



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech (EIE-NEW)/SEM-7/EI-701/2010-11

2010-11

TELEMETRY AND REMOTE CONTROL

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)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

- i) What is the equivalent Hamming code of 1010 ?
- a) 1110010
 - b) 1010010
 - c) 1011010
 - d) 1111010.
- ii) What is the bit rate, if a signal of a bandwidth of 5 kHz is sampled at Nyquist sampling rate and digitized into 8-bit per sample ?
- a) 20 kB/s
 - b) 40 kB/s
 - c) 80 kB/s
 - d) 160 kB/s.

- 7003



viii) Which one is the fastest type of ADC ?

- a) Slope integration type
- b) Successive approximation type
- c) Parallel type
- d) Counter type.

ix) A TDM system comprises twenty-four channels with quantization level of 0.5 mV and maximum analog signal of 2.048 V. What will be the frame length in terms of number of bits ? Assume one channel is allotted for synchronization.

- a) 25
- b) 150
- c) 300
- d) 600.

x) For step index fibre of core diameter of 50×10^{-6} m and NA of 0.352, what is the number of modes for $\lambda = 55 \mu\text{m}$?

- a) 2
- b) 4
- c) 8
- d) 16.

xi) Which one is better for satellite telemetry system ?

- a) CDMA
- b) FDMA
- c) TDMA
- d) None of these.

xii) The design of TDM system is better with which of the following ?

- a) JFET
- b) Bipolar transistor
- c) MOSFET
- d) Gunn diode.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. a) What do you mean by differential coding ? Explain with block diagram the scheme of differential coding.

b) Prove that in case of differential coding always we obtain the correct output. 1 + 2 + 2
3. Draw the detail block diagram of an Earth station & explain the functions of each block.
4. a) What do you mean by the 'figure of merit' of the optical fibre ? How does the channel bandwidth vary with the fibre length ?

b) In a fibre-optical cable the refractive indices of the core, cladding and air are 1.59, 1.56 and 1.00 respectively. Calculate the critical incidence angle and the numerical aperture. 1 + 2 + 2
5. Explain the operation of a QPSK receiver with the help of a block diagram.
6. Schematically explain the operation of a PLL and its application as a frequency divider. 3 + 2



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) How does TDM system differ from FDM system ? 2
- b) Draw a hardware circuit and explain the operation of a 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
- c) If the sampling frequency is 8 kHz and we use 8-bit ADC then calculate line speed of two channel TDM-PCM. 2
- d) Describe the operation of sample and hold circuit with suitable circuit diagram. 3
8. a) What are the differences between connectors and splices ? Where connectors are used in optical fibre telemetry system ? 1 + 2
- b) Explain different techniques for splicing with suitable diagram. 4
- c) Draw and explain detail circuit diagram of the transmitter and receiver of optical fibre telemetry system. 4



- d) When the mean optical power launched into an 8 km length of fibre is $120 \mu\text{W}$, the mean optical power at the fibre output is $3 \mu\text{W}$. Determine :
- i) the overall signal attenuation or loss in decibels through the fibre assuming there are no connectors or splices.
 - ii) the signal attenuation per kilometre for the fibre
 - iii) the overall signal attenuation for a 10 km optical link using the same fibre with splices at 1 km intervals, each giving an attenuation of 1 dB.
 - iv) The numerical input/output power ratio in 8 (c). 4
9. a) What do you mean by pipeline telemetry ? 3
- b) Explain the operation of a position telemetry system using synchro transmitter and receiver. 4
- 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 $G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$, mass of the earth $M = 5.98 \times 10^{24} \text{ kg}$, radius of earth $R = 6370 \text{ km}$. 3
- d) What are the advantages and disadvantages of satellite communication system ? 5



10. a) Explain the functioning of TT & C subsystems of a satellite communication system with necessary sketches. 8

- b) Mention the different subsystems in

- i) satellite stations and
- ii) earth stations.

How do they work for data transfer and other functions ? 7

11. Write short notes on any *three* of the following : 3 × 5

- a) Frequency telemetry system
 - b) Satellite telemetry and MA techniques
 - c) Smart and intelligent telemetry system
 - d) Optical detectors used in telemetry system
 - e) Importance of M2M system in modern society.
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