MASTER OF ELECTRICAL ENGINEERING 1ST YR 1ST SEMESTER EXAMINATION, 2017

SUBJECT: - ADVANCED INSTRUMENTATION TECHNIQUE

Time: Three hours   Full Marks: 100

Answer any five questions.

1. a) Derive the expression of In-phase and Quadrature components of an   10+10
unknown AC signal x(t) obtained using synchronous detection method
with reference signal r(t).
   b) Explain the working principle of two phase Lock-in-amplifier with the
help of functional diagram. Give example of two phase Lock-in-amplifier
used in measurement of complex impedance.

2. a) Explain the basic working principle of Auto-Zero circuit in DVM with   10+10
functional diagram.
   b) Explain the working principle of VFC and VTC method using typical
circuit and mathematical analysis.

3. a) Outline a scheme of automatic AC Bridge. Explain how the bridge   10+10
balance condition can be achieved by iterative algorithm.
   b) Illustrate a scheme for measurement of phase angle using digital method
without any frequency error.

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

5. a) Discuss the primary features of computer aided instrumentation in respect   10+10
of i) connectivity among processors with the real time smart
devices/controller/systems, ii) task or event management by polling and
interrupts.
   b) What is multidrop or multibus system? Explain its purpose showing
necessary diagram.

6. a) Compare the advantages and disadvantages of serial and parallel bus for   10+10
connecting smart instrumentation system, devices etc.
   b) Explain how several smart devices, connected among themselves through
IEEE-488 (GPIB) bus work by supervision of handshake signals. Show
the timing diagram.

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7. a) Illustrate a typical instrumentation scheme interconnecting different smart   10+10
        devices, sensors by FIELD bus showing diagram.
    b) Explain how HART protocol commands provide access control
        mechanism.

8. a) Describe the salient points for development of real time programming   10+10
        containing multiple tasks with different priorities showing necessary
        diagram.
    b) Explain the signal protection mechanism for input and output signals from
        and to the computer.