

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

**CLASS: BE
BRANCH: ECE**

**SEMESTER : III
SESSION : MO/18**

SUBJECT: EC3203-MODERN INSTRUMENTS & MEASUREMENT

TIME: 3.00 HOURS

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
 2. Candidates may attempt any 5 questions maximum of 60 marks.
 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) Differentiate between the terms "Scale range" and "Scale span" by giving suitable example. [2]
- Q.1(b) Describe the difference between deflection and null type Instrument by giving suitable examples. [4]
Discuss their accuracy, sensitivity and suitability for dynamic measurement.
- Q.1(c) A voltage has a true value of 1.50V. An analog indicating instrument with a scale range of 0-2.5V shows a voltage of 1.46V. What is the absolute error and its correction? Express the error as a fraction of the true value and full scale deflection (f.s.d.). [6]
- Q.2(a) What are the advantages of electronic voltmeters over electrical voltmeters? [2]
- Q.2(b) A shunt type ohmmeter using a 10mA d'Arsonval movement with an internal resistance of 5 ohm. The battery emf is 3V. It is desired to modify the circuit by adding appropriate shunt resistance across the movement so that the instrument indicates 0.5 ohm at the midpoint on its scale. Calculate (a) the value of shunt resistance (b) value of current limiting resistor. [4]
- Q.2(c) Describe the construction and working of PMMC instrument. Compare it with moving iron instrument. [6]
- Q.3(a) Explain why Maxwell's bridge is not suitable for high Q-coils. [2]
- Q.3(b) Define bridge sensitivity. Derive the expression for bridge sensitivity when all the arms are having same resistance. [4]
- Q.3(c) With suitable phasor diagram explain Schering bridge. Explain how Schering bridge is used for measurement of unknown capacitance and dissipation factor. [6]
- Q.4(a) Name four characteristics of D/A converter, which are generally specified by the manufacturer. [2]
- Q.4(b) Describe in details the successive approximation method of A/D conversion with proper circuit diagram. [4]
- Q.4(c) Find the digital word that results from a 3.127 V input to a 5-bit ADC with a 5 volt reference [6]
- Q.5(a) Write down the condition in which the lissajous figure will come as a. circle, b. straight line of angle 45°. [2]
- Q.5(b) With the help of block diagrams explain the function of dual trace CRO [4]
- Q.5(c) Prove that an electron entering the vertical deflection plates with an initial velocity follows a parabolic path. Find an expression for deflection sensitivity in terms of a constant of the tube and accelerating voltage. [6]
- Q.6(a) Classify transducer based on energy. [2]
- Q.6(b) With suitable diagram explain the working of LVDT. Draw the characteristics curve of LVDT. [4]
- Q.6(c) Compare among RTD, Thermocouple and thermistor. [6]
- Q.7(a) Write down the applications of wave analyzer. [2]
- Q.7(b) Draw a differentiator using OPAMP. What will be the output if a unit ramp input is applied to the differentiator? [4]
- Q.7(c) Design an alarm circuit using comparator in which the alarm will be generated when the temperature of the hot junction will go beyond 100°C. Assume the cold junction is at 20°C. The thermocouple coefficients k1 and K2 are 50µV/°C and 0.5µV/°C respectively. [6]

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