Ref No: **Ex/PG/EE/T/111C/2024**

MASTER OF ELECTRICAL ENGINEERING 1ST YR 1ST SEMESTER EXAMINATION, 2024

SUBJECT: - ADVANCED INSTRUMENTATION TECHNIQUE

Time: Three hours | Full Marks: 100

Answer any five Questions.

1. a) Explain the purpose of auto zeroing in DVM. Describe the working principle of a typical auto-zero circuit. 10+10

   b) Explain the algorithm of auto ranging principle. Describe the working principle of a Flash type auto ranging circuit.

2. a) Describe how maximum and minimum frequency can be detected and measured using digital method showing appropriate functional block diagram. 8+4+8

   b) Explain how synchronous detection method can extract in-phase and quadrature components of an unknown AC signal.

   c) Illustrate a scheme for measurement of complex impedance 'Z' in polar and Cartesian form.

3. a) Explain the working principles of VFC and VTC method using typical circuit diagram and mathematical analysis. 10+10

   b) Illustrate a suitable scheme of modulation index measurement.

4. a) Describe the working principle of Lag-Lead type DPLL. Show necessary functional and timing diagrams. 10+10

   b) Explain the working principle of Exclusive-OR type DPLL with functional and timing diagrams.

5. a) State the limitations of a conventional AC Bridge. Hence justify the use of automatic AC Bridge. 6+8+6
   b) Outline a scheme of an automatic AC Bridge.
   c) Explain how the bridge balance condition can be achieved by iterative algorithm.

[Turn over

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6. a) There are for tasks as i) Alarm (LO/HI) scanning, ii) ADC operation using sampling method for two channels, iii) Generation of control signal by digital computers and iv) Data logging operation (i.e. generation of print out) for reporting the values obtained from two analog channel analog. Illustrate a scheme by real time programming using priority diagram of tasks. Interrupted process etc. 10+10

   b) Describe the method of inter processor communication with the help of different function elements and different methods.

7. a) Make a comparison between the serial and parallel bus for connecting smart instrumentation systems. 6+8+6

   b) Discuss the advantages and disadvantages of common I-O bus and Multiprocessor I-O bus.

   c) What is meant by the priority of tasks? What is meant by polling of event/tasks?

8. a) State the advantages of FIELD bus. What are the variations of FIELD bus according to standard? 6+8+6

   b) Illustrate a scheme for interconnections for different field instruments using FIELD bus.

   c) What is meant by access control in HART protocol? How the commands are classified in HART communication?