Code : 041706

B.Tech 7th Semester Exam., 2015

INTELLIGENT INSTRUMENTATION

Time : 3 hours   Full Marks : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are **NINE** questions in this paper.

(iii) Attempt **FIVE** questions in all.

(iv) Question No. **1** is compulsory.

1. Choose the most appropriate answer/ Answer the following (any *seven*) :   2×7=14

   (a) Which one of the following is an active transducer?

   (i) Strain gauge

   (ii) Selsyn

   (iii) Photovoltaic cell

   (iv) Photoemissive cell

   (b) If a transducer has an output impedance of 1 Ω and a load resistance of 1 kΩ, it behaves as

   (i) a constant current source

   (ii) a constant voltage source

   (iii) a constant impedance source

   (iv) None of the above

   (c) The order of the output resistance of 741 OPAMP is

   (i) $0.1\,\Omega$ to $10\,\Omega$

   (ii) $10\,\Omega$ to $10^5\,k\Omega$

   (iii) $10\times10^3\,\Omega$ to $10^9\,\Omega$

   (iv) $10^3\,\Omega$ to $10^6\,\Omega$

   (d) A 741 OPAMP has an open-loop gain of 200000. The input offset voltage is 2 mV. If the input terminals are shorted, output voltage is

   (i) 0 V

   (ii) ∞

   (iii) 400 V

   (iv) ± 400 V

   (e) A low-pass filter has a time constant τ. Its gain at frequency ω is

   (i) $\sqrt{1+(\omega\tau)^2}$

   (ii) $\dfrac{\omega\tau}{\sqrt{1+(\omega\tau)^2}}$

   (iii) $\dfrac{1}{\sqrt{1+(\omega\tau)^2}}$

   (iv) None of the above

(3)

(f) A high-pass RC filter acts as a pure differentiator when

(i) $\omega\tau = 0$

(ii) $\omega\tau \gg 1$

(iii) $\omega\tau \ll 1$

(iv) $\omega\tau = 1$

where τ is the time constant and ω is the frequency.

(g) An 8-bit converter is used for a d.c. range of 0 V–10 V. Weight of LSB is

(i) 39 mV

(ii) 78 mV

(iii) 39·2 mV

(iv) None of the above

(h) Define transducer and inverse transducer. Give examples.

(i) What is the difference between accuracy and precision?

(j) Convert octal number 7654 to binary.

2. (a) What is the difference between an OPAMP and an instrumentation amplifier? Give schematic circuit. 7

(b) Mention the scheme and configuration for linearizing signal using OPAMP. 7

(4)

3. (a) Give the block diagram of intelligent instrumentation. Mention the features characterizing intelligence. 7

(b) Describe phase-locked loop with block diagram. 7

4. (a) Brief on serial and parallel interfacing and mention their advantages and disadvantages. 7

(b) Describe the operation of LAN mentioning the three basic network structures like star, bus and ring structures. 7

5. Write notes on the following : 7+7=14

(a) Primary sensors

(b) Standard for smart sensor interface

6. Write notes on the following : 7+7=14

(a) Digital encoder

(b) High-pass filter

7. Discuss autocorrelation and cross-correlation operation in signal conditioning technique. 14