Regulation R17 *Subject code:* 1P4DC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech II Year II Semester Supplementary Examinations, July 2021
CONTROL SYSTEMS

(ECE)

Maximum Marks: 70 Date:20.07.2021 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks **(10x2M=20 Marks)**

1 Define transfer function.

2 State and explain Mason's gain formula.

3 Define 'type' and 'order' of the system.

4 What are the effects of integral control action?

5 What are the limitations of Routh's stability?

6 What is the effect of adding zeros to G(s) H(s) on the root loci?

7 Draw the pole-zero plot of Lag compensator.

8 Draw the polar plot of $G(s)=\frac{1}{1+ST}$.

9 What is meant by state in control system?

10 Define state transition matrix.

Part-B

Answer All the following questions. **(10M X 5=50Marks)**

11 Find the overall gain for the signal flow graph shown in figure. (10M)

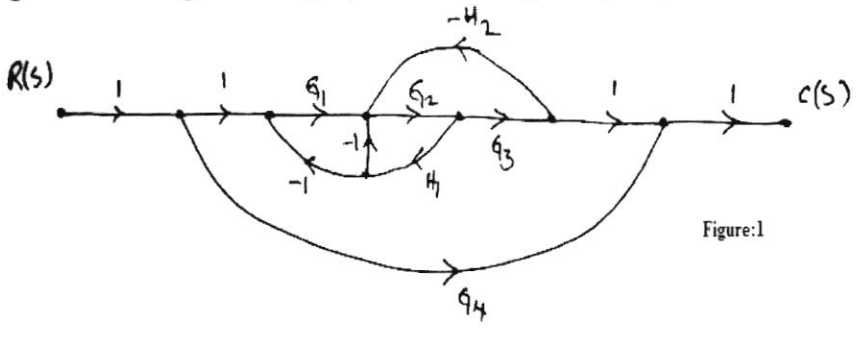

Figure:1

OR

12 A. Explain any one application of feedback control systems. (5M)

B. What are differences between block diagram reduction and signal flow graph Reduction? (5M)]

13 For unity feedback control system the open loop transfer function $G(s) = \frac{10(S+2)}{S^2(S+4)}$. Find the e_{ss} when th input is $r(t)=3+2t+3t^2$. And find K_p, K_v, and K_a. (10M)

OR

14 A.Sketch the time response of the first order system when excited with unit step input. (5M)

B. A unity feedback system is characterized by an open-loop transfer function $G(s)=\frac{K}{S(S+5)}$. Determine the gain 'K' so that the system will have a damping ratio of 0.5. For this value of 'K' determine settling time, peak overshoot and time to peak overshoot for a unit-step input. (5M)

15 Sketch the root locus plot of $G(S)\ H(S) = \frac{K}{S(S+4)(S+11)}$. Also find range of 'K' for system to be stable. (10M)

OR

16 Draw the Bode magnitude and phase angle plots for the transfer function $G(S) = \frac{2000(S+1)}{S(S+10)(S+40)}$ (10M)

17 Sketch the polar plot of the transfer function $G(s)=\frac{\mathbf{10}}{\mathbf{s(s+1)}}$ (10M)

OR

18 A. State and explain Nyquist stability criterion. (5M)

B. Draw the electrical circuit diagram that represents the Lead-Lag compensator and explain in detail. (5M)

19 Given $X(t) = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}+\begin{bmatrix} 0 \\ 1 \end{bmatrix}u(t)$. Find the unit step response when, $X(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$. (10M)

OR

20 A. What is observability? Explain the tests for observability. (5M)

B. Check whether the system represented by

$X(t) = \begin{bmatrix} 0 & 5 \\ -1 & -2 \end{bmatrix}\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}+\begin{bmatrix} 1 \\ 1 \end{bmatrix}u(t)$ and $y=[1 \quad 1]\begin{bmatrix} x_1(t) \\ x_2(t) \end{bmatrix}$ is observable or not. (5M)