

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

B.Tech (ECE) (Sem.-5)

CONTROL SYSTEMS

Subject Code : BTEC-504-18

M.Code : 78300

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

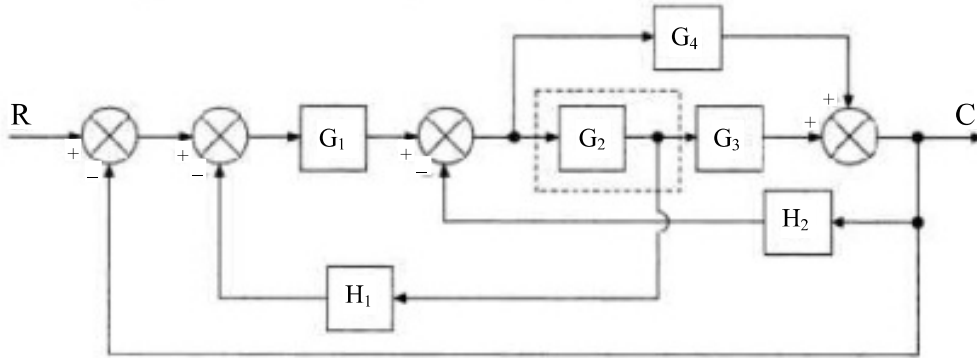
SECTION-A

Answer briefly :

- 1) Define transfer function for LTI systems.
- 2) Write the formula for Mason's gain formula.
- 3) What is the difference between steady-state and transient response?
- 4) a) What is the difference between proportional and integral control?
b) Draw the block diagram of feed forward and multi-loop control configurations.
- 5) Explain the Routh Hurwitz criterion of stability.
- 6) Draw the electrical circuits of lag and lead compensator.
- 7) What is the significance of gain margin and phase margin in the estimation of relative stability?
- 8) What is a characteristic equation? Give an example of it.
- 9) How state variables are derived for a given system?
- 10) What are eigen values and eigen vectors?

SECTION-B

- 11) Using Mason's Gain formula, obtain the transfer function of the control system for the following block diagram, where R is the input signal and C is the output signal. G's and H's are path gains.



- 12) Using the Routh's Hurwitz criterion, evaluate and comment on the stability for the control system having the following characteristics equation :

$$s^6 + s^5 - 2s^4 - 3s^3 - 7s^2 - 4s - 4 = 0$$

Also, determine the roots of the above system equation.

- 13) Using the final value theorem, derive the steady state error for unit step and unit ramp inputs.
- 14) Derive an equation for the magnitude and phase angle for a second order system in frequency domain. Also, estimate the resonant frequency and its bandwidth of system.
- 15) Derive the state transition equation in terms of state transition matrix and state variables.

SECTION-C

- 16) A unity feedback control system has an open-loop transfer function $G(s) = 5 / [s(s + 1)]$. Find the rise time, percentage overshoot, peak time, and settling time for a step input of 10 units. Also, determine the peak overshoot.
- 17) Obtain a state model of the system described by the transfer function. $Y(s)/U(s) = 5 / [s^3 + 6s + 7]$
- 18) Compare the P, I and D controllers in terms of time domain specifications. Hence, draw the overall response curve for PI and PID controller.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.