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## GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, June – 2021

(Sixth Semester)

**BEIPC6030 / BEPC6030 – CONTROL SYSTEMS**

(Common to AEI and ECE)

Time: 2 hrs

Maximum: 50 Marks

**Answer ALL Questions****The figures in the right hand margin indicate marks.****PART – A: (Multiple Choice Questions)****(1 x 10 = 10 Marks)****Q.1. Answer ALL questions**

[CO#] [PO#]

- |  |   |   |
|--|---|---|
| a. In an open loop control system ,<br>(i)output is independent of control input<br>(ii)Output is dependent of control input<br>(iii)Only system parameter have effect on the control output<br>(iv)None of the above  | 1 | 1 |
| b. The transfer function is applicable to<br>(i)Linear time variant system<br>(ii) Linear time invariant system<br>(iii)Non linear system<br>(iv) None of the above  | 1 | 1 |
| c. The type zero system has _____ pole at the origin<br>(i)one<br>(ii)two<br>(iii)Three<br>(iv)No pole   | 1 | 1 |
| d. The magnitude condition for root locus is<br>(i) $ G(s) H(s)  = 0$<br>(ii) $ G(s) H(s)  = 1$<br>(iii) $ G(s) H(s)  = 2$<br>(iv) $G(s) H(s) = \text{infinity}$   | 2 | 1 |
| e. Which of the following statements are correct?<br>1. Bode plot is in the frequency domain.<br>2. Root locus is in the time domain.<br>3. Nyquist criteria are in the frequency domain.<br>4. Routh Hurwitz's criteria are in the time domain.<br>(i) 1 and 2<br>(ii) 1 and 3<br>(iii) 1, 3, and 4<br>(iv) 2 and 3 | 2 | 1 |
| f. For the minimum phase system to be stable<br>(i) phase margin should be positive and gain margin negative<br>(ii) Phase margin should be negative and gain margin positive<br>(iii) both gain margin and phase margin should be positive<br>(iv) both gain margin and phase margin should be negative             | 3 | 1 |
| g. Which of the following can be measured by the use of tacho-generator?<br>(i) Acceleration<br>(ii) Speed<br>(iii) Displacement<br>(iv) None of the above   | 3 | 1 |
| h. AC servo motor resembles<br>(i) two phase induction motor<br>(ii) Three phase induction motor<br>(iii) direct current series motor<br>(iv) universal motor  | 4 | 1 |

- |    |  |                        |   |
|----|--|------------------------|---|
| i. | The controller required to handle fast process load changes is:  | 4                      | 1 |
|    | (i) PI controller  | (ii) PD controller     |   |
|    | (iii) PID Controller   | (iv) None of the above |   |
| j. | Which of the following device is commonly used as error detector | 4                      | 1 |
|    | (i) Vernistats   | (ii) Microsyns         |   |
|    | (iii) Resolvers  | (iv) None of the above |   |

**PART – B: (Short Answer Questions)**

**(2 x 5 = 10 Marks)**

Q.2. Answer ALL questions

[CO#] [PO#]

- |    |  |   |   |
|----|--|---|---|
| a. | Define closed loop system                                  | 1 | 1 |
| b. | List the time domain specifications.                       | 1 | 1 |
| c. | State the necessary and sufficient condition for stability | 2 | 1 |
| d. | What are the different types of stepper motor              | 3 | 1 |
| e. | What are the applications of synchros                      | 4 | 1 |

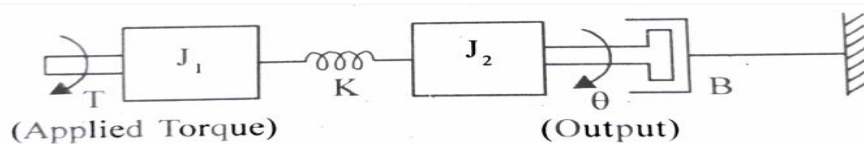
**PART – C: (Long Answer Questions)**

**(6 x 5 = 30 Marks)**

Answer ANY FIVE questions

Marks [CO#] [PO#]

- |    |  |     |   |   |
|----|--|-----|---|---|
| 3. | Find the transfer function for the mechanical system shown below | (6) | 1 | 2 |
|----|--|-----|---|---|



- |    |   |     |   |   |
|----|---|-----|---|---|
| 4. | Explain briefly about feedback characteristics of control systems   | (6) | 1 | 1 |
| 5. | Construct Routh array and determine the stability of the system represented by the characteristic equations and comment on the location of roots. | (6) | 2 | 2 |

i)  $s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$

ii)  $s^7 + 5s^6 + 9s^5 + 9s^4 + 4s^3 + 20s^2 + 36s + 36 = 0$

- |    |  |     |   |   |
|----|--|-----|---|---|
| 6. | Sketch the root locus of the system whose open loop transfer function is $G(s) = \frac{K}{s(s+2)(s+4)}$ . Find the value of K so that the damping ratio is 0.5 | (6) | 2 | 2 |
| 7. | Sketch the polar plot for the open loop transfer function  | (6) | 3 | 2 |

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

Determine the gain margin and phase margin

- |    |   |     |   |   |
|----|---|-----|---|---|
| 8. | Plot the Bode plot for the following transfer function and obtain the gain and phase crossover frequencies. | (6) | 3 | 2 |
|----|---|-----|---|---|

$$G(s) = \frac{10}{s(1+0.4s)(1+0.1s)}$$

- |     |   |     |   |   |
|-----|---|-----|---|---|
| 9.  | What is stepper motor? Explain any one type of stepper motor.                       | (6) | 4 | 1 |
| 10. | Explain the effect of adding PI, PD and PID controllers in feedback control systems | (6) | 4 | 1 |

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