

Bachelor of Engineering (Mechanical Engineering) - Third Year - Second Semester, 2025**SUBJECT: Experimental Method in Fluid Dynamics**

Time: Three hours

Full Marks 100

[Answer any 5 (five)]

1. Explain the functional components of a measuring instrument with two suitable examples. 20
- 2a. Distinguish between active and passive transducers with suitable examples. 8
- b. Comment on the relative advantages and disadvantages between null and deflection methods of measurement. Cite suitable examples against your comments. 9
- c. What do you mean by Resolution for a measuring instrument. 3
3. Write short notes on:
 - a. Interfering and Modified Inputs
 - b. Gimbal suspension
 - c. Analog and Digital Modes of Operation
 - d. Static sensitivity and Linearity 5 x 4
- 4a. What do you mean by signal filtering? Give two suitable examples of input and output filtering for elimination of spurious inputs to an instrument. 8
- b. Why Pitot tubes are made L – shaped? Explain. 8
- c. Write short note on: Hysteresis and dead space 4
5. Find the uncertainty in measurement of Fr ;

$$Fr = u/\sqrt{gh}$$

u is measured 10 times [in m/s] as 20.2, 21.0, 20.7, 20.5, 20.8, 20.0, 20.8, 20.9, 20.0, 21.0
 g is measured 5 times [in m/s²] as 9.81, 9.80, 9.81, 9.80, 9.81
 h is measured 12 times [in mm] as 1000, 1011, 1010, 1019, 1022, 1021, 1011, 1018, 1012, 1010, 1009, 1008. 20
- 6a. The power transmitted by a rotating shaft is given by

$$W = 2\pi RFL/t$$

If
 $R = 1200 \pm 2$ (rev) is the revolution of shaft during time t
 $F = 45 \pm 5\%$ (N) is the force at the end of torque arm
 $L = 0.397 \pm 2\%$ (m) is the length of torque arm
 $t = 600 \pm 2$ (sec) is the time length of run
 For a 95% reliability, calculate the uncertainty in measurement of W . 14
- b. What do you mean by Static Calibration. Write down the steps for the same. 6
7. Site suitable example of a first order instrument and find out the expression for time constant and static sensitivity for the same. Comment on its stability criteria. Explain the step response and ramp response for the same. 20