No. of Printed Pages : 3

BIEE-035

DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)

00176

Term-End Examination

June, 2016

BIEE-035 : CONTROL SYSTEMS

Time : 2 hours *Maximum Marks : 70*

Note :

(i) *Question no. 1 is **compulsory**.*

(ii) *Attempt any **five** questions.*

(iii) *All questions carry equal marks.*

(iv) *Use of scientific calculator is allowed.*

1. Write whether *True* or *False*. *7×2=14*

(a) Practical control systems are designed to perform as slightly underdamped second order systems.

(b) A DC tachogenerator produces voltage that is proportional to the rotor speed.

(c) Velocity error (due to unit ramp input) of a type-0 closed-loop control system is always zero.

(d) Characteristics of a system is dominantly determined by the roots near the imaginary axis on s-plane.

(e) To determine a transfer function from input-output relation of the system, all initial conditions are assumed zero.

(f) Root locus technique informs about the variation of gain with system stability in a negative feedback closed-loop system.

(g) While designing practical systems, integrator is placed slightly to the left of origin.

2. (a) Consider the block diagram shown in Figure 1. 7

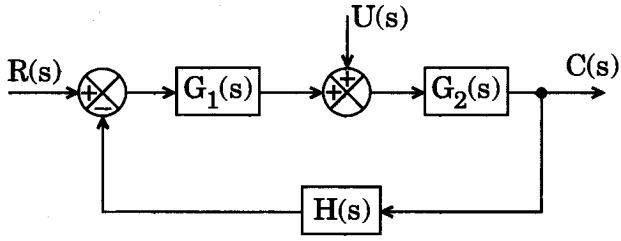

Figure 1

Determine the transfer functions C(s)/R(s) with U(s) = 0 and C(s)/U(s) with R(s) = 0.

(b) Use block diagram reduction technique in Figure 2 below and determine the transfer function. 7

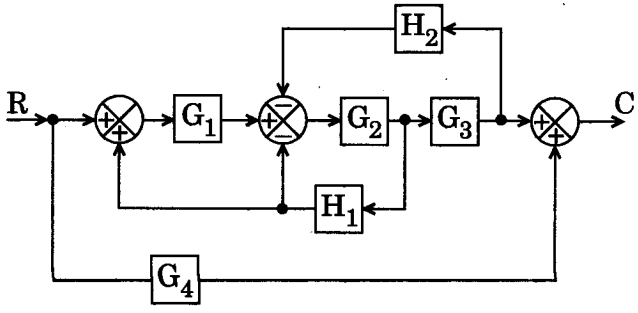

Figure 2

3. With the help of a schematic diagram, explain the working of a synchro error detector. Draw the typical waveforms. *14*

4. (a) When the first term in any row of the Routh array is zero while rest of the row has at least one non-zero term, Routh's test breaks down. How do you overcome this situation ? *4*

   (b) An open-loop system is given as

$$G(s) = \frac{k}{(s+2)(s+4)(s^2+6s+25)}.$$

   Using Routh criterion, determine the value of k for which the closed-loop unity feedback system will have sustained oscillation. Also determine the frequency of sustained oscillation in rad/sec. *10*

5. Explain the significance of step, ramp, parabolic and impulse signals as test input signals. Also derive the corresponding Laplace functions. *14*

6. (a) Describe the role of proportional, integral and derivative control in open-loop process control. *7*

   (b) Explain the working of on-off controller. *7*

7. Write short notes on any ***two*** of the following : *2×7=14*

   (a) Potentiometer as Error Detector

   (b) Op-Amp as Derivative Controller

   (c) Stepper Motor