B TECH
(SEM-IV) THEORY EXAMINATION 2017-18
ELECTRONIC MEASUREMENT & INSTRUMENTATION

Time: 3 Hours   *Total Marks: 70*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.   2 x 7 = 14

   a. Define primary and secondary standards.
   b. What do mean by Dissipation factor?
   c. How emitter follower structure reduces voltmeter loading effect?
   d. Define importance of Kelvin double bridge over Wheatstone bridge.
   e. The measured value of a resistance is 10.25Ω, whereas its value is 10.22Ω. Determine the absolute error of measurement.
   f. What are the essential components of a CRT?
   g. What do you understand by instrument calibration?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

   a. Explain the construction of PMMC instrument. Mathematically prove that the scale of such an instrument is linear.
   b. Draw and explain the FET input voltmeter circuit with range changing.
   c. Derive an expression for finding unknown resistance and inductance for Maxwell Bridge.
   d. Draw and explain the block diagram of Oscilloscope automatic time base with proper waveforms at the output of each block.
   e. Write a short note on working and applications of X –Y recorder.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

   a. Define systematic errors in details. A batch of resistors that each have a nominal resistance of 330Ω are to be tested and classified as ±10% components at 25 ºC. If their temperature coefficient is -300ppm/ºC, calculate the maximum and minimum resistance for these components at 75 ºC.
   b. Explain the concept of Swamping resistance. What are the materials generally used for manufacturing these resistances? A PMMC instrument with FSD of 0.2mA and the coil resistance of 10Ω is to be converted into a voltmeter. Determine the required multiplier

resistance if the voltmeter is used to measure 100V at full scale. Also determine the applied voltage when the instrument indicates 0.75, 0.5 ,0.25 and 0.1FSD.

4. Attempt any *one* part of the following: 7 x 1 = 7

   a. Explain Digital Multi meter. A $4\frac{1}{2}$Digit voltmeter is used to measure voltage. Find (i) Resolution (ii) How would 16.58 be displayed on a10V range.

   b. Define dual-slope integrator and zero crossing detector. Sketch the block diagram and system waveforms for a digital voltmeter that uses a dual slope integrator.

5. Attempt any *one* part of the following: 7 x 1 = 7

   a. Show how an ammeter, a voltmeter, and a DC supply can be used to measure a resistance. Show the two possible connection, write the resistance equation for each and discuss the error.

   b. Draw the circuit of a kelvin bridge, explain its operation, and derive the equation for the unknown resistance.

6. Attempt any *one* part of the following: 7 x 1 = 7

   a. Explain the following in detail with their diagram:

     (i) Attenuator probe

     (ii) 1:1 Probe

   b. Write short note on DSO. Compare it with Sampling Oscilloscope.

7. Attempt any *one* part of the following: 7 x 1 = 7

   a. Sketch the basic construction of a pen type galvanometer strip chart recorder. Briefly explain the instrument operation.

   b. What is importance of calibration in instrumentation sketch the circuit for calibrating a wattmeter and explain the calibration procedure.