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

CLASS: I.M.Sc. **SEMESTER : IV**
BRANCH: PHYSICS **SESSION : SP/2025**

SUBJECT: SEC407 BASIC INSTRUMENTATION SKILLS

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.

			CO	BL
Q.1(a)	List three techniques of voltage measurement. Explain any one of these in detail.	[5]	1	2
Q.1(b)	Explain how a galvanometer can be converted into (i) a voltmeter and (ii) an ammeter. The *internal resistance* and *full scale deflection current* of a moving coil galvanometer are $200\,\Omega$ and $100\,\mu A$, respectively. Determine the resistance required to convert the galvanometer into an ammeter having a range of $10\ \mathrm{mA}$.	[5]	1	3
Q.2(a)	Explain how a cathode ray oscilloscope (CRO) displays two traces simultaneously. Compare the *Alt* and *Chop* modes of displaying dual trace.	[5]	2	2
Q.2(b)	Discuss the advantages of digital storage oscilloscope (DSO) over a CRO.	[5]	2	2
Q.3(a)	What is the difference between a signal generator and a function generator? Describe the specifications of a typical function generator.	[5]	3	2
Q.3(b)	Define total harmonic distortion (THD) of a signal. Explain how THD can be measured using a DSO.	[5]	3	3
Q.4(a)	Explain the working of a Maxwell inductance bridge and obtain its balance conditions.	[5]	4	2
Q.4(b)	A strain gauge has a resistance of 350 ohms under no load condition and the resistance increases when the gauge is loaded. Design a Wheatstone bridge circuit such the bridge output is zero under no load condition and goes positive when loaded. The maximum current allowed through the strain gauge is $10\ \mathrm{mA}$.	[5]	4	4
Q.5(a)	Sketch the block diagram of a digital multimeter and explain the function of each part.	[5]	5	2
Q.5(b)	Explain the technique of measuring the frequency of a signal accurately.	[5]	5	3

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