

T.E. Sem - VI (B.S.G.S.)  
Electricity

13.12.16.

C.S.I

Q.P. Code : 584801

(3 Hours)

[ Total Marks : 80

- N.B. : (1) Question No. 1 is **compulsory**.  
(2) Attempt any **three** from the remaining questions.  
(3) **Figures** to the **right** indicate **full** marks.  
(4) Use **graph paper** and **semi log paper** wherever necessary.

1. Attempt any **four**

20

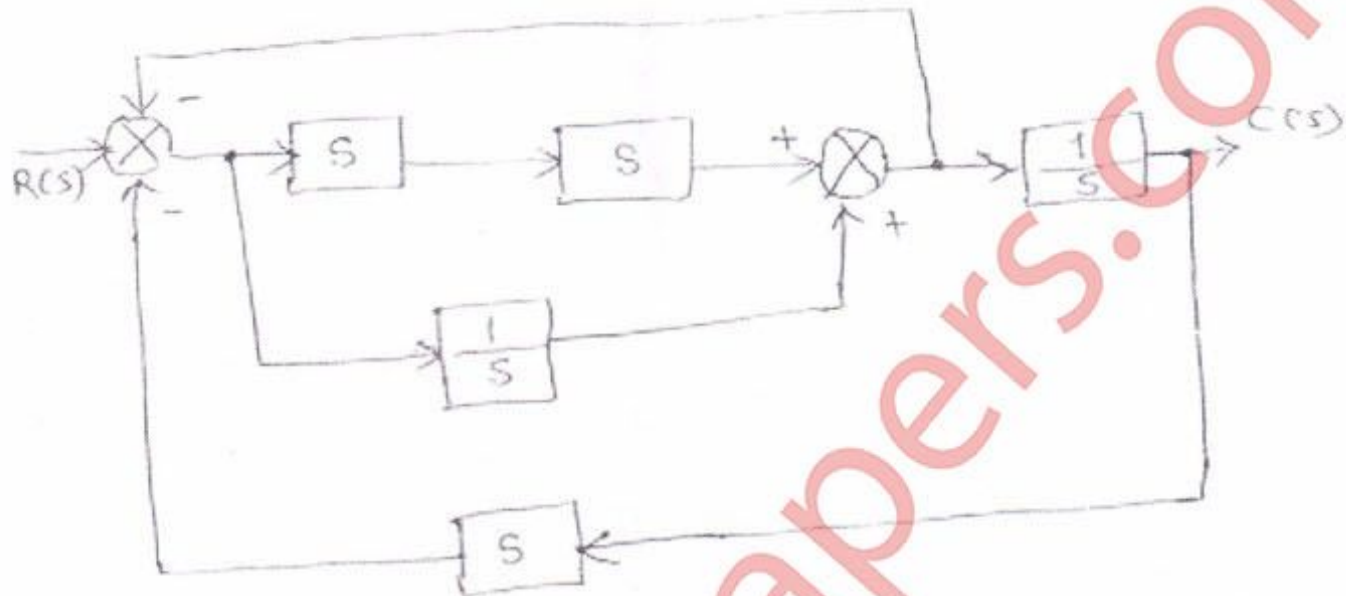
- Define 'Stability', 'Unstability' and 'Marginal Stability' with respect to pole position.
- Explain the first element zero and complete row zero condition in routh stability criteria.
- Draw the block diagram of closed loop linear time invariant system and define its components.
- Explain Nyquist criteria for stability.
- Explain the advantages of state space approach over conventional approaches.

2. (A) Reduce the block diagram to a single block  $T(S) = \frac{C(S)}{R(S)}$

10

- (B) Use Masson's gain formula to obtain the transfer function for the given system represented in the block diagram. 10

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- 3 (A) Represent the following system in state space in phase variable form and draw its state model. 10

$$\frac{C(S)}{R(S)} = \frac{10(S+2)(S+3)}{(S+1)(S+4)(S+5)}$$

- (B) Diagonalize the following system represented in state space model. 10

$$\dot{x} = \begin{bmatrix} -5 & -5 & 4 \\ 2 & 0 & -2 \\ 0 & -2 & -1 \end{bmatrix} x + \begin{bmatrix} -1 \\ 2 \\ -2 \end{bmatrix} r$$

$$y = [-1 \ 1 \ 2]x$$

4. (A) Given the unity feedback system that has the forward transfer function 10

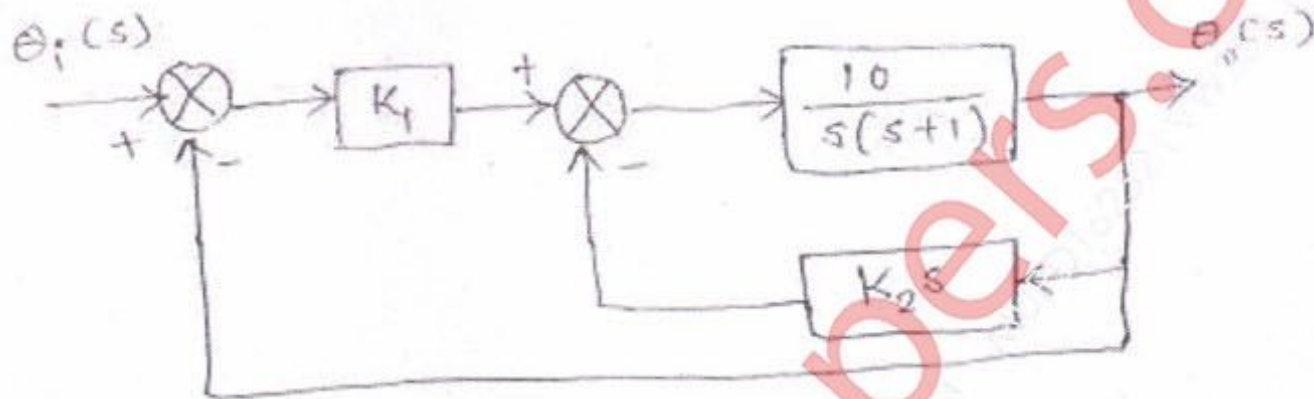
$$G(S) = \frac{K(S+2)}{(S^2 + 4S + 13)}$$

sketch the complete root locus.

- (B) Using the routh table tell how many poles of the following function are in the RHS, LHS & on the imaginary axis. 10

$$CLTF = T(S) = \frac{S+8}{S^5 - S^4 + 5S^2 + 3S - 2}$$

5. (a) The system of the figure is to have the following specifications :  $K_v = 10$  and  $\xi = 0.5$ . Find the values of  $K_1$  &  $K_2$  required for the specification of the system to be met. 10



- (b) Draw the bode log magnitude & phase angle plots for the system given by 10

$$G(S)H(S) = \frac{(S+20)}{(S+1)(S+7)(S+50)}$$

Find phase margin, gain margin, phase & gain crossover frequency. Also comment on stability.

6. (a) Write notes on any two. 20
- Time response of second order system.
  - Transfer function of DC servomotor.
  - Relation between time response and frequency response performance criteria.