Ticket Number:

Code No. : 31205 S

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (E.E.E.) III Year I-Semester Supplementary Examinations, May/June-2017

Linear Control Systems

Time: 3 hours Max. Marks: 70

*Note: Answer ALL questions in **Part-A** and any FIVE from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Differentiate between open loop and closed loop control systems with some example from daily life.
2. What are the similarities and differences between AC servomotor and 2 phase induction motor?
3. Transient response is determined only for a step input but steady state response is determined for all inputs. Explain the reason.
4. The block diagram of a unity feedback system is shown in figure1, determine the second undershoot time.

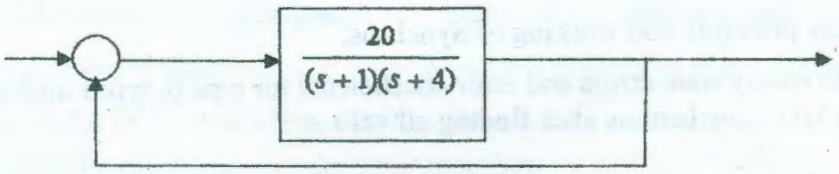


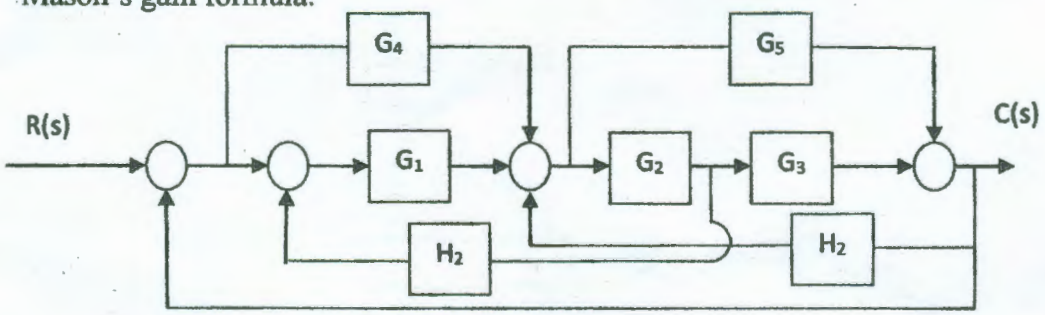
Figure 1

5. What is principle of argument?
6. Draw the polar plot for the following system:
   G(s) = 2/(s+1)(s+2)
7. Is it possible to represent a purely resistive circuit with state model? Explain the reason.
8. Define Observability.
9. Explain the relation between S-plane and Z-plane.
10. What is the difference between continuous system, discrete time system and digital system?

Part-B (5 × 10 = 50 Marks)

11. a) Derive the transfer function for armature controlled DC servo motor. [4]

    b) Determine the transfer function C(s)/R(s) of the system shown in figure below by using Mason's gain formula. [6]



12. a) Explain the two special cases of Routh-Hurwitz stability criteria. [4]

    b) Draw the root locus of the unity feedback system whose open loop Transfer function is [6]
    $G(s) = \frac{K}{s(s+4)(s^2+8s+32)}$

Contd...2

13. a) Explain the need for compensation and procedure to design a lead compensator. [5]

b) Determine the stability of the following system using Nyquist stability criteria. [5]

$$GH(s) = \frac{k(s+2)}{s^2(s+1)}$$

14. a) Define state, state variable and state space. [3]

b) Find $x_1(t), x_2(t)$ and $y(t)$ of the system described by $\begin{bmatrix}\dot{x}_1(t)\\ \dot{x}_2(t)\end{bmatrix} = \begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}1\\ 0\end{bmatrix}u$ [7]

and $y = [0 \quad 1]\begin{bmatrix}x_1\\ x_2\end{bmatrix}$ where initial conditions are $\begin{bmatrix}x_1(0)\\ x_2(0)\end{bmatrix} = \begin{bmatrix}1\\ -1\end{bmatrix}$, u is unit step input.

15. a) Write Z-domain specifications. [5]

b) Determine the stability condition of the discrete data system that is represented by following characteristic equation. [5]

$z^3 + 3.3z^2 + 3z + 0.8 = 0$

16. a) Explain the principle and working of Synchros. [5]

b) Determine steady state errors and error coefficients for type 0, type1 and type 2 systems and write your conclusions after finding all values. [5]

17. Write short notes on any ***two*** of the following:

a) Determining transfer function from Bode plot. [5]

b) Controllability and observability. [5]

c) Pulse transfer function. [5]

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