

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

CLASS: I.M.Sc.
BRANCH: PHYSICS

SEMESTER: V
SESSION: MO/2025

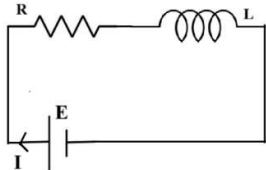
SUBJECT: PH307R1 EXPERIMENTAL TECHNIQUES

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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Q.1(a) The following measurements were recorded for the time period (in seconds) of a simple pendulum: 2.05, 2.03, 2.06, 2.04, 2.07, 2.02, 2.05, and 2.04. Assuming that only random errors are present, determine the standard deviation and standard error. Calculate the percentage uncertainty in the measurement of mean time period.	[5]	1	3
Q.1(b) Briefly outline the steps involved in carrying out a Chi-squared test for a distribution.	[5]	1	2
Q.2(a) Define a system? List the different types of system interconnections. State the basic properties of a system and explain any two of them.	[5]	2	1,2
Q.2(b) Define grounding and shielding. Discuss the concept and importance of magnetic field shielding in electrical systems.	[5]	2	1,2
Q.3(a) For a given L-R circuit, derive the equation for current using differential equation if E is constant and initially no current passes through the circuit.	[5]	3	1,2
			
Q.3(b) What are radiation transducers? Describe different regions of ionization chamber. Which region is used for Geiger Muller Counter?	[5]	3	1,2
Q.4(a) (i) Compare analog and digital measuring instruments based on the following parameters: working principle, accuracy and resolution, sensitivity, advantages and limitations. (ii) With neat block diagrams, explain the measurement methods for current (I), voltage (V), and capacitance (C).	[5]	4	1,2,3
Q.4(b) (i) Explain the working principle of an Impedance Bridge. Describe the operation of any one RLC bridge used for unknown parameter measurement. (ii) What is a Q-meter? Explain how Q-factor of an inductor is measured. Also differentiate between Q-meter and digital LCR bridge with respect to accuracy, frequency range, and measurement method.	[5]	4	1,2
Q.5(a) What do you understand by vacuum? How it is useful for Research and Development. Describe any one machine to develop the vacuum.	[5]	5	1,2
Q.5(b) What do you understand by Pressure gauges? Describe the basic principle of Pirani, Penning, and ionization gauges.	[5]	5	1,2