Exam.Code:0930
Sub. Code: 6920

2062

B.E. (Electronics and Communication Engineering)

Sixth Semester

EC-624: Control System

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of scientific calculator is allowed.*

x-x-x

I. **(a)** What is Force current analogy for the elements of mechanical translational system? **(2)**

(b) Why you need feedback controller? Justify with example. **(2)**

(c) What is polar plot. **(2)**

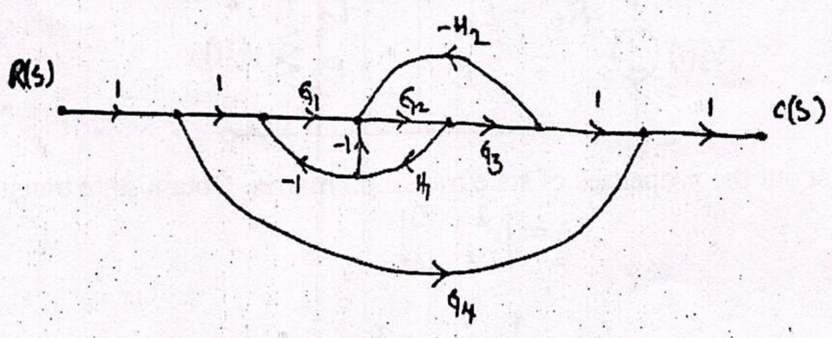
(d) Compare absolute stability, conditional stability and relative stability. **(2)**

(e) How do you determine system eigen values and what is its role in the system response. **(2)**

Part- A

II. **(a)** Compare the AC and DC servomotors. **(5)**

(b) Find overall gain for signal flow graph shown below. **(5)**



III. **(a)** Using Routh Hurwitz criterion, determine the number of roots in the right half of S-plane

$S^4 + 2S^3 + 10S^2 + 20S + 5 = 0$ **(5)**

(b) Derive an expression for time response of second order under damped system to step input. **(5)**

P.T.O.

IV (a) Sketch the root locus of the system having **(5)**

$$G(s)H(s) = \frac{K}{(S)(S+4)(S^2+4s+20)}$$

For positive values of K.

(b) For unity feedback control system, open loop transfer function is given by

$$G(S) = \frac{10\,(S+2)}{(S^2)(S+4)}$$

Find e_{ss}, when the input is $r(t) = 3 - 2t + 3t^2$ and find K_v, K_p and k_a. **(5)**

Part-B

V. Draw the bode plot of the system $G(s) = \frac{K}{(S)(1+S)(1+0.1S)}$. Determine values of 'k' such that gain margin = 10dB and phase margin= 24° **(10)**

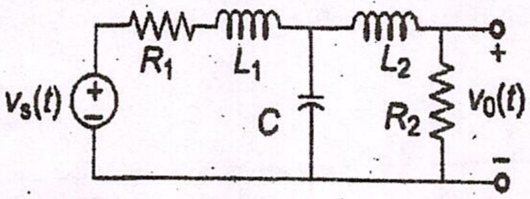
VI. (a) The open-loop transfer function of a system is given by.

$$G(s)H(s) = \frac{K}{S(1+0.1\,S)(1+0.2S)}$$

Design lag compensator to meet Kv = 100sec-4 and phase margin ≥30°. **(5)**

(b) Explain Nyquist stability criterion. **(5)**

VII.(a) Obtain state space representation of following system.



(5)

(b) List out the properties of state transition matrix. Obtain state transition Matrix of

$$A = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$$ **(5)**

x-x-x