B.E. Instrumentation Engineering (Model Curriculum) Semester-VII

IN701M - Instrumentation System Design

P. Pages : 2 **GUG/W/23/14256**

Time : Three Hours * 7 8 2 3 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.

1. a) Define calibration. Explain in detail the calibration procedure for any temperature sensors. **8**

b) Explain the installation procedure for the thermocouple in detail. **8**

OR

2. a) The temperature of a process tank was measured using a Pt 500 RTD. It was found that the final temperature measured was 428 ºC. Calculate the unknown resistance. (Temp. coefficient $\alpha = 0.00392$). Also explain calibration procedure for RTD pt 500. **8**

b) Distinguish the temperature sensors with the help of. **8**

i) Range.

ii) Accuracy.

iii) Sensitivity.

iv) Input- output characteristics.

3. a) Write a short note on 'Evolution of Transmitters'. **8**

b) In the water flow measurement application, an orifice plate is designed with the following parameters: the coefficient of discharge (Cd) is set as 0.619, the beta ratio (β) is 0.25 and orifice plate diameter is designed as 50mm. It is found that the volumetric flow measured with the setup is 2000lph. Calculate the input differential pressure (ΔP). (Assume the expansibility coefficient as 1). **8**

OR

4. a) Discuss in detail design of square root extractor. **8**

b) Why current transmission is preferred in automation industry? Discuss the components of 4-20 mA, 2-wire type transmitter. **8**

5. a) Illustrate in detail, the design consideration of I/P and P/I convertor. **8**

b) Draw a neat diagram representing different types of pressures. Define any three types of pressure. **8**

OR

6. a) Design any level sensor with its signal conditioning circuit. **8**

b) A pressure gauge located at the base of an open tank containing a liquid with a specific weight of 54.5 lb./ft3 registers 11.7 psi. What is the depth of the fluid in the tank? **8**

7. a) List out various control valve accessories. Explain any three control valve accessories with figure and its role in control valve. **8**

b) What is the need of valve positioner for the operation of control valve? **8**

OR

8. a) Explain the following terms w.r.t control valve in detail. **8**

i) Rangeability ii) Turndown.

iii) Valve capacity iv) Throttling valve.

b) Illustrate the concept of cavitation and flashing. Explain the remedies to reduce the cavitation. **8**

9. a) Discuss in brief reliability concepts and causes of failure. **8**

b) Discuss in brief single, double, multi-layer and SMD boards. **8**

OR

10. a) Write a short note on Bathtub curve. **8**

b) Enlist various soldering materials and techniques. Explain any one technique in short. **8**

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