Total number of printed pages: **3** **Programme(D)/5th Semester/DIE511**

2023

TELEMETRY

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. a) Draw a schematic block diagram of a telemetry system and identify different parts in it. 5

   b) Why the signal is required to be processed or conditioned before transmission by a telemetry system? 3

   c) What is pneumatic system and what types of data can be telemetered by such system? Draw the sketch of a pneumatic telemetering system. 2+5

   d) Sketch the current to frequency converter circuit as used in frequency telemetering system and explain its operation. Deduce the relationship between output frequency and input voltage. 5

2. a) Draw the sketches of a voltage and current telemetry schemes using two wires for level measurement. Write their advantages and disadvantages. 5+5

   b) Briefly describe the process of amplitude modulation for signal transmission. 6

   c) For transmission of the carrier alone the antenna current is 5A, becoming 5.5A when sinusoidal modulation occurs. Find depth of modulation in percentage. If the depth of modulation is 80% by what percentage the current would increase? 2+2

3. a) Find the periodic and aperiodic signals from the following. 4

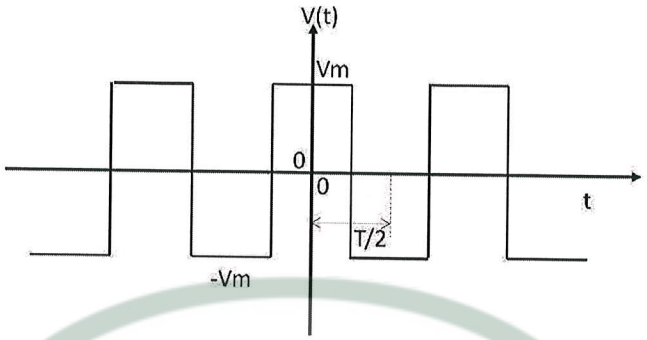
   i) $x(t) = 7\sin(400\pi t)$

   ii) $x(t) = 3 + t^2$

   iii) $x(t) = 10\sin(12\pi t) + 4\cos(18\pi t)$

iv) $x(t) = e^{-j60\pi}$

b) Find out the trigonometric Fourier series for the given waveform, where symbols represent their usual meanings. 6



c) Write the principle of FM (Frequency Modulation) for wave modulation. 4

d) A sinusoidal modulating waveform of amplitude 5 V and a frequency of 2 KHz is applied to the FM generator, which has a frequency sensitivity of 40 Hz/volt. Calculate the frequency deviation, modulation index, and bandwidth. 2+2+2

4. a) What is modem? Write the basic operation of a modem in telemetry. 5

b) Discuss the working principle of TT and C subsystem for satellite communication. 5

c) What is angular modulation? Why is it so named? How does it work to help signal transmission? 10

5. a) What is FM wave modulation index and how is it calculated? 4

b) A sinusoidal modulating waveform of amplitude 5 V and a frequency of 2 KHz is applied to the FM generator, which has a frequency sensitivity of 40 Hz/volt. Calculate the frequency deviation, modulation index, and bandwidth. 6

c) How the bandwidth (BW) is related with channel capacity (C)? If the channel capacity is given as 12 kb/s, what should be its bandwidth for a binary system (i.e. a two level system 1 and 0)? 2+3

d) What is rectangular pulse? Sketch the unipolar rectangular pulse with its mathematical representation. 1+4

6. Write short notes on any four from the following topics. 4x5=20

a) Synchro transmitter-receiver system

b) Two wire telemetry system

c) Phase modulation

d) Frequency-Voltage converter

e) IRIG Standards

7. a) Draw the block diagram of a complete telemetry scheme using frequency division multiplexing and de-multiplexing using FM/FM system. Discuss briefly by mentioning the advantages and disadvantages of the system. 10

b) Write the principles of light propagation through an optical fibre. 5

c) Draw and discuss the primary elements of an optical fibre based communication system. 5