PAPER ID-311575

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BTECH
(SEM III) THEORY EXAMINATION 2023-24
ELECTRICAL MEASUREMENTS & INSTRUMENTATION

TIME: 3HRS   **M.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**

Q no.	Question	Marks	CO
a.	Differentiate between 'accuracy 'and 'precision'.	2	CO1
b.	What are the different types of errors in a measurement?	2	CO1
c.	What is creeping in energy meters?	2	CO2
d.	What conditions must be satisfied to make an ac bridge balanced?	2	CO3
e.	Define the Transformation ratio and nominal ratio for CT and PT.	2	CO4
f.	Differentiate between active and passive transducers	2	CO5
g.	Differentiate between primary and secondary transducers.	2	CO5

SECTION B

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

Q no.	Question	Marks	CO
a.	Explain the principle, construction and operation of attraction-type moving iron instruments with a neat diagram. Derive the expression of deflecting torque.	7	CO1
b.	Explain the two-wattmeter method in three-phase power measurement for a star-connected load. Discuss how the method helps determine the power factor in a three-phase system.	7	CO2
c.	Explain Owen's bridge method for the measurement of unknown inductance. Derive the equation for balance and draw the phasor diagram.	7	CO3
d.	A current transformer of turns ratio 1:199 is rated as 1000/5, 25 VA. The core loss and magnetizing components of the primary current are 4A and 7A under rated conditions. Determine the phase angle and ratio errors for the rated burden and rated secondary current of 0.8 p.f lagging. Neglect the resistance and leakage reactance of secondary winding.	7	CO4
e.	Describe the construction and working of L.V.D.T with advantages and disadvantages.	7	CO5

SECTION C

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

Q no.	Question	Marks	CO
a.	Explain the construction and working of PMMC instruments. Derive the equation for deflection torque.	7	CO1
b.	The solution for the unknown resistance for a Wheatstone bridge is : $$R_x = \frac{R_2 R_3}{R_1}$$ Where $R_1 = 100\ \Omega \pm 0.5\%$, $R_2 = 1000\ \Omega \pm 0.5\%$ and $R_3 = 800\ \Omega \pm 0.5\%$. Determine the magnitude of the unknown resistance and the limiting error in percent and in ohm for the unknown resistance R_x.	7	CO1

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

Q no.	Question	Marks	CO
a.	Explain the construction and working of a single-phase electrodynamometer-type wattmeter. Also, derive the expression of deflecting and controlling torque.	7	CO2
b.	Explain the construction and working of a power factor meter. Also, explain its advantages and disadvantages.	7	CO2

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

Q no.	Question	Marks	CO
a.	Explain the working principle of Kelvin's double bridge for the measurement of unknown low resistances. Explain how the effects of contact resistance and resistance of leads are eliminated.	7	CO3
b.	Explain the working principle of a Crompton's dc potentiometer with a suitable diagram.	7	CO3

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

Q no.	Question	Marks	CO
a.	With the help of suitable block diagram explain different types of wave analyzer and their applications..	7	CO4
b.	Draw the equivalent circuit and phasor diagram of the current transformer. Derive the expression for ratio and phase angle.	7	CO4

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

Q no.	Question	Marks	CO
a.	Explain the principle, construction, and working of strain gauge transducer and formulate the expression for gauge factor in terms of Poisson's ratio.	7	CO5
b.	Explain the principle, construction, and working of the capacitive transducer with neat diagrams.	7	CO5