

**GURU NANAK INSTITUTE OF TECHNOLOGY**  
**An Autonomous Institute under MAKAUT**  
**2020-2021**  
**TELEMETRY AND REMOTE CONTROL**  
**EI 701**

**TIME ALLOTTED: 3 HOURS**

**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**

		<b>Marks</b>	<b>CO No.</b>
1.	(i) The term Transponder is related to a) Satellite communication b) Fiber optic communication c) Remote control d) None of this.	1	CO3
	(ii) Remote sensing techniques make use of the properties of _____ emitted, reflected or diffracted by the sensed objects: a) Electric Wires b) Sound waves c) Electromagnetic waves d) Wind waves	1	CO4
	(iii) For total coverage round the earth, the minimum no. of satellites needed is a) 4 b) 7 c) 3 d) 2	1	CO6
	(iv) If there are 2 channels and sampling frequency of each channel is 8KHz, then line speed is – a) 64 kbps b) 128 kbps c) 256 kbps d) 512 kbps	1	CO2
	(v) Repeaters inside communications satellites are known as a) Transceivers b) Transponders c) Transducers d) TWT	1	CO5
	(vi) The extra bit in MODEM is used for- a) Error correction b) Error detection c) Noise d) Distortion	1	CO3

(vii)	Which of the following pulse modulation systems is analog ? a) PCM b) DPCM c) PWM d) DELTA	1	CO2
(viii)	Probability density function defines a) Amplitudes of random noise b) Density of signal c) Probability of error d) All of the above	1	CO1
(ix)	The circuit used to regenerate clock pulses from the transmitted PAM signals is called ____ a) Clock demodulator circuits b) Timer circuits c) Clock receiving circuits d) Clock recovery circuits	1	CO4
(x)	Which one is not a unit of information? a) Bit b) Digit c) NAT d) Nibble	1	CO2
(xi)	For frequency telemetry, 4-20mA signal is transformed into frequency range of a) 5-15Hz b) 50-65 Hz c) 65-70Hz d) 1-2 Hz	1	CO1
(xii)	The altitudinal distance of a geostationary satellite from the earth is about: a) 26,000 km b) 36,000 km c) 30,000 km d) 44,000 km	1	CO5

**GROUP – B\***

**(Short Answer Type Questions)**

Answer any *three* from the following: **3×5=15**

		<b>Marks</b>	<b>CO No.</b>
2.	(a) What are the purposes of the telemetry systems?	2	CO1
	(b) Draw the transmitter and receiver circuit diagrams of Frequency telemetry system and explain.	3	CO1
3.	(a) Explain with a circuit diagram for synchronization pulse generation with input blank synchronization channel.	3	CO2
	(b) Describe a PAM/PM/PM system.	2	CO3
4.	Draw and Explain basic architecture of GSM	5	CO4
5.	Explain the following: i. Pre-assigned FDMA, ii. Demand Assigned FDMA, iii. Pre-assigned TDMA, iv. Demand-assigned TDMA, v. Satellite-Switched TDMA	5	CO3

6. Design a typical PCM telemetry system. The telemetry system must handle both analog and digital signals with pneumatic and electrical systems, having a minimum of 10 channels. 5 CO6

**GROUP – C\***

**(Long Answer Type Questions)**

Answer any *three* from the following: **3×15=45**

		<b>Marks</b>	<b>CO No.</b>
7.	(a) Suppose in a CDMA system, sender 0 has code (1, -1) and data (1,1,0,0) and sender 1 has code (1,1) and data (1,1,1,0) and both senders transmit data simultaneously. Then draw tables describing the coding and decoding steps.	7	CO6
	(b) Explain why power control is necessary in CDMA system?	3	CO3
	(c) Explain why the number of subscribers in CDMA can be increased freely.	2	CO3
	(d) Make a comparative study between CDMA, FDMA and TDMA.	3	CO3
8.	(a) How does TDM system differ from FDM system?	2	CO3
	(b) Draw a hardware circuit and explain the operation of an 8-channel TDM-PAM telemetering transmitter system and draw the pulse waveforms at the outputs of the clock generator, counter, multivibrator and gates for one time frame.	8	CO2
	(c) If the sampling frequency is 8KHz. In addition, an 8-bit ADC is used, and then calculate line speed of two channel TDM-PCM.	2	CO2
	(d) Describe the operation of sample and hold circuit with suitable circuit diagram.	3	CO2
9.	(a) Draw the basic block diagram of a satellite communication. Explain the half and full duplex communication.	3	CO4
	(b) How the communication path is established in between the earth station and satellite? Explain the architecture of satellite telemetry with a single complete sketch mentioning different subsystems.	7	CO4
	(c) Determine the orbital velocity of a satellite moving in a circular orbit at a height of 150 km above the surface of earth given that gravity constant $G=6.67 \times 10^{-11} \text{ N-m}^2/\text{kg}^2$ , mass of the earth $M=5.98 \times 10^{24} \text{ kg}$ , radius of earth $R=6370 \text{ km}$ .	3	CO4
	(d) What are the advantages and disadvantages of a satellite communication system?	2	CO5
10.	(a) What is BER? What is the highest allowed BER in speech transmission?	3	CO1
	(b) Prove that, the average error probability $P(E)= Q( V_p/ \sigma_n)$ , where $V_p$ is the received pulse amplitude and $\sigma_n$ is the rms value of the noise.	4	CO1
	(c) In a digital data transmission system, the codeword is of 8 bits and the bit error probability is $10^{-2}$ . Calculate the probability that the codeword would have 2 errors and 3 errors.	3	CO2

- (d) What is companding? Why it is used in PCM? How companding is done using suitable amplifier? Draw these amplifiers and the companding curves. 5 CO2
11. Write short notes on any three of the following: 3 x 5 =15
- (a) MODEM 5 CO5
- (b) Remote control system 5 CO5
- (c) Pipeline telemetry 5 CO2
- (d) Direct Broadcast Satellites (DBS) 5 CO4
- (e) Space and Surface waves Propagation 5 CO4