

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

CLASS: I.M.Sc.
BRANCH: PHYSICS

SEMESTER : IV
SESSION : SP/2023

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.
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Q.1(a)	Explain in detail the potentiometric technique of voltage measurement.	[5]	1 2
Q.1(b)	The <i>internal resistance</i> and <i>full scale deflection current</i> of a moving coil galvanometer are $400\ \Omega$ and $200\ \mu A$, respectively. (i) Determine the resistance required to convert the galvanometer into a voltmeter having a range of 10 V. (ii) Examine whether the resulting voltmeter is suitable for measuring potential drop across a $10\ k\Omega$ resistance connected in some network.	[5]	1 4, 5
Q.2(a)	Explain the construction and working of dual channel cathode ray oscilloscope (CRO). Compare the <i>Alt</i> and <i>Chop</i> modes of displaying dual trace.	[5]	2 2
Q.2(b)	Explain how time varying signals are measured using CRO. Discuss the applications and limitations of a typical CRO.	[5]	2 1, 2
Q.3(a)	Explain the working of digital storage oscilloscope (DSO). Discuss the advantages of DSO over a CRO.	[5]	2 2,
Q.3(b)	Write the specifications of a typical function generator used for educational purposes and discuss their significance.	[5]	3 1, 2
Q.4(a)	What is the meaning of <i>frequency response</i> of a system? Explain how frequency response of a given system can be determined.	[5]	3 2
Q.4(b)	Write the working principle of a balancing type impedance bridge. Draw the circuit diagram of Wien bridge and identify the conditions for bridge to be balanced.	[5]	4 1, 3
Q.5(a)	A thermistor having $20\ k\Omega$ resistance at room temperature and $2\ k\Omega$ at $100^\circ C$ is used as one of the resistance of a Wheatstone bridge. Compare the bridge outputs (error voltages) at room temperature and at $100^\circ C$ if the bridge is powered by a 9V supply and remaining 3 resistors are $15\ k\Omega$ each.	[5]	4 2, 4
Q.5(b)	Sketch the block diagram of a digital multimeter and briefly explain the function of each part.	[5]	5 2

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