Total No. of printed pages = 4

CAI-503/POI/5th Sem/2015/M

PRINCIPLES OF INSTRUMENTATION

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *six* from the rest.

1. (a) Fill in the blanks. 1×8=8

(i) If the percentage error is 2% and the measured voltage of a voltmeter is 200V, the true value is _____.

(ii) A 0–100 voltmeter has 200 scale, the resolution of the meter is _____.

(iii) The difference between the measured value and the true value is _____.

(iv) Time constant of an R.C circuit is _____.

[Turn over

(v) The order of the system governed by the equation $a_1 \frac{dc(t)}{dt} + a_o\ c(t) = b_o\ r(t)$ is _____.

(vi) The time required for a system to rise from 0 to 100 percent of its final value is known as _____.

(vii) The power requirement of an LED is _____.

(viii) Drift and Dead zone is _____ characteristic of an instrument.

(b) Define transfer function. 2

2. (a) What are the desirable and undesirable characteristic of instrument ? 5

(b) The true value of voltage across a resistor is 50V. The measurement finds a value of 49V. Calculate the absolute error, the percent error and percent accuracy. 5

3. (a) Draw the instrumentation block diagram and discuss briefly. 4

(b) Derive the transfer function of a first order system subjected to unit step input. 6

4. (a) A temperature sensitive transducer is subjected to sudden change. It takes 10s for the transducer to reach equilibrium (5 time constants). How long will it take for the transducer to read half of the temperature difference. 5

(b) An RC circuit consists of a capacitor in series with a resistor of 5 kΩ. A d.c voltage of 50V is applied suddenly. If 31.6V is generated after 5 ms, calculate the value of capacitor. 5

5. (a) Derive the characteristic equation of a second order system. 5

(b) A linear second order system has a mass of 4g and a stiffness of 1000 N/m. Calculate the natural frequency of the system. Determine the damping co-efficient if the system is critically damped. 5

6. (a) Explain the functioning of a 5×7 LED matrix display. 5

(b) Explain the working and principle of a Nixie tube. 5

7. Explain the working of a LCD and LED and discuss its advantages and disadvantages.

5+5=10

8. (a) With suitable diagram, explain the working of a X-Y recorder. 5

(b) Differentiate accuracy and precission with suitable example. 5