



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

PAPER ID : 121307

Roll No.

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B. Tech.

(SEM. III) (ODD SEM.) THEORY

EXAMINATION, 2014-15

**ELECTRICAL MEASUREMENTS & MEASURING
INSTRUMENTS**

Time : 3 Hours]

[Total Marks : 100

Note: Attempt all questions.

1 Attempt any **four** of the following questions : **5×4=20**

(a) Explain the following terms :

- (i) Precision
- (ii) Accuracy
- (iii) Error
- (iv) Hysteresis.

(b) Differentiate between Null and Deflection method of measurement.

(c) What are the term measurements and measurement system ? Describe the functional element of measurement system with block diagram.

- (d) Three resistances are specified as :
 $R_1 = 200\Omega \pm 5\%$, $R_2 = 100\Omega \pm 5\%$, $R_3 = 50\Omega \pm 5\%$.
 Determine the magnitude of the resultant resistance and the limiting error in percentage and in ohms if the resistances are connected in series.
- (e) Describe construction and working of 3-phase wattmeter. In a particular test the two wattmeter readings are 4 kW and 1 kW.
 Calculate the power and power factor if :
 (i) Both meters read direct
 (ii) One meter connection reversed.
- (f) An electrostatic voltmeter reading upto 1 kv is controlled by a spring with a torsion constant of 0.0981×10^{-6} Nm/degree and has a full scale deflection of 80° . The capacitance at zero voltage is 10×10^{-12} farad. What is the capacitance when the pointer indicates 1 kv ?

2 Attempt any two of the following questions : **10×2=20**

- (a) What are the different methods of measurement of frequency in power frequency range ? Explain the working of Electrical resonance type frequency meter.
- (b) Describe the construction and working of 3-phase electrodynamic power factor meter.
- (c) A current transformer of nominal ratio 1000/5 is operating with total secondary impedance of $0.4 + j0.3 \Omega$. At the rated current the components of primary current associated with the core magnetizing and core-loss effect are 6A and 1.5A respectively. The primary winding has 4 turns. Calculate the ratio error and phase angle at rated primary current if the secondary winding has (1) 800 turns (2) 795 turns.

3 Attempt any two of the following questions : **10×2=20**

- (a) Describe working of Hay's bridge. Derive the equations for balance condition and draw the phasor diagram under balance condition.
- (b) Describe the circuit and working of a Q meter. Calculate the value of self capacitance if the measurement results are $F_1 = 2$ MHz and $C_1 = 500$ pf. When the second frequency is 2.5 times F_1 , the tuning capacitor is 60 pf.
- (c) An Owen bridge is used to measure properties of a sample of steel sheet at 2 kHz. At balance arm AB is test specimen. Arm BC is $R_3 = 100 \Omega$. Arm CD is $C_4 = 0.1 \mu\text{f}$ and arm DA is $R_2 = 834 \Omega$ is series with $C_2 = 0.124 \mu\text{f}$. Calculate the effective impedance of specimen under test.

4 Attempt any two of the following questions : **10×2=20**

- (a) Describe the construction and working of a co-ordinate type potentiometer. How is it standardized ? Explain how an unknown voltage can measured with it.
- (b) A ring specimen having a mean diameter of 0.3 m and a cross-sectional area 400 mm^2 has a primary winding of 80 turns wound uniformly. The secondary winding of 30 turns is connected to a flux meter having a constant of 0.10×10^{-3} Wb-turn/division. A deflection of 46 division is observed when a current of 2 A is reversed in the primary winding. Calculate the relative permeability of iron specimen.
- (c) Describe the method of experimental determination of flux density in specimen of magnetic material using a ballistic galvanometer. Explain how the correction for flux in the air space between the specimen and the coil is applied ?

- 5 Attempt any two of the following questions : $10 \times 2 = 20$
- (a) Draw and explain the circuit of a digital frequency meter. What are the different methods used for high frequency determination ?
 - (b) Describe the construction and working of dual beam C.R.O. using block diagram.
 - (c) What is digital voltmeter (DVMs) ? What are its advantages ? List different types of DVM. Describe the circuit and working of Ramp type DVM.
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