Exam. Code: 0934
Sub. Code: 6663

2054

B.E. (Electrical and Electronics Engineering)-4th Semester

PC-EE-403: Control Engineering - I

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. Missing data (If any) can be appropriately assumed.***

-*-*-*-

Q1 Explain briefly

A) Give disadvantages of transfer function. **(2)**

B) Explain how the gain and phase margin are obtained from Nyquist plots? **(2)**

C) What are the frequency domain specifications? **(2)**

D) What is limitedly stable system? **(2)**

E) Write the expression for resonant peak and resonant frequency? **(2)**

Part A

Q2 A) Write the analogous electrical elements in force current analogy for the elements of mechanical translational system. **(5)**

B) Distinguish between Block diagram Reduction Technique and Signal Flow Graph? **(5)**

Q3 A) Find the overall transfer function of the system whose signal flow graph is shown in fig.1. **(5)**

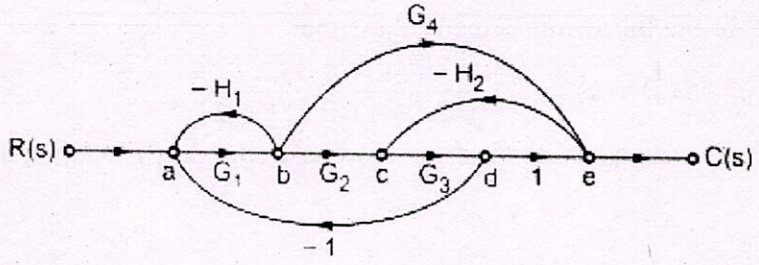

Fig.1

B) A unity feedback control system is characterized by the following open loop transfer function **(5)**

$$G(s) = \frac{4s + 1}{s(s + 6)}$$

Determine its transient response for unit step input and sketch the response. Evaluate the maximum overshoot and the corresponding peak time.

P.T.O.

Q4 A) With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equations: **(5)**

(i) $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$

(ii) $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$

B) What are the difficulties in the formulation of the Routh table? Explain how they can be overcome. **(5)**

Part B

Q5 Draw the Nyquist plot for the system whose open loop transfer function is **(10)**

$$G(s) = \frac{K(1+5s)(1+s)}{(10s+1)(s-1)}$$

Determine the range of K for which closed loop system is stable.

Q6 The open loop Transfer function of a unity feedback control system is given by **(10)**

$$G(s)H(s) = \frac{K}{((s+2)(s+4)(s^2+6s+25)}$$

Determine the value of K which will cause sustained oscillations in the closed loop system and what is the corresponding oscillation Frequency.

Q7 A) Draw the Bode plot for the following Transfer Function **(5)**

$$G(s)H(s) = \frac{20(0.1s+1)}{(s^2(0.2s+1)(0.02s+1)}$$

From the bode plot determine (i) Gain Margin (ii) Phase Margin (iii) Comment on the stability.

B) Describe the schematic arrangement and working of a pair as an error detector. **(5)**

-*-*-*-