Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Winter Semester: 2021 - 22
Course Code: MEC 3063
Course Name: Control Engineering
Program & Sem: B.Tech and IV Sem

Date: 26th April 2022
Time: 03.00 PM to 04.00 PM
Max Marks: 30
Weightage: 15 %

Instructions:
(i) Read the all questions carefully and answer accordingly.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries 2 marks. (5Qx 2M= 10M)

1 Write 2 Applications of Open loop Control system (CO1, Knowledge Level)

2 Write the mathematical expression for Proportional-Integral Control System. (CO1, Knowledge Level)

3 Write the Laplace equation for Torque due to inertia for rotational mechanical System. (CO2, Knowledge Level)

4 Write the Equivalent Mechanical System using Node Basis for given system below (Fig 1)

(CO2, Knowledge Level)

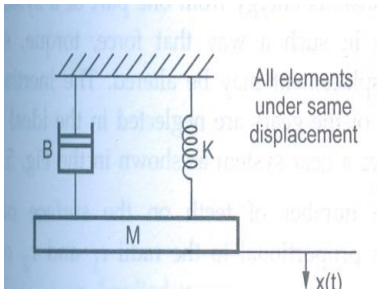

Fig. 1

5 A good control system has all the following features except
a) good stability b) slow response c) good accuracy d) sufficient power handling capacity
(CO1, Knowledge Level)

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries 5 marks. (2Qx5M=10M)

6 What are the properties any control system should satisfy to be called as Non-Linear system? (CO1, Comprehension Level)

7 What are the steps involved in converting Mechanical System into Equivalent Mechanical System Node Basis? (CO2, Comprehension Level)

Part C [Problem Solving Questions]

Answer the Question. The question carries 10 marks. (1Qx10M=10M)

8 Write about Proportional-Integral-Derivative (PID) controller along with graphs for error and controller output. (CO1, Application Level)

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SCHOOL OF ENGINEERING

TEST 2

Winter Semester: 2021 - 22
Course Code: MEC 3063
Course Name: Control Engineering
Program & Sem: B.Tech and IV Sem

Date: 1st June 2022
Time: 03:00 PM to 04:00 PM
Max Marks: 30
Weightage: 15 %

Instructions:

(i) Read the all questions carefully and answer accordingly.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries TWO marks. (5Qx 2M= 10M)

Q.NO. 1 In force-current analogy, write the analogous elements for Force and Spring. [2M] (CO2, Knowledge Level)

Q.NO. 2 Write any 3 advantages of block diagram. [2M] (CO3, Knowledge Level)

Q.NO. 3 Write the simple canonical form of closed loop system by using block diagram**.** [2M] (CO3, Knowledge Level)

Q.NO. 4 What is Self Loop in Signal Flow Graph**.** [2M] (CO3, Knowledge Level)

Q.NO. 5 The servomotors are basically classified depending upon the nature of the electric supply to be used for its operation. Write the classification of servomotors. [2M] (CO2, Knowledge Level)

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries FIVE marks. (2Qx5M=10M)

Q.NO. 6 A servomotor rarely operates at high speeds. Hence for a given value of control voltage, T α N characteristics are perfectly linear. Write the differences between AC Servomotor and DC Servomotor. [5M] (CO2, Comprehension Level)

Q.NO. 7 Signal flow graph and Block diagrams play major role in the analysis of control systems. Write the block diagrams reduction rules for Blocks connected in Series and Parallel. [5M] (CO3, Comprehension Level)

Part C [Problem Solving Questions]

Answer the Question. The question carries TEN marks. (1Qx10M=10M)

Q.NO. 8 Draw the signal flow graph for the given equations below and also write the forward paths in that particular Signal Flow Diagram. Write the product gain for the forward path.

$V_1 = 2V_i + 3V_2$, $V_2 = 4V_1 + 5V_3 + 2V_2$, $V_3 = 5V_2 + V_0$, $V_0 = 6V_3$

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SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021-22
Course Code: MEC 3063
Course Name: Control Engineering
Program & Sem: B. Tech& IV Sem

Date: 30th June 2022
Time: 9.30AM to 12.30PM
Max Marks: 100
Weightage: 50%

Instructions:

(ii) Read the all questions carefully and answer accordingly.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries FIVE marks. (5Qx5M=25M)

1. Write the analogous elements for Friction Constant, Spring Constant, Displacement, Mass and Velocity using Force-Current Analogy. [5M] (CO3, Knowledge Level)
2. What are the properties for any control system should satisfy to be called as Linear system? [5M] (CO1, Knowledge Level)
3. Explain about the magnitude condition used in root locus. [5M] (CO4, Knowledge Level)
4. Signal flow graph is a graphical representation of algebraic equations. Define the following terms w.r.t. to a signal flow graph. i) Dummy node ii) Self Loop iii) Feedback loop [5M] (CO3, Knowledge Level)
5. What are properties of Signal Flow Graph. [5M] (CO2, Knowledge Level)

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks. (3Qx10M=30M)

6. Signal flow graph and Block diagrams play major role in the analysis of control systems. Write the block diagrams reduction rules for i) Blocks connected in Series and Parallel ii) Shifting a summing point behind the block. [10M] (CO3, Comprehension Level)
7. Consider a type 1 system with open loop transfer function $G(s)H(s)=\frac{1}{s(1+Ts)}$ where T is a constant. Obtain it's polar plot when is varied from 0 to ∞. [10M] (CO4, Comprehension Level)
8. In electrical and mechanical systems there exists a fixed analogy and a similarity between their equilibrium equations. Write the steps to solve problems on Analogous Systems. [10M] (CO3, Comprehension Level)

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries FIFTEEN marks. (3Qx15M=45M)

9. Proportional plus integral (PI) controller. An improved type of proportional controller that provides integral action. PI controllers provide the low sensitivity necessary to produce stable control as well as the small drift characteristic of a high sensitivity instrument. Elucidate about such a controller, also write the graph for Error and output of controller, and write 6 characteristics for such a controller. [15M] (CO1, Application Level)

10. The angle condition and magnitude conditions are used for checking as given lies on the root locus of the given transfer function. Consider the system with $G(s)H(s)=\frac{K}{s(s+2)(s+4)}$. Find whether s = -0.75 and s = -1+4j lies on the root locus or not using angle condition. [15M] (CO4, Application Level)

11. A feedback loop is a common and powerful tool when designing a control system. Feedback loops take the system output into consideration, which enables the system to adjust its performance to meet a desired output response. Reduce the given block diagram to it's Canonical form and hence obtain the equivalent transfer function C(s)/R(s). [15M] (CO3, Application Level)