*Regulation* **R18** *Subject code:* **2P4BD**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

# B.Tech IV Semester Supplementary Examinations, July 2022

# CONTROL SYSTEMS

*(EEE)*

***Maximum Marks: 70*** Date:28.07.2022 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)

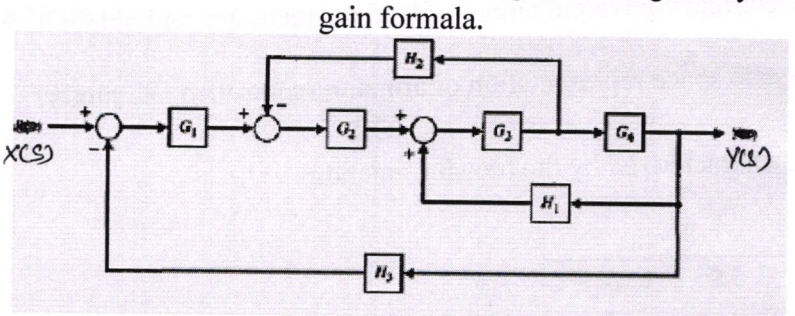
1 Which type of feedback is preferred in control system and why?
2 What is a take off point or branch point
3 What does the 'type' of a system indicate?
4 What are the time domain specifications
5 Define resonant peak and resonant frequency
6 What is the necessary condition for stability?
7 Draw the pole zero location of lag compensator
8 What is the effect of polar plot if a non-zero pole is added to the transfer function?
9 Define state variable
10 What are the advantages of state variable model of dynamic system?

Part-B

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

11 a) What are the important rules of the block diagram reduction techniques 5

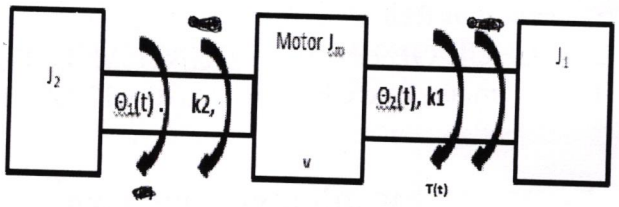
b) Obtain the transfer function $\frac{Y(s)}{X(S)}$ for the following block diagram by using Mason's gain formala. 5




OR

12 a) Give Force-Voltage analogy of mechanical translational system. 5

b) Derive the transfer function of the mechanical system shown below $T(s)/\Theta_1(s)$ 5




13 Derive the time response for standard 2nd order underdamped system along with its transient response specifications 10

OR

14 Find i) delay time, ii) Rise time, iii) Peak time, iv) % Peak overshoot and v) settling time for the system transfer function $\frac{36}{(s^2+6s+36)}$ 10

15 a) What is Routh-Hurwitz criterion? Explain its predicting conditions 5

b) The open loop transfer function of a unity feedback system is given by $G(s) = K/(s(S^2+S+1)(S+2))$. 5

Examine the range of k for stability of the closed loop system using RH-Criteria.

OR

16 A unity feedback system with open loop transfer function. 10

$$G(S) = \frac{K}{S(S+3)(S+5)}$$

Determine the range of 'K' for which system to be stable using Root locus techniques.

17 Draw the polar plot for the below open loop transfer functions 10

$$1).G(S)H(S) = \frac{K}{(1+ST_1)(1+ST_2)}; 2)\ G(S)H(S) = \frac{K}{S(1+ST_1)(1+ST_2)}$$

$$3)\ G(S)H(S) = \frac{K}{S^2(1+ST_1)(1+ST_2)}; 4)G(S)H(S) = \frac{K}{S^3(1+ST_1)(1+ST_2)}$$

OR

18 Draw the electrical equivalent circuit of lead compensator and obtain its transfer function 10

19 Obtain the state space representation of armature-controlled DC motor. 10

OR

20 A system is characterized by the transfer function 10

$$\frac{Y(S)}{U(S)} = \frac{3}{S^3+5S^2+11S+6}$$

Identify the first state as the output. Determine the system is completely controllable and observable or not?