No. of Printed Pages : 4

**BIEE-035**

# DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)

## Term-End Examination

## December, 2016

00753

## 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 *True* or *False*. *7×2=14*

(a) The transfer function of the circuit in Figure 1 is $G(s) = \frac{R}{R + sL}$.

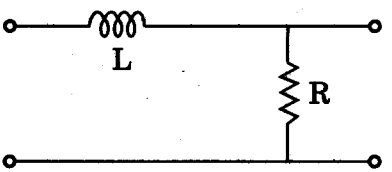


*Figure 1*

(b) In Mason's Gain formula $M = \frac{1}{\Delta}\sum P_k \Delta_k$, M is known as the gain of the $k^{th}$ forward path.

(c) A system is said to be stable if for a finite duration, a disturbance causes a response of a finite duration after which the system resumes a steady state condition.

(d) The sufficient condition for stability in Routh-Hurwitz criterion is that there must be one sign change in the first column of Routh's array.

(e) Bode plot is a plot of magnitude and angle of transfer function against frequency.

(f) Two cascaded systems may be combined by multiplying independent Laplace transforms of the transfer functions of each system.

(g) Pole-zero plot having two poles at origin belongs to a stable system.

**2.** Determine the expressions of C(s) as shown in Figure 2, transient response of second-order system for a unit step input for all four cases $\xi = 0, \xi = 1, \xi < 1, \xi > 1$. *14*

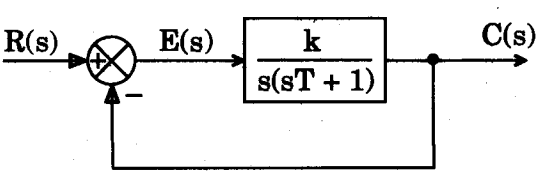


*Figure 2*

3. (a) What are the advantages and disadvantages of frequency response analysis ? 7

(b) The unit step response of a system is given as $C(t) = \frac{5}{2} + 5t - \frac{5}{2} e^{-2t}$.

Find the transfer function of the system. 7

4. What is steady state response and what happens to the steady state error of a

(a) Type-0 system,

(b) Type-1 system, and

(c) Type-2 system

for a unit parabolic input ? 14

5. (a) Explain the difference between absolute and relative stability. 4

(b) A servo system for position control has the closed-loop transfer function $\frac{6}{s^2 + 2s + 6}$.

Find the percentage overshoot, if the input is suddenly moved to a new position. 10

6. (a) Discuss the role of controllers in process industry. 7

(b) Find the initial and final values of the following functions : 7

(i) $F(s) = \dfrac{s(s+10)}{(s+2)(s+4)(s+6)}$

(ii) $F(s) = \dfrac{12(s-1)}{s(s+2)^2(s+3)}$

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

(a) Servo System

(b) Advantages and Classification of Robotics

(c) Synchros as Error Detectors