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## Fourth Semester B.E. Degree Examination, July/August 2022 Signal Conditioning and Data Acquisition Circuits

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. With neat circuit diagrams derive an expression for the voltage gain of an ideal,
  - (i) Inverting amplifier.
  - (ii) Non-inverting amplifier

(10 Marks)
- b. Draw the inverting summing amplifier circuit and derive an equation for its output voltage. Also, realize an inverting averaging circuit. (10 Marks)

**OR**

- 2 a. Define Input Bias current. Show that the use of  $R_{comp}$  in the closed loop amplifier circuit can compensate for bias currents. (10 Marks)
- b. Sketch the instrumentation amplifier circuit and derive an equation for the overall closed loop voltage gain  $A_V$ . (10 Marks)

### Module-2

- 3 a. Define Hold time and sampling time. With a neat circuit diagram and voltage waveforms, explain the operation of a sample and hold circuit. (10 Marks)
- b. State the advantages of precision rectifier. With a circuit diagram, I/O waveforms and voltage equations, explain the operation of Full Wave Precision rectifier. (10 Marks)

**OR**

- 4 a. Draw the circuit diagram of an Astable multivibrator and derive an expression for the frequency of the square wave output. (10 Marks)
- b. With a neat circuit diagram and voltage waveforms, explain the operation of an inverting Schmitt trigger. (10 Marks)

### Module-3

- 5 a. Define the terms : (i) Line regulation and (ii) Load regulation. Draw a neat circuit diagram of series voltage regulator and explain its operation. (10 Marks)
- b. Draw the circuit diagram and functional diagram of IC723 low voltage regulator. Explain the circuit operation. (10 Marks)

**OR**

- 6 a. Sketch the frequency response curve and circuit diagram of a first order low pass filter. Deduce an expression for the magnitude of the filter gain  $|H(j\omega)|$  and verify the filter operation. (10 Marks)
- b. State the advantages of Active filters over passive filters. Give the step by step procedure for the design of,
  - (i) Wide band pass filter and
  - (ii) Wide band reject filter.

(10 Marks)

**Module-4**

- 7 a. With a neat circuit diagram, timing waveforms and functional diagram, explain the operation of an astable multivibrator using 555 timer. (10 Marks)
- b. Explain the operation of the following 555 timer circuits : (10 Marks)
- FSK Generator and
  - Pulse-position modulator

**OR**

- 8 a. Explain the operation of the following circuits that use phase locked loop: (10 Marks)
- FM Demodulator.
  - Frequency translator.
- b. Define the terms : (i) Lockin Range (ii) Capture range. (10 Marks)
- Give the block diagram of IC566 VCO and explain its operation. (10 Marks)

**Module-5**

- 9 a. Draw the block diagram of Digital Data Acquisition system and explain the function of each block. (10 Marks)
- b. Explain the process of Digital Recording using, (10 Marks)
- Analog recorders and
  - Digital recorders.

**OR**

- 10 a. Draw a 3-bit R-2R ladder DAC circuit and with necessary derivation, explain the circuit operation. (10 Marks)
- b. With a neat circuit diagram, explain the operation of a 3 bit Flash ADC. (10 Marks)

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