

B. MECH. ENGG. (EVENING) SUPPL. EXAMINATION, 2017 (4th Year, 1st Semester)

ELECTIVE - I [EXPERIMENTAL METHODS IN FLUID MECHANICS]

Time : 3 hours

Full Marks: 100

Answer any four [4] questions
All questions carry equal marks

1. Explain the basic functional elements of measurements system with two suitable examples. 25
2. Explain the generalized input-output configuration of measurement systems and the different methods of correction of spurious inputs with suitable examples. 25
3. The resistance of a certain size of copper wire is given by 25
 $R = R_0[1 + \alpha(T - 20)]$
 where R_0 is the resistance at 20°C, and have been measured for 10 times [in ohm] as 6.18, 6.14, 6.25, 6.11, 6.10, 6.18, 6.11, 6.18, 6.20, 6.19.
 $\alpha = 0.004/^\circ\text{C}$, is the temperature co efficient of resistance.
 the Temperature T is measured for 10 times [in °C] as 30.10, 30.11, 29.85, 29.99, 30.01, 30.05, 29.98, 30.05, 30.11, 30.11.
 For a 95% reliability, calculate the uncertainty in measurement of the normal resistance of the wire R .
4. What do you mean by static calibration. State the basic steps of the same.
 What do you mean by Static sensitivity, linearity, precision, resolution and dead space in connection to an instrument.
 What is loading effect? 8+12+5
5. State the basic sources of uncertainty of an instrument. What are random and systematic errors?
 The power transmitted by a rotating shaft can be given by 8+7+10
 $W = 2\pi RFL/t$
 Where,
 $R = 1,205 \pm 2$ [rev] is the revolution of shaft during time t .
 $F = 45 \pm 5\%$ [N] is the force at end of torque arm.
 $L = 0.397 \pm 2\%$ [m] is the length of torque arm.
 $t = 60 \pm 5$ [sec] is the time length of run
 For a 95% reliability, calculate the uncertainty in measurement of W .
6. Write short notes on the following: 8+8+9
 - a. Active and Passive Transducer
 - b. Analog and Digital Modes of Operation
 - c. Null and Deflection Methods