

**DIPLOMA IN ELECTRICAL ENGINEERING  
(DELVI)**

**Term-End Examination**

**December, 2015**

**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.*

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

- (a) Use of negative feedback control has the advantage of reducing sensitivity, improving transient response and minimizing the effects of disturbance signals.
- (b) Inertia of a servomotor is reduced by reducing the length and diameter of its rotor.
- (c) Ramp response of a first order system has steady state error equal to the time constant of the system.

- (d) If one pair of roots of characteristic equation lie on the imaginary axis of s-plane, the impulse response will be sustained oscillation.
- (e) Two cascaded systems may be combined by multiplying independent Laplace transforms of transfer functions of each system.
- (f) Routh-Hurwitz analysis may inform about the roots on the imaginary axis of s-plane.
- (g) In Bode plot, an error of 3 dB occurs at the corner frequency while plotting the transfer function  $1/(s + 1)$ .
2. (a) Explain the difference between open-loop and closed-loop systems with suitable examples.
- (b) Consider the following block diagram :

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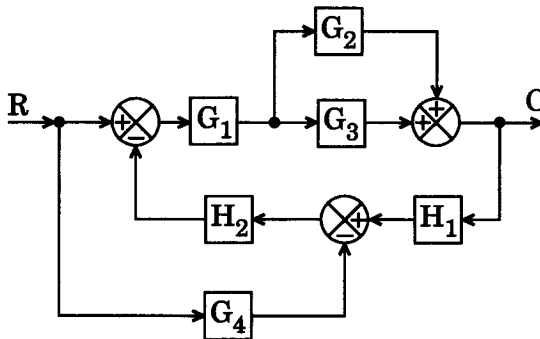


Figure 1

Draw a signal flow graph and determine the closed-loop transfer function of the system shown in Figure 1.

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3. (a) What are the advantages and disadvantages of frequency response analysis ? 7
- (b) A negative feedback control system has forward path transfer function  $10/[s(s + 1)]$  and feedback path gain as 5. Determine the sensitivity of the closed-loop transfer function with respect to the open-loop transfer function at frequency 1 rad/sec. 7
4. What is steady state response ? What happens to steady state error of a
- (a) Type-0 system,
- (b) Type-1 system, and
- (c) Type-2 system,
- for a unit ramp input ? 14
5. (a) Define stability of a system. Where should the roots lie on s-plane for the system to be (i) stable, (ii) unstable and (iii) marginal stable ? 7
- (b) Use Routh stability analysis to determine the range of values of k for the system  $s^4 + 4s^3 + 13s^2 + 36s + k = 0$  to be stable. 7

6. (a) Discuss the role of controllers in process industry. 7
- (b) Given  $Y(s) = \frac{5s + 2}{s(5s + 4)}$   
Determine the initial and final values of  $y(t)$ . 7
7. Write short notes on any *two* of the following :  $2 \times 7 = 14$
- (a) AC Servomotor
- (b) PID Controllers
- (c) Parabolic and Impulse Functions
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