B.E. (CST) Part-II 4th Semester Examination, 2007

Control and Instrumentation

(EE-406)

Time : 3 hours **Full Marks : 70**

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1. a) What do you mean by 'Transfer function' of a system?

   b) The output of a system, for a given input, can be expressed as

   $$Y(s) = \frac{5}{s^2 (s+1)(s+2)}$$

   Find the expression for time domain representation of output, i.e. y(t).

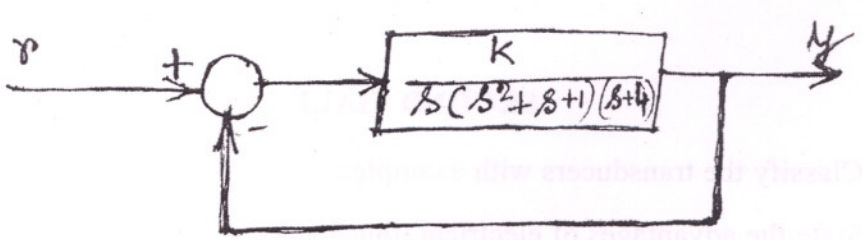
   c) Let the differential equation of a first order system is

   $$J\frac{dw(t)}{dt} + Bw(t) = T(t)$$

   where w(t) = angular velocity, T(t) = Input torque, B = damping coefficient, J = Moment of Inertia.

   Find the transfer function of the system. Draw the step response of the given system. **[2+5+4]**

2. a)



   Determine the range of K of the above system for which the system is stable.

   b) Draw a mechanical system and an electrical system which are analogous to each other. Identify the analogous quantities.

   c) Explain the difference between time varying and Time invariant system with proper equation. **[5+4+2]**

b) A resistance strain gauge with a gauge factor of 2.4 is mounted on a steel beam whose modulus of elasticity is 2×10^6 kg/cm^2. The strain gauge has an unstrained resistance of 120 Ω, which increases to 120.1 Ω, when the beam is subjected to a stress. Calculate the stress at that point, where the strain gauge is mounted. **[6+5]**

8. a) Name and compare the characteristic features of various types of temperature transducers.

b) A resistance thermometer shows a temperature of 100°C when a current of 1 mA flows through it and a temperature 99°C when a current 0.8 mA flows through it. What is the correct temperature? **[6+5]**

9. a) How the shaft position of a rotary system can be obtained in terms of digital pulse rate? Describe a method with diagram.

b) Describe and compare the successive approximation" type and the "flash" type ADCs. **[5½+5½]**

10. Write short notes on <u>any two</u> of the following :- **[5½+5½]**

a) LVDT

b) Instrumentation amplifiers

c) Piezo-electric transducers

d) Digital to analog converters.

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