

**P.E.S. College of Engineering, Mandya - 571 401***(An Autonomous Institution affiliated to VTU, Belagavi)***Third Semester, B.E. - Electrical and Electronics Engineering****Semester End Examination; March/April - 2022****Measurements and Instrumentation**

Time: 3 hrs

Max. Marks: 100

Course Outcome*The Students will be able to:**CO1: Understand various units and dimensions associated with Electrical Quantities.**CO2: Apply fundamental knowledge of instruments/bridges characteristics for solving engineering problems.**CO3: Understand different types of standards; methods of calibration used in measurements and statistical and regression analysis.**CO4: Understand the principle of operation and working of different electronic instruments.**CO5: Apply the knowledge of different oscilloscopes like CRO, DSO for various applications.***Note: I) PART - A** is compulsory. **Two** marks for each question.**II) PART - B:** Answer any **Two** sub questions (from a, b, c) for **Maximum of 18 marks** from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A		10			
I a.	Why should an ammeter have low resistance and voltmeter have high resistance?	2	L2	CO1	PO1
b.	What are the difficulties on high resistance measurement?	2	L2	CO2	PO1
c.	What are instrument transformers? How do they differ from power transformer?	2	L2	CO3	PO1
d.	Mention the advantage of electrical transducer.	2	L2	CO4	PO1
e.	Precautions to be observed in the use of LED.	2	L2	CO5	PO1
II : PART - B		90			
UNIT - I		18			
1 a.	Prove that deflecting torque created in wattmeter reads power drawn by the load in an single phase AC circuit. If inductance is present in the pressure coil of wattmeter what will be the impact on wattmeter reading	9	L2	CO1	PO2
b.	Constant of energy meter is 750 Revol/kWh. Calculate number of revolution made by the meter, when connected to a load carrying 100 A at 230 V and 0.8pF in 30 sec.	9	L3	CO1	PO2
	i) If it makes 110 revolutions in 30 sec, find the percentage error				
	ii) Compute power factor of the load if number of revolution is 1000 when operating at 230 V and 4 A for 2 hours				
c.	With a neat Phasor diagram, explain the operation of three phase dynamometer type power factor meter.	9	L2	CO1	PO2

UNIT - II**18**

- 2 a. Prove that maximum sensitivity in wheat stone bridge is given by,

$$S_B = \frac{S_U E}{4}$$

9 L2 CO2 PO3

- b. Capacitor is tested by Schering bridge which forms one arm AB of the bridge, other arms are;

AD-non inductive resistance of 100 Ω

DC-non reactive resistance of 300 Ω in parallel with a capacitor of 0.5 μ F

BC-standard loss free capacitor of 100pF

9 L3 CO2 PO1

Supply frequency of 50Hz. Bridge is balanced. Calculate

- i) Capacitor value and resistance value
 - ii) Power factor of the capacitor
 - iii) Loss angle of capacitor
- c. Derive an expression for unknown R in Kelvin's double bridge with a diagram. If the ratio P/Q is different from p/q, what will be the impact on unknown measured resistance?

9 L2 CO2 PO1

UNIT - III**18**

- 3 a. What are the requirement of shunt and multiplier? Derive an expression for shunt resistance and multiplier resistance when meter range is extended.
- b. Explain the construction and operation of current transformer? Why the secondary of CT should not be open?
- c. A CT has single turn primary and 400 turns secondary. Secondary is supplying pure resistive load of 2 Ω at 5A. Magnetizing mmf required to set up the flux in core is 100AT. Frequency is 50 Hz. Neglect iron losses and copper loses. Calculate ratio and phase angle error.

9 L2 CO3 PO1

9 L2 CO3 PO1

9 L3 CO3 PO1

UNIT - IV**18**

- 4 a. With a diagram, explain the operation of true RMS responding voltmeter.
- b. What is LVDT? Explain its operating principle.
- c. With a diagram, explain the operation of digital tachometer.

9 L2 CO4 PO1

9 L2 CO4 PO1

9 L2 CO4 PO1

UNIT - V**18**

- 5 a. With a diagram, explain the working of digital storage oscilloscope.
- b. With a diagram, explain the front panel details of typical dual trace oscilloscope.
- c. Write a short note on;
- i) X-Y recorder
 - ii) LED display

9 L2 CO5 PO1

9 L2 CO5 PO1

9 L2 CO5 PO1