Exam.Code:0941
Sub. Code: 33865

2076

B.E. (Mechanical Engineering)

Fifth Semester

MEC-504: Mechanical Measurement

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.

x-x-x

I. Attempt the following:-

(a) A flow meter is calibrated from 0 to 50 m^3/s. the accuracy is specified as within ± 0.75 percent over 20 percent of the scale reading. What is a static error if the instrument indicates 30 m^3/s?

(b) Describe the hydrogen bubble technique used for flow visualization.

(c) The temperature indicated by a "total immersion" mercury-in-glass thermometer is 70^0 C (158°F). Actual immersion is to the 5^0 C (41^0 F) mark. What correction should be applied to account for the partial immersion? Assume ambient temperature is 20^0 C (68°F).

(d) How Does a Scanning Probe Microscope work?

(e) What is the relationship that governs the operation of liquid in a glass thermometer?

(5×2)

UNIT - I

II. (a) Discuss the Input-output configuration of instruments and measurement systems taking a suitable example.

(b) Derive the equation for the time response of a first-order system when subjected to Step Input. Also, Plot the curve showing dynamic error for a first-order system when subjected to step input.

(2x5)

III. (a) What do you mean by linearity? Briefly describe various forms of linearity. (b) Define hysteresis and list the reasons for the presence of hysteresis in measuring systems.

(c) With a block diagram, explain the three stages of a generalized measurement system giving suitable examples.

(3,3,4)

P.T.O.

IV. (a) Define precision uncertainty. Discuss two fundamental concepts used for estimating the precision uncertainty.

(b) Differentiate between bonded and unbonded strain gauges. Write the strain gauge applications for direct, bending, and torsional loads. (2x5)

UNIT - II

V. (a) List different elastic-type pressure transducers. Discuss how a Bourdon tube pressure gauge works with a neat sketch.

(b) Explain the constructional features and working principle of the thermal conductivity gauge with the help of a neat sketch. (2x5)

VI. (a) Discuss how a linear quartz thermometer is used to measure temperature. Discuss its merits and demerits.

(b) Describe the construction and working of the optical pyrometer with the help of a neat sketch. Write its characteristics. (4,6)

VII. (a) Describe the construction and working of a light torsion dynamometer with the help of a neat sketch.

(b) Discuss the principle & working of magnetic levitation systems for wafer conveyors. (2x5)

x-x-x