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**B TECH**  
**(SEM-III) THEORY EXAMINATION 2020-21**  
**ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS**

Time: 3 Hours

Total Marks: 100

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

**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

a.	Why accuracy differs from precision? Justify with suitable example.
b.	Distinguish between active and passive transducer.
c.	A digital voltmeter has read out range from 0- 9999 counts. determine the resolution of the instruments in volt when the full-scale reading is 9.999 volt.
d.	Define static sensitivity and linearity of instrument.
e.	The measured value of capacitor is 205.3 $\mu$ f, whereas its true value is 201.4 $\mu$ f. Determine the relative error.
f.	Write down the applications of CRO in measurement.
g.	Draw the circuit and phasor diagram of Owen's bridge.
h.	What is the basic principle of piezoelectric transducer?
i.	Write short note on Wave analyzer.
j.	What is the measurement of resistance? Write the types of resistance with their ranges.

**SECTION B****2. Attempt any three of the following:****10x3=30**

a.	What are the various types of errors occurring in electrical measurements? Explain them.
b.	Determine the dimensions of $\mu$ (r and L are radius and length, P1 and P2 are pressures and Q is flow). If $r = 0.5 \pm 0.01$ mm; $P_1 = 200 \pm 3$ kPa; $P_2 = 150 \pm 2$ kPa; $Q = 4 * 10^{-7}$ m <sup>3</sup> /s and $L = 1$ m. Calculate the absolute error in $\mu$ . Given expression is $\mu = \frac{\pi r^4 (P_1 - P_2)}{8QL}$ .
c.	Explain construction and operation of moving iron instruments with neat diagram.
d.	List the different sources of error in electro-dynamometer-type wattmeter. Briefly discuss the error due to pressure coil inductance. How is this error compensated?
e.	Explain the various operating torques in an energy meter.

**SECTION C****3. Attempt any one part of the following:****10x1=10**

a.	(i) Briefly explain the loss of charge method for measurement of resistance. (ii) Draw the bridge arrangement and describe the Hay's bridge for inductance measurement. Draw the phasor diagram.
b.	Explain the construction and working of a Wien bridge used for the measurement of frequency.



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**4. Attempt any one part of the following:****10x1=10**

a.	A current transformer has a bar primary is rated at 500/5 A, 50 Hz with an output of 15 VA at rated load with non-inductive burden. The in phase and quadrature components (referred to the flux) of exciting MMF are 8 A and 10 A respectively. The number of turns in the secondary is 98, and the resistance and leakage reactance of the secondary winding are $0.35 \Omega$ and $0.3 \Omega$ respectively. Calculate the ratio and phase angle error.
b.	Explain the construction and working of a potential transformer. Draw and explain the phasor diagram. What are the various errors occurring in it? Explain.

**5. Attempt any one part of the following:****10x1=10**

a.	What precautions are taken while measuring low resistances? Explain the reason how a Kelvin's double bridge measures low resistances without error.
b.	Four arms of a Wheatstone bridge are as follows: $AB = 150 \Omega$ , $BC = 15 \Omega$ , $CD = 6 \Omega$ , $DA = 60 \Omega$ . A galvanometer with internal resistance of $25 \Omega$ is connected between BD, while a battery of 20 V dc is connected between AC. Find the current through the galvanometer. Find the value of the resistance to be put on the arm DA so that the bridge is balanced.

**6. Attempt any one part of the following:****10x1=10**

a.	Explain the construction and principle of operation of a Ballistic Galvanometer. How is it calibrated?
b.	(i) Explain the construction and principle of operation of a polar type of potentiometer. How is it standardized? (ii) Explain the principle of operation of a Q meter.

**7. Attempt any one part of the following:****10x1=10**

a.	What is total harmonic distortion? How many types of harmonic analyzers are there? Explain the concept of tuned circuit harmonic analyzer.
b.	How many types of digital voltmeters are there? Explain the Integrating type of Digital voltmeter. What are its specific advantages?