A

Reg. No. :

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which among the following represents an illustration of closed loop   CO1- R
   system?

   (a) Automatic washing machine   (b) Automatic electric iron
   (c) Bread toaster   (d) Electric hand drier

2. A closed loop system is distinguished from open loop system by which   CO1- R
   of the following?

   (a) Servomechanism   (b) Feedback   (c) Output pattern   (d) Input pattern

3. 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

4. Which controller has the potential to eliminate/overcome the drawback   CO2- R
   of offset in proportional controllers?

   (a) P-I   (b) P-D   (c) Both a and b   (d) None of the above

5. Which unit is adopted for magnitude measurement in Bode plots?   CO3- R

   (a) Degree   (b) Decimal   (c) Decibel   (d) Deviation

6. The magnitude & phase relationship between _____input and the   CO3- R
   steady state output is called as frequency domain.
   (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

<center>PART – B (5 x 2= 10 Marks)</center>

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

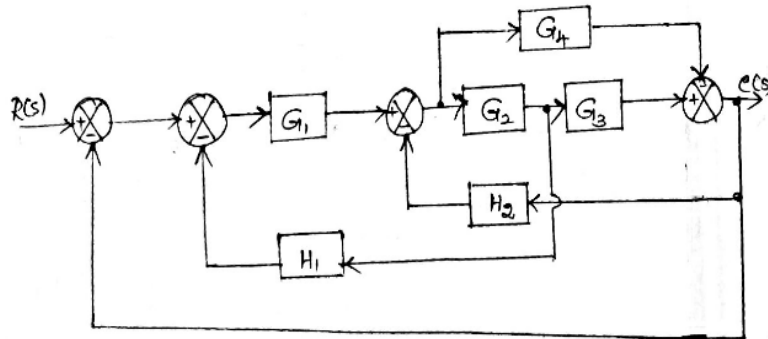15. Define the state and state variable of a model.   CO5- R

<center>PART – C (5 x 16= 80 Marks)</center>

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

<center>Or</center>

<center>**59404**</center>
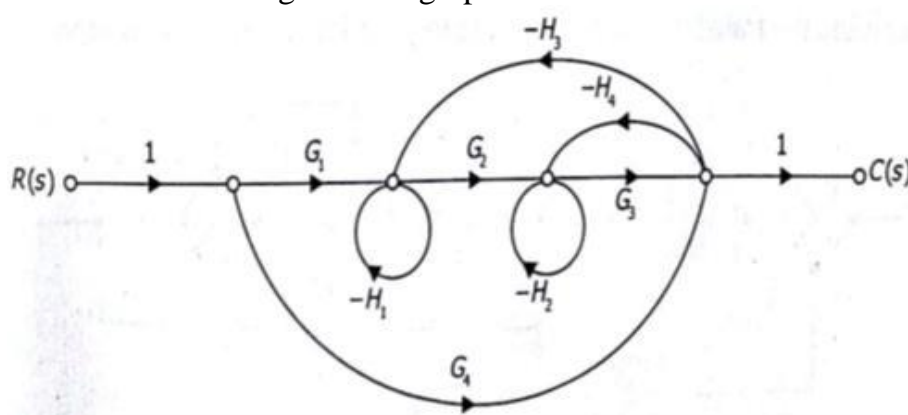
(b) How could you determine the Transfer Function of the system Shown in the figure below?　　　CO1 App　(16)

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

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 $(S) = (S+9)/S(S^2+4S+11)$. Sketch the root locus of the system and the evaluate the system stability with respect to their location of poles.　　　CO4- App　(16)

59404

20. (a) A system is represented by State equation   CO5- App   (16)

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

Y=Cx + Du   Where

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

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

4

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