

Subject Code: BEC-209

B.TECH.
 Year: 2nd, Semester: 3rd
MINOR TEST (EXAMINATION): 2025-26
 Electronic Measurement and Instrumentation

Max. Marks: 20

Time: 2 Hr.

Note- Answer all questions

Q1.	Attempt any Two parts of the following.	Marks	CO	BL	PO	PI Code
a)	Draw a neat diagram to show the basic construction of a PMMC instrument. A PMMC instrument has an air gap flux density of 50mT, the 150-turn coil has a dimension of $d=2.5$ cm and $l=3$ cm. The spring controlling torque is 3×10^{-6} Nm/degree. Determine the coil current that produces 50 degree deflection.	4	1	1	1	1.1.2
b)	Define precision with suitable example. Three resistors connected in series have the following values: ($5.6 \text{ k}\Omega \pm 10\%$), ($8.2 \text{ k}\Omega \pm 5\%$), ($6.8 \text{ k}\Omega \pm 2\%$). Calculate the total resistance, the maximum absolute error, and the maximum relative error.	4	2	1,2	1	1.1.2
c)	Derive the balance equation for Parallel RL Hay bridge. A Hay Bridge operating at a supply frequency of 100 Hz is balanced when the components are $C_3 = 0.1 \mu\text{F}$, $R_1 = 1.26 \text{ k}\Omega$, $R_3 = 75 \Omega$ and $R_4 = 500 \Omega$. Calculate the inductance and resistance of the measured inductor as a parallel RL circuit.	4	2	1,3	2	2.1.2
Q2.	Attempt any Two parts of the following.					
a)	1. Derive the expression for error in the: a) sum of two measured quantities b) product of two measured quantities. Calculate the maximum percentage error in the sum of two voltage measurements when $V_1 = 100\text{V} \pm 1\%$ and $V_2 = 80\text{V} \pm 5\%$.	3	1	1,3	1	1.1.1
b)	The accuracies of five precision resistors are checked by comparing each of them to a 1.00Ω resistor. The measured resistances are as follows: $R_1 = 1.001 \Omega$, $R_2 = 1.002 \Omega$, $R_3 = 0.999 \Omega$, $R_4 = 0.998 \Omega$ and $R_5 = 1.000 \Omega$. Calculate the average resistance and average deviation.	3	2	1,2	2	2.1.2
c)	Define with suitable example: a) Absolute error and relative error b) Gross error and systematic error	3	1	1,2	2	2.1.1
Q3.	Attempt any Two parts of the following.					

a)	Explain the operation of the Wheatstone bridge and derive the equation for the unknown resistance. Calculate the maximum and minimum resistance that can be measured by the Wheatstone bridge which can have $P = (1\text{ k}\Omega, 5\text{ k}\Omega, \text{ or } 10\text{ k}\Omega)$, $Q = (1\text{ k}\Omega, 5\text{ k}\Omega, \text{ or } 10\text{ k}\Omega)$, and S adjustable from $1\text{ k}\Omega$ to $6\text{ k}\Omega$.	3	2	1,2	1	1.2.2
b)	Derive the expression for the unknown capacitance and resistance for Wein's bridge. Also obtained the equation for $C_1=C_2=C$ and $R_1=R_2=R$.	3	2	1,2	2	2.2.1
c)	Derive the expression for the three-voltmeter method of power measurement. Calculate the load power and power factor from the following measurements made using the three-voltmeter method of power measurement: $V_1=50\text{V}$, $V_2=25\text{V}$, $V_3=70\text{V}$, and $R=22\Omega$.	3	2	1,2	2	2.2.2

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating)

CO – Course Outcomes

PO – Program Outcomes (As per Examination Reform Policy by AICTE Page No. 15)

PI Code – Performance Indicator Code

B. Tech. ECE & ECE (IOT)
Year: 2nd Semester: III
Major Examination: 2025-26
Electronic Measurement and Instrumentation

Time: 3 Hrs.

Max Marks: 50

Note: Attempt ALL questions. ALL questions carry equal marks.

Q1.	Attempt any Five parts of the following.	Marks	CO	BL	PO	PI Code
a)	Define the absolute and secondary instruments with a suitable example.	2	1	1	1.1	1.2.2
b)	Do the classification of errors in the measurement.	2	1	1	2.2	2.4.4
c)	Design the 4-input R-2R method for D2A conversion with an example.	2	5	1,2	1.1	1.2.1
d)	Explain the working principle and classification of LCDs.	2	5	1	1.2	1.3.1
e)	Derive the balance equation and conditions for an AC source bridge circuit.	2	3	1,2	1.3	1.3.1
f)	Deduce the expression for power measurement without a wattmeter using the three-voltmeter method.	2	6	1,4	1.2	1.2.2
g)	A PMMC instrument has an air gap flux density of 50mT, and the 150-turn coil has dimensions of $d = 2.5$ cm and $l = 3$ cm. The spring controlling torque is 3×10^{-6} Nm/degree. Determine the coil current that will produce a 50° deflection.	2	1	1,4	2.1	2.3.1
Q2.	Attempt any Two parts of the following.					
a)	Explain the working of the digital transducer. The coil in a variable reluctance transducer has an inductance of 1mH when the total air gap length is 1mm. Calculate the inductance change when the air gap is reduced by 0.2mm.	5	4	1,2	1.1	1.2.1
b)	Illustrate and sketch a diagram showing LVDT output waveforms for different core positions. An 11mm displacement of an LVDT core produces a 55mV output voltage. Calculate the output when the displacement is 15mm.	5	4	1,4	2.2	2.3.2
c)	Define charge sensitivity and voltage sensitivity for a piezoelectric transducer. Derive the equation for the piezoelectric transducer output voltage.	5	1,4	1,2	1.1	1.2.1
Q3.	Attempt any Two parts of the following.					
a)	A parallel plate capacitor transducer has a plate area ($l \times w$) = (40mm \times 40mm) and a plate spacing of 0.5mm. Calculate the device capacitance that needs to change by 5pF. Also, determine the transducer sensitivity.	5	1,4	3,4	3.1	3.2.3
b)	Draw and describe the operation of a resistance thermometer and list its typical temperature range. A resistance thermometer has a temperature coefficient of 0.0039 at 20°C and a resistance of 130Ω. Calculate the temperature when its resistance measures 175Ω.	5	1,4	3,4	3.2	3.2.3

	c)	Sketch and explain the operation of a photodiode with a suitable diagram.	5	5	1,3	3.1	3.2.3
Q4.	Attempt any Two parts of the following.						
	a)	A PMMC instrument with FSD = 200 μ A and $R_m = 1K\Omega$ is to be employed as an ac voltmeter using a full-wave bridge rectifier. FSD is to be 200V(rms), and germanium diodes are to be used. Calculate the required multiplier resistance value.	5	1	1,2	1.1	1.2.1
	b)	Draw and explain the operation of an ammeter that uses an Ayrton shunt circuit. How is it different from the general multirange ammeter circuit?	5	3	3,4	2.2	2.2.1
	c)	Explain the block diagram of the data acquisition system. Enlist the five differences with data loggers.	5	5	1,2	1.1	1.2.1
Q5.	Attempt any Two parts of the following.						
	a)	Describe the operation of a basic series ohmmeter diagram. The series ohmmeter consists of a 1.5V battery, a 100 μ A meter, and a resistance R_1 , which makes $(R_1 + R_m) = 15K\Omega$. (i) Determine the instrument indication when $R_x = 0$. (ii) Determine the resistance scale marking at 0.5 FSD, 0.25 FSD and 0.75 FSD.	5	3	1,2	1.1	1.2.1
	b)	Draw and explain the basic blocks of the digital frequency meter.	5	4,5	2,3	2.2	2.2.3
	c)	Sketch and explain the working principle for a non-inverting amplifier voltmeter and a voltage-to-current converter circuit.	5	4,5	2,4	3.2	3.2.1

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