**Code No.PC406EC**

**METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY**

**(An Autonomous Institution)**

**B.E. (ECE) IV-Semester (Supplementary) Examination, FEB-2024**

**Subject: AUTOMATIC CONTROL SYSTEMS**

**Time: 3 hours Max.Marks:60**

**Note: Missing data, if any, maybe suitably assumed.**

**PART-A**

**Answer All the questions.(10X2M=20M)**

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| --- | --- | --- | --- | --- |
| **Q.No.** | **Questions** | **Marks** | **CO** | **BTL** |
| **1. a** | What are the advantages of open loop system? | **2M** | **1** | **1** |
| **b** | Write the analogous electrical and mechanical quantities based on force-voltage analogy. | **2M** | **1** | **2** |
| **c** | State the limitations of RH criterion of stability. | **2M** | **2** | **2** |
| **d** | Examine the stability of the system whose Characteristic Equation is  s4+4s3+s2+8s+1=0. | **2M** | **2** | **4** |
| **e** | Define Gain Margin and Phase Margin. | **2M** | **3** | **1** |
| **f** | What is the effect of PID Controllers? | **2M** | **3** | **2** |
| **g** | State the advantages of state variable analysis. | **2M** | **4** | **2** |
| **h** | Define Observability of a system. | **2M** | **4** | **1** |
| **i**  **j** | Draw the block diagram of Digital Control System.  List the merits and demerits of digital control systems over analog systems. | **2M**  **2M** | **5**  **5** | **3**  **3** |

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**PART-B**

**Answer Any Five questions**.**(5X8M=40M)**

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| **Q.No.** |  | **Questions** | **Marks** | **CO** | **BTL** |
| **2.** | **a** | Obtain the Transfer Function of the following using Mason’s Gain Formula: | **5M** | **1** | **4** |
| **b** | Determine the overall Transfer Function of the block diagram given below: | **3M** | **1** | **4** |
| **3.** | **a** | Sketch the root locus of a unity feedback control system whose loop transfer function is G(s).H(s) = k/[s(s+5)(s+10)]. | **6M** | **2** | **4** |
| **b** | Define break in and breakaway point with respect to root locus. | **2M** | **2** | **1** |
| **4.** | **a** | Draw a Bode plot and obtain Gain and Phase Margins for G(s) = | **6M** | **3** | **4** |
| **b** | List the various types of compensators. | **2M** | **3** | **1** |
| **5.** | **a** | A Linear Time-Invariant system is given by the homogeneous state equation:  = . Find its State Transition Matrix. | **4M** | **4** | **4** |
| **b** | State the properties of State Transition Matrix. | **4M** | **4** | **1** |
| **6.** | **a** | For the sampled data control system shown below, find the response to unit step input when G(s) = 1/ (s+1). | **5M** | **5** | **4** |
| **b** | Explain the architecture of Digital Control System. | **3M** | **5** | **3** |
| **7.** | **a** | Write the differential equations governing mechanical systems. | **4M** | **1** | **2** |
| **b** | The Transfer Function of forward path and feedback element is G(s) = and H(s) =  Then determine the type and order of the system. | **4M** | **2** | **4** |
| **8.** | **a** | Write short notes on Nyquist Plots. | **3M** | **3** | **4** |
| **b** | Obtain state variable model for a closed loop Transfer Function given by Y(s) / U(s) = | **5M** | **4** | **3** |
| **9.** | **a** | Obtain the expression for C(z) in terms of R(z) of a basic closed loop discrete control system. | **5M** | **5** | **4** |
| **b** | Define time-domain specifications. | **3M** | **2** | **1** |

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