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BIEE-035

DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)

Term-End Examination

00646

June, 2015

BIEE-035 : CONTROL SYSTEMS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Question no. **1** is **compulsory**.*

1. Write *True/False* and justify the following : *7×2=14*

(a) A positive feedback signal improves the performance of automatic control system.

(b) In a closed loop system of feedback signal is usually positive.

(c) Induction type potentiometers can be used in high impedance servo controlled systems.

(d) Mason's gain formula is used to find the overall gain of the system.

(e) The polar plot relates the magnitude in decibels with phase angle.

(f) Gain margin is a measure of relative stability of a system.

(g) The velocity error constant for a type-2 system is infinite.

2. (a) What do you mean by continuous and discrete time control system ? 7

(b) Discuss the effect of feedback on the (i) overall gain, (ii) noise and disturbance. 7

3. (a) What is the use of Laplace transform in control system engineering ? 4

(b) Find the inverse Laplace transform of

$$F(s) = \frac{(s + 5)}{s(s + 6)(s + 7)}.$$ 10

4. (a) Define transfer function and give its advantages and disadvantages in analysis of control system. 7

(b) Discuss unit step and unit parabolic test signal with graphical representation. 7

5. (a) The transfer function of a system is given by, $T(s) = \frac{K(s + 6)}{s(s + 2)(s + 5)(s^2 + 7s + 2)}$. Determine the poles, zeros, characteristic equation and pole-zero plot. 7

(b) What is the analogy between translational and rotational motion ? 7

6. (a) Define the static position error constant K_p. Find the steady actuating error e_{ss} to unit step input for type-0 and type-1 system. 7

(b) The open loop transfer function of a servo system with unity feedback is given by,

$$G(s) = \frac{10}{(s+2)(s+5)}.$$

Determine the damping ratio, un-damped natural frequency of oscillation. What is the % overshoot of the response to a unit step input ? 7

7. A second order servo system is governed by the following equation :

$$\frac{d^2\theta_o}{dt^2} + 4\frac{d\theta_o}{dt} + 16\theta_o = 10\theta_i$$

where, θ_o represents output and θ_i is unit step input. Determine the peak overshoots, rise time and settling time (5%). 14

8. (a) List the various methods of determining the stability of control systems. Discuss their relative merits and limitations. 7

(b) Using Nyquist criterion investigate closed loop stability of

$$G(s)\,H(s) = \frac{1{\cdot}25\,(s+1)}{(s+0{\cdot}5)(s-2)}.$$ 7