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Question Paper Code : 52445

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fourth Semester

Electronics and Communication Engineering

EC 2255 – CONTROL SYSTEMS

(Regulations 2008)

[Common to PTEC 2255 – Control Systems for BE (Part-Time)

Fourth Semester – ECE – Regulations 2009]

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

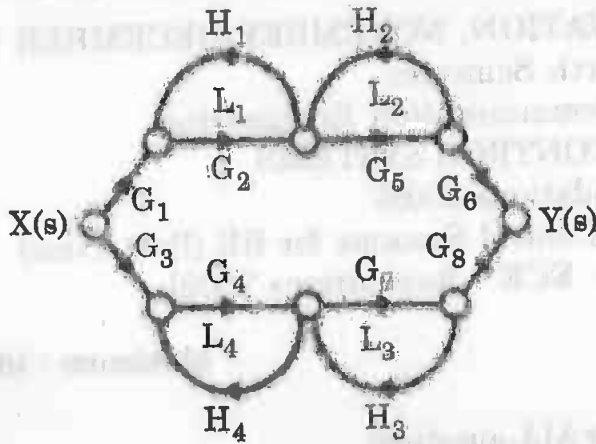
1. Define transfer function.
2. List the advantages and disadvantages of feedback systems.
3. Define order of a system.
4. What are the standard test signals employed for time domain studies ?
5. Define phase margin.
6. Write short notes on the correlation between the time and frequency response.
7. State Routh's criterion for stability.
8. The addition of a pole will make a system more stable. Justify your answer.
9. What is quantization ?
10. What is controllability ?



PART - B

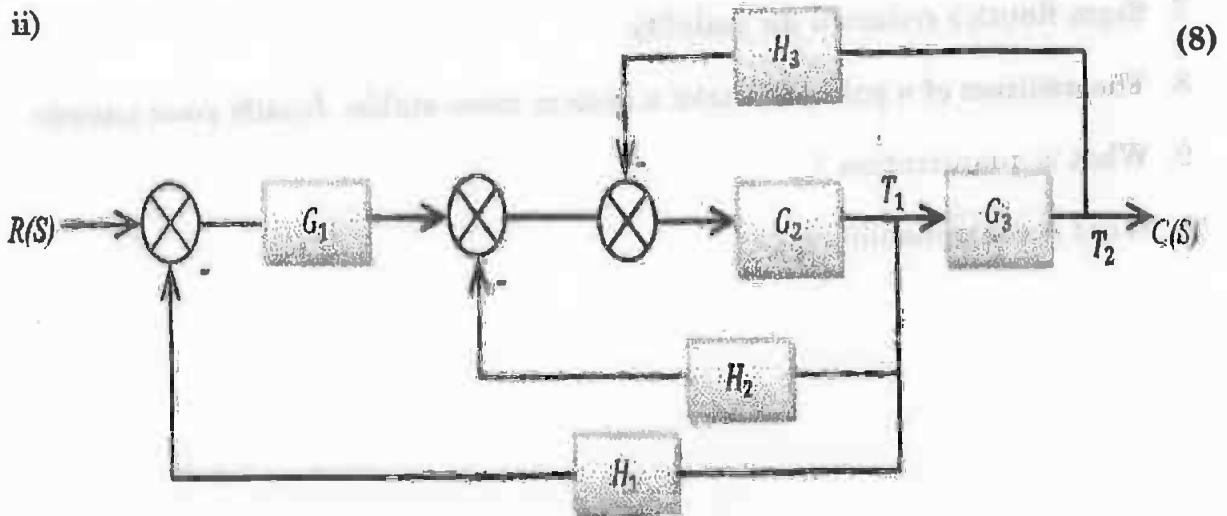
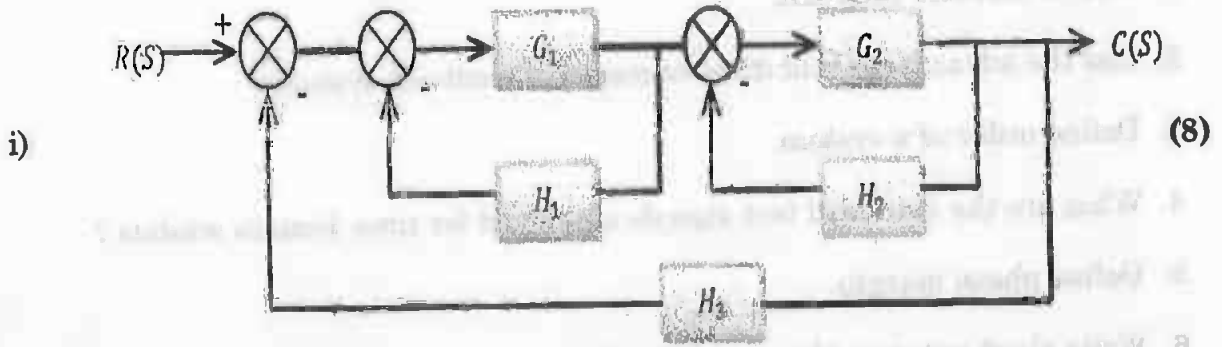
(5×16=80 Marks)

11. a) Find the Transfer Function $Y(s)/X(s)$ using signal flow graph. (16)



(OR)

b) Reduce the Block Diagram shown below :





12. a) Obtain the step response of a second order system and its time domain specifications for an under damped case.

(OR)

- b) Write notes on PI and PID controllers with neat sketches.

13. a) Draw the Bode diagram for the transfer function :

$$H(s) = -100 \frac{s}{s^3 + 12s^2 + 21s + 10}$$

(OR)

- b) Explain the step by step procedure to design a lead compensator.

14. a) Sketch the root locus for the system defined by the transfer function $G(s) = K/[s(s + 4)(s + 2)]$.

(OR)

- b) Plot the Nyquist diagram of the system $G(s) = 1/s(s + 2)^2$ and determine the gain margin.

15. a) Check for the observability and controllability of the given system.

$$A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, C = [0 \quad 1]$$

(OR)

- b) Obtain the general expression to obtain the transfer function from state equation and hence obtain the transfer function for the system

$$A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, C = [0 \quad 1].$$

15. (10 points) The transfer function of a system is given by

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

(a) Write the state equations for this system.

(b) Find the state transition matrix for this system.

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

$$(10)$$

(c) Design a state feedback controller to place the poles at $s = -1 \pm j$.

(d) Find the root locus for the system defined by the transfer function

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

$$(10)$$

(e) Find the system response of the system $G(s) = \frac{1}{s^2 + 2s + 1}$ to a unit step input.

(f) Check for BIBO stability and controllability of the given system.

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

$$(10)$$

(g) Design a state feedback controller for the system $G(s) = \frac{1}{s^2 + 2s + 1}$ such that the closed-loop poles are at $s = -1 \pm j$.

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