



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

PAPER ID : 121313

Roll No.

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B. Tech.

(SEM. III) (ODD SEM.) THEORY
EXAMINATION, 2014-15
**ELECTRICAL MEASUREMENT &
MEASURING INSTRUMENTS**

Time : 3 Hours]

[Total Marks : 100

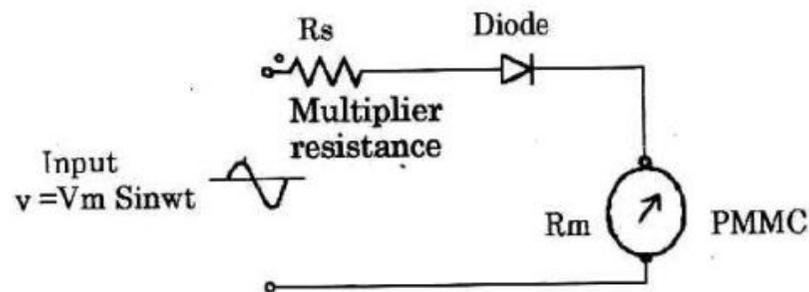
1 Attempt any FOUR parts : 5x4=20

- (a) Describe the Various types of errors in Measurement.
- (b) A circuit was tuned for resonance by eight different students, and the values of resonant frequency in kHz were recorded as 532, 548, 543, 535, 546, 531, 543 and 536.

Calculate :

- (i) the arithmetic mean
- (ii) deviations of mean
- (iii) the average deviation
- (iv) Standard deviation
- (v) Variance.

- (c) The inductance of a .25 A electrodynamic ammeter changes uniformly at the rate of $0.0035 \mu\text{H/degree}$. The spring constant is $10^{-6} \text{ N-m/degree}$. Determine the angular deflection at full scale.
- (d) Compute the value of multiplier resistor for a 10 V rms sinusoidal a.c. range of the voltmeter shown in figure. The forward resistance of the diode is zero and the reverse resistance is infinite.



- (e) Explain the working principle of thermocouple instruments.
- (f) Describe the errors in electro-dynamometer type wattmeters.

2 Attempt any TWO parts : 10x2=20

- (a) Describe how high current is measured with the help of instrument transformer. And show the relationships in a current transformer from Equivalent circuit of it.
- (b) Explain the applications of potential transformer in the extension of instrument range.
- (c) Explain any one type of frequency measuring method with suitable frequency meter.

3 Attempt any TWO parts : 10x2=20

- (a) Describe the substitution method of measurement of medium resistances. List the factors on which the accuracy of the method depends.
- (b) A Wheatstone bridge has resistance of $P=1000\ \Omega$, $Q=100\ \Omega$, $R=2,005\ \Omega$ and $S=200\ \Omega$. The battery has an emf of 5 V and negligible internal resistance. The galvanometer has a current sensitivity of $10\ \text{mm}/\mu\text{A}$ and an internal resistance of $100\ \Omega$. Calculate the deflection of galvanometer and the sensitivity of the bridge in terms of deflection per unit change in resistance.
- (c) Derive the equations for balance in the case of Maxwell's inductance capacitance bridge. Draw the phasor diagram for balance conditions.

4 Attempt any TWO parts : 10x2=20

- (a) Calculate the inductance of a coil from the following measurement on an a.c. potentiometer.
- (i) Voltage drop across a $0.1\ \Omega$ standard resistor connected in series with the coil = $0.613 \angle 12^\circ 6'$.
- (ii) Voltage across the test coil through a 100/1 volt ratio box = $0.781 \angle 50^\circ 48'$ V.

(b) A ballistic galvanometer gives a first swing of 60° for a discharge of $1000\ \mu\text{C}$. Find the quantity of electricity to produce

- (i) a swing of 90° in the instrument
- (ii) a spot deflection of 20 mm on a scale 1 m away.

(c) Explain in detail about the various methods involved in the measurement of iron loss.

5 Attempt any TWO parts : 10x2=20

- (a) Describe the basic circuit of a spectrum analyser. Explain how the spectra of the following are displayed :
- (i) continuous signal
- (ii) amplitude modulated signal
- (iii) frequency modulated signal
- (iv) pulse modulated signal.
- (b) Explain, with the help of block diagram, about the various parts of an electronic multimeter.
- (c) Describe the following types of oscilloscope in detail :
- (i) Dual beam oscilloscope
- (ii) Dual trace oscilloscope.