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**BTECH**  
**(SEM III) THEORY EXAMINATION 2024-25**  
**ELECTRICAL MEASUREMENTS & INSTRUMENTATION**

TIME: 3 HRS

M.MARKS: 70

**Note:** Attempt all Sections. In case of any missing data; choose suitably.

**SECTION A**

**1. Attempt all questions in brief. 2 x 07 = 14**

Q no.	Question	CO	Level
a.	What is measurement? Explain measurement system with appropriate block diagram.	CO1	K1
b.	What is the difference between an ammeter and a voltmeter?	CO1	K1
c.	What is creeping in Energy Meters? How it is prevented?	CO2	K2
d.	What are the applications of bridge circuits?	CO3	K2
e.	Define turns ratio and transformation ratio for CT and PT.	CO4	K2
f.	Write down the applications of CRO in measurement.	CO4	K2
g.	What is the basic principle of piezoelectric transducer?	CO5	K3

**SECTION B**

**2. Attempt any three of the following: 07 x 3 = 21**

a.	What is Limiting error in measurement? Three resistors are specified as : $R_1 = 200\Omega \pm 5\%$ , $R_2 = 100\Omega \pm 5\%$ and $R_3 = 50\Omega \pm 5\%$ Determine the magnitude of the resultant resistance and the limiting error in percentage and in ohms if the resistances are connected in series.	CO1	K1
b.	What are the types of watt meters in measurement systems? Explain two watt meter method for power measurement in balanced and unbalanced three phase system.	CO2	K2
c.	Explain the working principle of potentiometers. With the help of neat diagram explain D.C. Crompton's potentiometer.	CO3	K2
d.	Draw and explain the equivalent circuit and phasor diagram of current transformer (C.T.). State the ratio error present in current transformer. Also differentiate between current transformer and potential transformer.	CO4	K2
e.	Discuss factors for selecting a transducer. Explain pressure capacitance transducer with a neat diagram. State advantages and disadvantages of a capacitive transducer.	CO5	K3

**SECTION C**

**3. Attempt any one part of the following: 07 x 1 = 07**

a.	Illustrate the construction and operation of attraction and repulsion type of moving iron instruments. Also derive the expression of deflecting torque. Enlist the advantages, disadvantages of these instruments.	CO1	K1
b.	Explain the working principle of PMMC instruments. How the current range of PMMC instrument extended with the help of shunts?	CO1	K1

**4. Attempt any one part of the following: 07 x 1 = 07**

a.	How energy is to be measured using energy meters? Explain single phase induction type energy meter with the help of suitable diagram.	CO2	K2
b.	Explain the following instruments with proper diagram: (i) Power factor meter (ii) Analog frequency meter	CO2	K2



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**5. Attempt any one part of the following: 07 x 1 = 07**

a.	Derive balance equation of Maxwell's Inductance-Capacitance Bridge along with its phasor diagram. In an Maxwell's bridge the arms are adjusted as: Arm AB: non-reactive resistance of $700\Omega$ Arm CD: non-reactive resistance of $300\Omega$ Arm AD: non-reactive resistance of $1200\Omega$ in parallel with capacitor of $0.5 \mu\text{F}$ . Under balance condition find the components of arm BC ( $R_x$ and $L_x$ ).	CO3	K2
b.	Explain Schering Bridge for the measurement of unknown capacitance. How the measure the loss angle and dissipation factor using Schering Bridge? The Schering Bridge has the following constants: Arm AB – capacitor of $1\mu\text{F}$ in parallel with $1.2\text{k}\Omega$ resistance Arm AD – resistance of $4.7\text{k}\Omega$ , Arm BC – capacitor of $1\mu\text{F}$ and Arm CD – unknown capacitor $C_x$ and resistance $R_x$ Calculate the unknown capacitance and its dissipation factor. The frequency is given as $0.5 \text{ kHz}$ .	CO3	K2

**6. Attempt any one part of the following: 07 x 1 = 07**

a.	Describe the construction and working of general purpose CRO with its block diagram and explain its components.	CO4	K2
b.	Define spectrum analyzer. Classify different types of spectrum analyzers and explain basic spectrum analyzer with neat block diagram. Also give the applications of wave analyzers.	CO4	K2

**7. Attempt any one part of the following: 07 x 1 = 07**

a.	What do you understand by transducers? Explain the construction and working principle of LVDT.	CO5	K3
b.	Explain the principle, construction and working of strain gauge transducer and formulate the expression for gauge factor in terms of Poisson's ratio.	CO5	K3