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Question Paper Code: 59404

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Elective

Electronics and Communication Engineering

15UEC904–LINEAR CONTROL ENGINEERING

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Which among the following represents an illustration of closed loop system? CO1- R
(a) Automatic washing machine (b) Automatic electric iron
(c) Bread toaster (d) Electric hand drier
- A closed loop system is distinguished from open loop system by which of the following? CO1- R
(a) Servomechanism (b) Feedback (c) Output pattern (d) Input pattern
- By which of the following the system response can be tested better? CO2- R
(a) Ramp input signal (b) Sinusoidal input signal
(c) Unit impulse input signal (d) Exponentially decaying signal
- Which controller has the potential to eliminate/overcome the drawback of offset in proportional controllers? CO2- R
(a) P-I (b) P-D (c) Both a and b (d) None of the above
- Which unit is adopted for magnitude measurement in Bode plots? CO3- R
(a) Degree (b) Decimal (c) Decibel (d) Deviation
- The magnitude & phase relationship between _____ input and the steady state output is called as frequency domain. CO3- R
(a) Step (b) Ramp (c) Sinusoidal (d) Parabolic

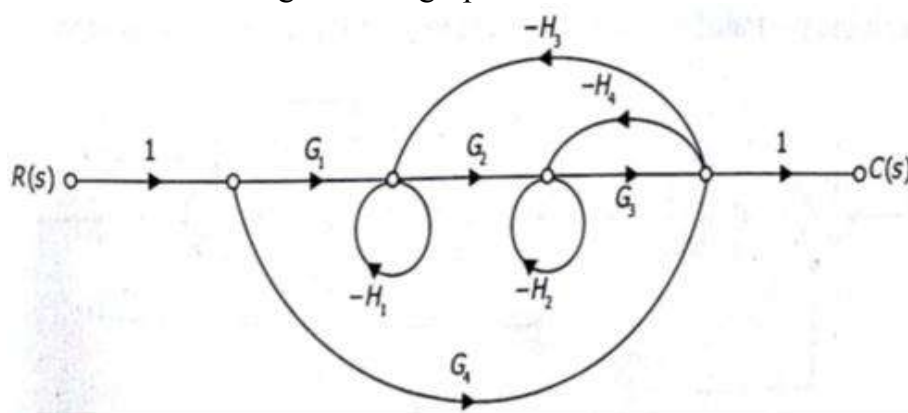
7. Root locus specifies the movement of closed loop poles especially when the gain of system _____ CO4- R
- (a) Remains constant (b) Exhibit variations
 (c) Gives zero feedback (d) Gives infinite poles
8. In Routh array, if zero is found in the first column, then by which term it needs to be replaced? CO4- R
- (a) δ (b) η (c) σ (d) ε
9. Which among the following plays a crucial role in determining the state of dynamic system? CO5- R
- (a) State variables (b) State vector (c) State space (d) State scalar
10. State space analysis is applicable even if the initial conditions are _____ CO5- R
- (a) Zero (b) Non-zero (c) Equal (d) Not equal

PART – B (5 x 2= 10 Marks)

11. State Mason's gain formula. CO1- R
12. What will be the response of a first order system with unit step input? CO2- R
13. What are the characteristics of phase lead network? CO3- R
14. What is dominant pole? CO4- R
15. Define the state and state variable of a model. CO5- R

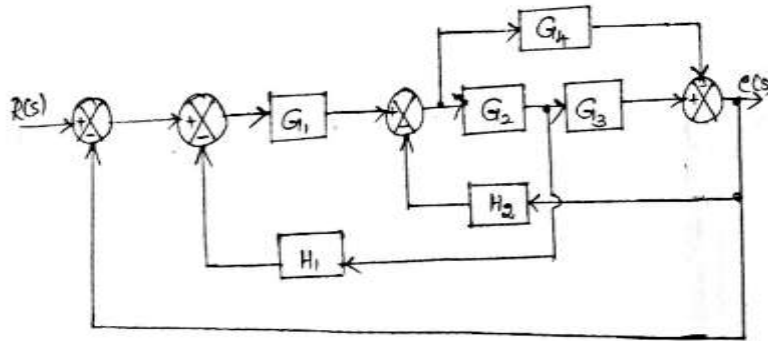
PART – C (5 x 16= 80 Marks)

16. (a) Solve C/R for the signal flow graph shown below CO1 App (16)



Or

- (b) How could you determine the Transfer Function of the system Shown in the figure below? CO1 App (16)



17. (a) Draw the block diagram of second order system. Classify it. CO2- App (16)
Derive the time response of any one of the damped systems for unit step input.

Or

- (b) The open loop transfer function of a unity feedback system is given by $G(S) = 20/S(S+2)$. The input function is $r(t) = 2 + 3t + t^2$. Examine the generalized error coefficient and steady state error. CO2- App (16)
18. (a) Given $G(S) = ke^{-0.2S}/S(S+2)(S+8)$ CO3- App (16)
Draw the Bode plot and find K for the following two cases when
(i) Gain margin equal to 6db
(ii) Phase margin equal to 45° .

Or

- (b) The open loop transfer function of a unity feedback system is given by $G(S) = 1 / S^2 (1+S) (1+2S)$. Sketch the polar plot and determine the gain and phase margin. CO3- App (16)
19. (a) Define Stability. With an example, explain the steps to be followed for Routh-Hurwitz criterion. CO4- App (16)

Or

- (b) The open loop transfer function of a unity feedback system is given by $G(S) = (S+9)/S(S^2+4S+11)$. Sketch the root locus of the system and evaluate the system stability with respect to their location of poles. CO4- App (16)

20. (a) A system is represented by State equation

CO5- App (16)

$\dot{X} = Ax + Bu$ and output equation

$Y = Cx + Du$ Where

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}; \quad B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}; \quad C = [10 \quad 5 \quad 1]$$

Verify the controllability and observability of the control system.

Or

(b) Determine the state variable representation of the system whose CO5- App (16)
transfer function is given as

$$Y(S) / U(S) = 2S^2 + 8S + 7 / (S+1)(S+2)^2.$$