |
| (xi) | Calculate power in each sideband, if power of carrier wave is 176W and there is 60% modulation in toneamplitude-modulated signal?<br>a) 13.36W<br>b) 52W<br>c) 67W<br>d) 15.84W | | 1 | CO1, CO2 |
| (xii) | Pre-emphasis requires<br>a) Compression of modulating signal<br>b) Expansion of modulating signal<br>c) PM of lower frequency and FM for higher frequency components of modulating signal<br>d) FM of lower frequency and PM for higher frequency components of modulating signal | | 1 | CO2 |

## GROUP – B[*]
### (Short Answer Type Questions)
### Answer any *three* from the following: 3×5=15

| | | | Marks | CO No |
|---|---|---|---|---|
| 2. | | How can the envelope detection technique be used for Single side band AM modulation? | 5 | CO2 |
| 3. | | How the balanced DSBSC modulation technique works in the communication system? | 5 | CO2 |
| 4. | | What is the generation technique of Narrowband FM in the communication process? | 5 | CO1 |
| 5. | | Perform the expression derivation process of power efficiency for single tone AM modulation. | 5 | CO2 |
| 6. | (a) | Draw a clean diagram of Ring modulator in relation with the DSBSC generation. | 3 | CO3 |

| | | | Marks | CO No |
|---|---|---|---|---|
| | (b) | Explain how the carrier signal is suppressed through this modulator unit and draw the requisite waveform. | 2 | CO3 |

**GROUP – C[*]**
**(Long Answer Type Questions)**
**Answer any *three* from the following: 3×15=45**

| | | | Marks | CO No |
|---|---|---|---|---|
| 7. | (a) | What are the different types of sampling techniques? | 6 | CO2 |
| | (b) | How to modulate and demodulate using PWM technique? | 9 | CO3 |
| 8. | (a) | How the mid tread and midrise types of quantization techniques work? Give explanation with proper diagram. | 8 | CO3 |
| | (b) | Show the derivation process of the quantization noise power for uniform step size PCM. | 7 | CO3 |
| 9. | (a) | Briefly describe the entropy of a discrete memoryless message source. | 8 | CO4 |
| | (b) | What is the significance of ISI diagram? | 7 | CO4 |
| 10. | (a) | What are the TDM and FDM systems? | 8 | CO2 |
| | (b) | What do you understand by the aliasing effect? What is Anti-aliasing filter? | 7 | CO2 |
| 11. | | Write short notes on any *three* of the followings. | 5*3=15 | |
| | (a) | Adaptive Delta Modulation process | 5 | CO2 |
| | (b) | Differential PCM technique | 5 | CO1 |
| | (c) | QAM | 5 | CO3 |
| | (d) | Types of Line codings | 5 | CO2 |
| | (e) | SSBSC method | 5 | CO2 |