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

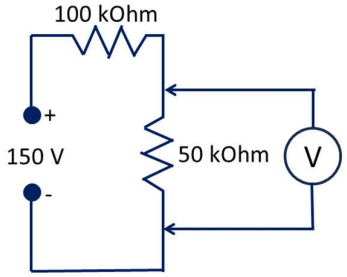
CLASS: I.M.Sc/ M.SC/Pre-PhD **SEMESTER : IX/I**
BRANCH: Physics **SESSION : MO/2025**

SUBJECT: PH509 INSTRUMENTATION AND CONTROL

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)	The current passing through a resistor of 100 ± 0.2 is 2.0±0.01 A. Using the relationship $P=I^2R$, calculate the limiting error in the computed value of power dissipation?	[5]	1	3
Q.1(b)	Explain terms accuracy, precision, sensitivity, resolution with example for any specific sensor?	[5]	1	1
Q.2(a)	It is desired to measure the voltage across the 50 kΩ resistor in the circuit of figure shown below. Two voltmeter are available for this measurement: voltmeter 1 with a sensitivity of 1,000 Ω/V and voltmeter 2 with a sensitivity of 20,000 Ω/V. Both meters are used on their 50-V range. Calculate (a) the reading of each meter; (b) the error in each reading, expressed as a percentage of the true value.	[5]	2	3
Q.2(b)	Compare the advantage and disadvantages of the electrical and optical sensors in the tabular format?	[5]	2	2
Q.3(a)	Draw the schematic diagram of a basic instrumentation amplifier? Establish the expression for closed-loop gain $A_{cl} = 1 + \frac{2R}{R_G}$, Where R_G is the external resistance.	[5]	3	2
Q.3(b)	What do you understand by signal to noise ratio? Write a short note on various types of noise, their origin and method to reduce?	[5]	3	1
Q.4(a)	For a low pass LC filter, calculate the response function? Graphically indicate the positions of -3 db and -20 db roll-off frequency as obtained from response function?	[5]	4	2
Q.4(b)	Discuss the working of a phase locked loop (PLL) and discuss its purpose?	[5]	4	1
Q.5(a)	Explain working of a basic analog electronic process controller?	[5]	5	1
Q.5(b)	With schematic diagram explain the working process and structure of a programmable logic controller (PLC)?	[5]	5	1



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