



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 131403-N

Roll No.

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B. Tech.

**(SEM. IV) THEORY EXAMINATION, 2014-15
ELECTRONIC MEASUREMENTS AND
INSTRUMENTATION**

Time : 3 Hours]

[Total Marks : 100

- Note : (1) Attempt all questions.
(2) All questions carry equal marks.

1. Attempt any four parts : 5×4=20
(a) Define measurement. Calculate percentage error in determination of time period of a pendulum given by

$$T=2\pi\sqrt{\frac{l}{g}}$$

Where l and g are measured in $\pm 2\%$ and $\pm 3\%$ errors.

- (b) Differentiate between Gross errors and Systematic errors. List a few ways of minimizing the effect of errors in measurement.
- (c) A batch of resistors that each have a nominal resistance of 330Ω are to be tested and classified as $\pm 10\%$ components at 25°C . If their temperature coefficient is $-300\text{ppm}/^\circ\text{C}$, calculate the maximum and minimum resistance for these components at 100°C .

- (d) A thin wire has a length of 21.7 cm and radius 0.46 cm. Calculate the volume of the wire correct to required significant figures.
- (e) Explain the construction of a PMMC instrument. Mathematically prove that the scale of such an instrument is linear.
- (f) Explain the concept of Swamping resistance. What are the materials generally used for manufacturing these resistances.

2 Attempt any four parts : 5×4=20

- (a) What do you mean by Loading Effect? How does electronic voltmeter help in minimizing the loading effect?
- (b) Draw and explain the FET input voltmeter circuit with range changing.
- (c) Explain the -working of precision rectifier based voltmeters.
- (d) A Half wave rectifier Op-Amp based voltage amplifier circuit has a feedback resistance of $2.4\text{k}\Omega$ and a resistance between the ground and the inverting terminal of $4.9\text{k}\Omega$. If the r.m.s. input voltage to be measured is 89.40 mV at the FSD of the deflection instrument with $R_s = 100\Omega$ and $R_{in} = 200\Omega$. Find the FSD of the meter.
- (e) Write a short note on multimeter probes.
- (f) Draw and explain the block diagram of a Digital Frequency meter system.

- 3 Attempt any two parts : $10 \times 2 = 20$
- (a) Give numerical example to explain the sensitivity of a Wheatstone bridge. What is the main advantage of using Kelvin's bridge over Wheatstone bridge?
 - (b) Explain how AC bridges are balanced with proper phase diagrams. Derive the expressions of converting series inductor circuits into parallel equivalent circuits.
 - (c) Write the mathematical expressions for inductor Q-factor and capacitor D-factor. Explain the working of inductance Comparison Bridge,
- 4 Attempt any two parts: $10 \times 2 = 20$
- (a) Draw and explain the block diagram of Oscilloscope automatic time base with proper waveforms at the output of each block.
 - (b) Explain the operation of Sampling Oscilloscopes. Also explain individual circuits of staircase generator and sampling gate.
 - (c) What do you mean by interpolation? Briefly explain the operation of a DSO storage and display system.
- 5 Attempt any two parts: $10 \times 2 = 20$
- (a) On what factors does the frequency of instrumentation calibration depend? Explain how A.C. voltmeter calibration can be done.
 - (b) Discuss how D.C. source and Potentiometer may be developed in laboratories for calibration purpose.
 - (c) Write a short note on working and applications of X-Y plotter.
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