Total No. of Questions : 10] [Total No. of Printed Pages : 4

Roll No. ....

EC–402(N)

B. E. (Fourth Semester) EXAMINATION, June, 2010

(New Scheme)

(Electronics & Communication Engg Branch)

CONTROL SYSTEM

[EC – 402(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt *one* question from each Unit. Provide Graph and log paper.

Unit – I

1. Draw the block diagram of the circuit shown in fig. 1. Also find out the transfer function by block diagram reduction method. 20

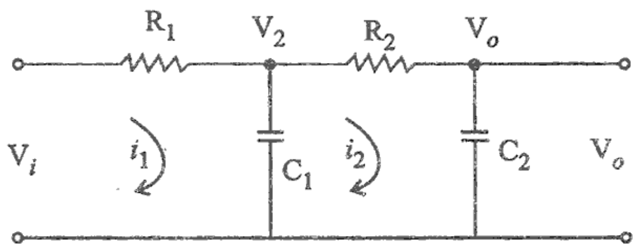

Fig. 1

Or

2. Describe the D. C. servomotor (Armature and field controlled) and A. C. servomoter. Find out the T. F. in both cases. 20

P. T. O.

Unit – II

3. (a) Describe the effect of feedback on gain, sensitivity, band width and stability. 10

(b) Discuss the error coefficients (K_p, K_v and K_a) for type '0', '1' and '2' systems. 10

Or

4. The block diagram of an electronic pacemaker is given in fig. 2, where K = 400. 20

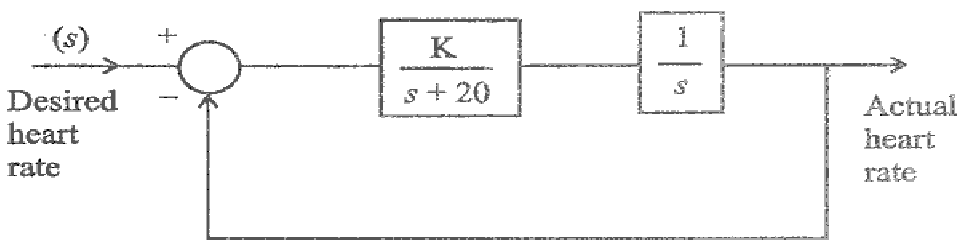

Fig. 2

(i) Calculate ω_n, ξ and ω_d.

(ii) Calculate the output C(*t*) for a unit step input.

(iii) Detemine the steady-state error for unit ramp input.

(iv) Determine the value of K for which the steady state error to ramp input will be 0·02.

Unit – III

5. (a) A system has $G(s)H(s) = \frac{k}{[s(s+2)(s+4)(s+8)]}$ where *k* is positive. Determine the range of *k* for stability. 6

(b) Sketch the root locus plot for the system having open-loop T. F. given by :

$$G(s)H(s) = \frac{k}{s(s+4)(s^2+4s+13)}$$

Determine the stability condition. 14

Or

6. (a) Use Nyquist criterion to determine whether the closed loop system having the following open loop T. F. is stable or not. If not how many closed loop poles lie in the R. H. S-plane ? 10

$$G(s)H(s) = \frac{1 + 4s}{s^2(1+s)(1+2s)}$$

(b) Draw the Bode plot for the T. F. :

$$G(s) = \frac{50}{s(1 + 0{\cdot}25\,s) + (1 + 0{\cdot}1\,s)}$$

From the graph determine : 10

(i) Gain crossover frequency

(ii) Phase cross over frequency

(iii) G. M. and P. M.

(iv) Stability of the system

Unit—IV

7. (a) Describe the phase lead-lag compensation circuit. 10

(b) Fig. 3 shows PD controller used for controlling the system performance. Determine T_d to make the system critically damped. Calculate settling time. 10

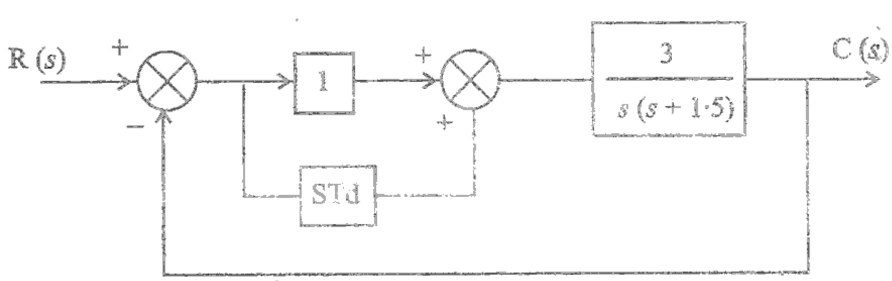

Fig. 3

Or

8. Determine the tachometer feedback constant K_b so that damping ratio will be 0·8. Calculate corresponding natural frequency, damped frequency, peak time, peak overshoot and settling time. 20

Unit—V

9. (a) Obtain the state equations for the field controlled D. C. motor shown in fig. 4. 10

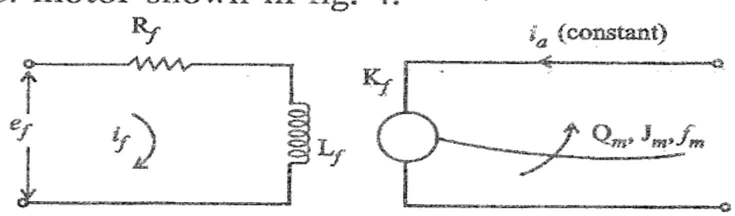

Fig. 4

(b) Verify the controllability. Give that : 10

$$\dot{x}_1 = x_2 + u_1$$
$$\dot{x}_2 = x_3$$
$$\dot{x}_3 = -2x_2 - 3x_3 + u_1 + u_2$$

Or

10. (a) Determine the transfer matrix from the data given below : 10

$$A = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 1 \end{bmatrix},$$
$$C = [1 \quad 1] \text{ and } D = 0$$

(b) Obtain the state transition matrix in the form e^{At} and determine the time response for the system, $\dot{X} = AX$ where : 10

$$A = \begin{bmatrix} 0 & 1 \\ -2 & 0 \end{bmatrix}$$

and $x_1(0) = 1$, $x_2(0) = 1$.