Code No: 155CB **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, September - 2021
MEASUREMENTS AND INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) By utilizing attracted disc technique explain how electrostatic voltmeter works with help of neat diagram.
b) A moving coil instrument gives a full-scale deflection of 10mA when the potential difference across its terminal is 100mV. Calculate (i) The shunt resistance for a full-scale deflection corresponding to 100A (ii) The resistance for full-scale reading with 1000V. Calculate the power dissipation in each case. [8+7]

2.a) A PMMC ammeter has the following specification Coil dimension are 1cm× 1cm. Spring constant is 0.15×10^{-6} N m / rad, Flux density is 1.5×10^{-3} wb / m. Determine the number of turns required to produce a deflection of 900 when a current 2mA flows through the coil.
b) Describe the construction and working of PMMC instrument. Derive the equation for deflection if the instruments are spring controlled. [7+8]

3. Differentiate between a C.T. and P.T. Discuss the theory of a P.T with phasor diagrams. Derive the expression for actual transformation ratio, ratio error and phasor angle error of a P.T. [15]

4. Discuss the major sources of errors in the current transformer. What are the means to reduce errors in CT? Explain the design and constructional feature to reduce the error. [15]

5. Explain the construction and working of induction type single-phase energy meter with a neat diagram and derive its equation. [15]

6.a) Explain the principle of working of LPF wattmeter.
b) Explain the operation of a three-phase dynamometer type wattmeter. [7+8]

7.a) Describe the circuit of Kelvin double bridge used for measurement of low resistance. Derive the conditions for balance.
b) Derive an equation for Wien's bridge at balance with a circuit diagram and explain the measurement procedure for measuring unknown frequency using this bridge. [7+8]

8.a) How the transducers are classified based on the principle of operation?
b) Explain the construction and principle of working of an LVDT. [7+8]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2021
MEASUREMENTS AND INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) A basic d' Arsonval meter movement with an internal resistance, Rm =100Ω and a full scale current of Im =1mA is to be converted in to a multi range D.C. voltmeter with ranges of 0-10V, 0- 50V, 0- 250V,0-500V. Determine the values of various resistances required for potential divider arrangement.
b) How can you extend the range of Electro static Voltmeters? Elaborate. [8+7]

2.a) Compare Polar and Coordinate type AC potentiometers.
b) Conclude the need of Potential transformer? And list different errors occurred in PTs. [8+7]

3.a) How can you test energy meter by phantom loading? Explain.
b) Explain the construction and working of three element dynamometer wattmeter. [7+8]

4.a) How could you measure medium resistance using bridge ? Elaborate.
b) Construct the circuit Maxwell's bridge and develop relation for unknown inductance. [8+7]

5.a) Explain the principle of operation of Thermocouple and mention its advantages.
b) Discuss principle of operation of Capacitance transducers and list their applications. [8+7]

6.a) Explain the Principle and working of DC potentiometer with a neat sketch.
b) Explain the working principle of repulsion type moving iron instrument. [7+8]

7.a) Prove that for electrodynamometer type wattmeter
True power = {cos Φ / [cos Φ cos (Φ – β]} x actual wattmeter reading
Where cos Φ = power factor of the circuit
β = tan-1 (ωL/R) where L and R are the inductance and resistance of the pressure coil of the circuit.
b) How could you measure frequency using Wein's bridge? Discuss with the help of diagram. [8+7]

8.a) Discuss principle of operation of True RMS meters.
b) Categorize the errors occurred in instrument transformers and describe them. [7+8]

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Code No: 155CB **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January/February - 2023
MEASUREMENTS AND INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define controlling torque and deflecting torque.	[2]
b)	Draw sketches for range extension of ammeter and voltmeter.	[3]
c)	What are instrument transformers? What are their uses?	[2]
d)	Define ratio error and phase angle error in potential transformer.	[3]
e)	What is tri-vector meter? What are its applications?	[2]
f)	Define driving and braking torques of induction type energy meter.	[3]
g)	State the conditions for AC bridge balancing.	[2]
h)	Draw the circuit diagram for H. V. Schering Bridge and write its uses.	[3]
i)	What are true RMS meters and what are their applications?	[2]
j)	Write the working principle of strain gauge and define its gauge factor.	[3]

PART – B

(50 Marks)

2.a) Explain the principle and working of PMMC type instruments and derive the expressions for its deflecting and controlling torque.
b) Explain with a neat sketch the working of attracting disc type electrostatic volt meter and describe the range extension of E.S. Volt meter. [5+5]

OR

3.a) Explain the principle and working of electrometer type volt meter and describe their range extension.
b) A deflecting electrostatic voltmeter gives full scale deflection of 40 degrees with 9V applied to its terminals. Its capacitance is 10pF at zero deflection and 30 pF at 30^0 and varies uniformly with deflection. The moment of inertia of moving vanes is 0.02×10^{-6} kg/m^2. Calculate the undamped period of instrument. [5+5]

4.a) Describe the principle and operation of D. C. Crompton's potentiometer with a neat diagram and explain how unknown resistance and voltage is measured using it.
b) Derive the expressions for the phase angle errors of a current transformer with a neat phasor diagram. [5+5]

OR

5.a) Explain the principle and working of A.C. Potentiometer with a neat diagram and describe its standardization.
b) Explain the construction, principle and working of current transformer. Explain the Wilson compensation method for reduction of errors in current transformers. [5+5]

6.a) Explain the construction, principle and operation of single phase three element electro dynamometer type watt meter and derive its torque equation.

b) If the reactance of the pressure coil circuit of a watt meter is 1 percent of its resistance, calculate the percentage error due to this cause at power factors of 0.8, 0.5 and 0.1 respectively. [6+4]

OR

7.a) Explain with neat sketches the measurement of active and reactive powers in balanced and unbalanced systems.

b) Explain the extension of ranges of watt meters using instrument transformers with help of neat diagrams. [6+4]

8.a) Draw the neat sketch of Kelvin's double bridge for measurement of low resistance and describe it's working.

b) Explain with a neat circuit the working of Wein's bridge for measurement of capacitance and frequency of the supply voltage and derive the expression for unknown capacitance and frequency. [5+5]

OR

9.a) Describe the working of Maxwell's inductance capacitance bridge for measurement of unknown inductance and derive the expression for its balance condition. Draw its phasor diagram.

b) Explain with neat diagram for measurement of capacitance and loss angle using Desauty's Bridge. [5+5]

10.a) Explain the classification of transducers with examples and discuss the general characteristics of transducers.

b) Describe with a neat sketch the principle and working of piezoelectric accelerometer and derive the expression for its output. [5+5]

OR

11.a) Explain the construction, working principle and applications of capacitive transducers.

b) Explain the methods of measurement of torque on rotating shafts using strain gauges with help of neat sketches. [5+5]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, February - 2022
MEASUREMENTS AND INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) A moving coil instrument gives a full-scale deflection of 10mA when the potential difference across its terminal is 100mV. Calculate,
i) The shunt resistance for a full-scale deflection of 100A
ii) Find the resistance for full-scale reading with 100V
Also, calculate the power dissipation in each case.
b) Derive an equation for the torque developed in PMMC instrument. [8+7]

2.a) A PMMC ammeter has following specification, coil dimension of 1cm×1cm, spring constant is 0.15×10^{-6} N-m/rad, Flux density is 1.5×10^{-3}wb/m^2. Determine the number of turns required to produce a deflection of 90^0, when a current of 2mA flows through the coil.
b) With the help of a neat diagram, explain the working of attracted disc type voltmeter. [7+8]

3.a) Discuss how AC potentiometer can be used for calibration of wattmeter.
b) Explain the procedure to calibrate voltmeter and ammeter using DC potentiometer. [8+7]

4.a) With help of a neat diagram explain the working of coordinate type potentiometer.
b) Draw the equivalent circuit diagram and phasor diagram of the current transformer. [8+7]

5.a) Discuss the construction and Working Principle of Electrodynamometer type 1-ϕ wattmeter with help of a neat diagram.
b) Explain any two errors that occur in electrodynamometer type 1-ϕ wattmeter and its compensation. [9+6]

6.a) With help of a neat diagram, explain the construction and working of a three-phase energy meter.
b) Two-watt meters are connected to measure the input to a balanced 3 phase circuit indicating 2000W and 500W respectively. Find the power factor of a circuit,
i) When both the reading is positive and
ii) When the latter reading is obtained after reversing the connections to the current coil of the first instrument. [9+6]

7.a) Draw the circuit of Kelvin double bridge used for measurement of low resistance. Explain its working principle

b) An AC bridge is balanced at 2KHz with the following components in each arm: Arm AB=10KΩ, Arm BC=100μF in series with 100KΩ, Arm AD=50KΩ. Find the unknown impendence R ± jX in the arm DC, if the detector is between BD. [8+7]

8.a) Derive an equation for gauge factor in strain gauge.

b) With help of a neat diagram, explain the principle and working of LVDT. [7+8]

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Code No: 155CB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, August - 2022
MEASUREMENTS AND INSTRUMENTATION
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Derive the equation for deflection if the instruments are spring controlled. In PMMC instrument.
b) Explain the working of M. I. instrument. [8+7]

2.a) By utilizing Quadrant method briefly explain the working of electrostatic voltmeter with neat diagram.
b) A moving coil instrument gives a full-scale deflection of 10mA when the potential difference across its terminal is 100mV. Calculate (i) The shunt resistance for a full-scale deflection corresponding to 100A (ii) The resistance for full-scale reading with 1000V. Calculate the power dissipation in each case. [8+7]

3.a) With help of a neat diagram explain the working of Crompton type DC potentiometer.
b) Enumerate the steps used in standardization of DC potentiometer. [8+7]

4.a) Compare C. T with P. T.
b) Derive the expression for ratio error of a C. T. [6+9]

5.a) Explain the construction, working principle of a three-phase wattmeter. What is the importance of deflecting torque in these analog instruments?
b) Derive the torque equation for an electrodynamometer type of wattmeter. [8+7]

6.a) With help of a neat diagram explain the working of Single phase induction type energy meter.
b) Briefly discuss about the working of LPF wattmeter with help of a neat diagram. [8+7]

7.a) Derive the bridge balance condition for the Maxwell bridge and Schering bridge.
b) Derive an equation for measurement of low resistance using Kelvin double bridge. [8+7]

8.a) Describe the principle of working and circuit diagram of a digital storage oscilloscope with help of a neat diagram.
b) Explain the working of photo voltaic cell and photoconductive cells with suitable diagram. [8+7]

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