

Printed Pages : 4



ECH-507

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 151508

Roll No.

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B. Tech.(SEM. V) (ODD SEM.) THEORY
EXAMINATION, 2014-15**INSTRUMENTATION AND PROCESS CONTROL**

Time : 2 Hours]

[Total Marks : 50

Note : Attempt all questions.

1. Attempt any four of the following : **3.5×4=14**
- Define the functional elements of a measuring system, with the help of a neat sketch, describe the functional group for a system.
 - Explain static Characteristic of the instrument.
 - Pressuring spring thermometer the accuracies specified for different element are :
Bulb – within $\pm 0.5\%$, capillary and bourdon – within $\pm 1.5\%$, indicator - $\pm 0.15\%$. What is square root accuracy?
 - Describe the various indicating and recording types of measuring instruments.

- (e) Explain static and dynamic error of the instrument. Also write the types of the static error.
- (f) A diaphragm type pressure measuring instrument is calibrated for absolute pressure of 7 to 763 mm of mercury. It has an accuracy of $\pm 1\%$ based upon scale span. Calculate the scale range, scale span and maximum static.
- 2** Attempt any four of the following : **4×3=12**
- (a) With the help of neat sketch explain the working principle of a orifice-meter. How discharge can be measured?
- (b) Discuss the working of expansion type of thermometers in detail. Explain the various types of temperature measurement.
- (c) A thermometer initially at 40°C is immersed in a bath of 105°C . Find the time to reach 100°C by thermometer. if time constant 12 sec.
- (d) Explain the various instruments used for analysis of a gaseous mixture ? Describe the working one of them.
- (e) Give the classification of liquid level measuring system. With the help of a neat sketch, describe the construction, principle and operation of Air-purge method.
- (f) Discuss the principle and construction of resistance temperature detector. Give the advantage over other temperature measuring devices.

3 Attempt any two of the following : 6×2=12

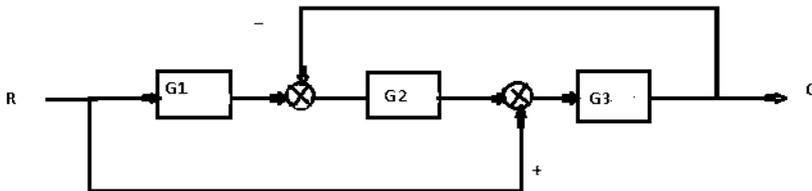
- (a) For the second order system, whose transfer function is given below, for a unit impulse function. Find the maximum value of the output if the response is oscillatory.

$$\frac{Y(s)}{X(s)} = 1 / (2s^2 + s + 1)$$

- (b) Discuss the dynamic response of a second order system for a sinusoidal input. Also show the effect of τ and ξ on amplitude ratio and lag in output.
- (c) Find transfer function of mercury thermometer and find its dynamic response for a linear input. Discuss the dynamic error and lag in the output.

4. Attempt any two of the following : 6×2=12

- (a) Determine the transfer function C/R for a control system represented by the block diagram below:



- (b) Explain the following controllers and show the output response with sketch :

- I PI controller
- II PD controller
- III PID controller
- IV P-Controller

- (c) What is open-loop and closed-loop control system? Explain their significance with the help of a simple block diagram and suitable examples.
