Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM EXAMINATION AUGUST-2024

Odd Semester:
Course Code: MEC 3006
Course Name: Mechatronics
Program & Sem: B. Tech

Date: 14.08.2024
Time: 9.30AM -12.30PM
Max Marks: 100
Weightage: 50%

Instructions:

(i) Read the all questions carefully and answer accordingly.
(ii) Draw the Diagrams where ever it is necessary.

Part A [Memory Recall Questions]

Answer any Five Questions. Each question carries 2 marks. (5Qx 2M= 10M)

1. Define Signal conditioning and list out the functions of signal conditioner. (C.O.No.2) [Knowledge]
2. What is Mechatronics? Explain with suitable example. (C.O.No.2) [Knowledge]
3. What are Directional Control Valves? (C.O.No.3) [Knowledge]
4. What are the types of pumps used as energy source in a hydraulic system? (C.O.No.3) [Knowledge]
5. What is system? (C.O.No.3) [Knowledge]
6. What are sensors? what are the functions of sensors? (C.O.No.4) [Knowledge]
7. What is control system and what are the classification of control system. (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all Five Questions. Each question carries 10 marks. (5Qx10M=50M)

8. Directional control valves are integral part of mechatronic systems. Although, they are used to direct the flow of compressed air (or fluid), they are not used in conventional hydraulic systems (basic type systems). Why do you think that they suitable only for mechatronic based systems? Describe any 1 type of DCV of your choice in brief. (C.O.No.3) [Application]

9. Consider 2 actuation systems, Type A and Type B. Type A requires to deliver high torque with low velocity of operation, while the Type B must deliver high velocity of operation with low torque. Among the 2 types. Which one is more suitable with a hydraulic actuation system? Can a

pneumatic actuation system be used instead? Elaborate your opinion.

(C.O.No.3) [Application]

10. With the help of sensors and suitable transducers a change in almost all physical phenomenon can be converted into electrical signals, which can then be fed to a control based system. It is understood that these signals are processed before feeding them to microcontrollers. Why do you think that signal processing or conditioning is necessary, when the microcontrollers are provisioned with substantial information to interpret them? Illustrate your opinion with any one suitable example.

(C.O.No.2) [Comprehension]

11. Consider the installation of an automatic door at a retail outlet. The door should be designed to sense the presence or arrival of customers in the door vicinity, and actuate a mechanism to open the door automatically. Suggest few sensors which can be used to detect the presence of customers. Describe the working of such sensors in brief. (C.O.NO.2) [Application. Level]

12. Technology where a fluid is used to move the energy from, for example an electric motor to an actuator. Identify the system and explain the working with suitable diagram.

(C.O.No.3) [Application]

13. A control system is a mechanical or electronic device that automatically regulates a system to maintain a desired state or set point without human interaction. Identify the type of control system and explain with suitable example and block diagram. (C.O.No.2) [Comprehension]

14. Sensors that perform non-contact detection in comparison to sensors, such as limit switches, that detect objects by physically contacting them. Identify the type of sensors and explain with suitable diagram.

(C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer any Two Questions. Each question carries 20 marks. (2Qx20M=40M)

15. Consider a hydraulic cylinder to be used to move a workpiece in a manufacturing operation through a distance of 250 mm in 15 s. If a force of 50 KN is required to move the workpiece, what is the required working pressure and hydraulic liquid flow rate if a cylinder with a piston diameter of 150 mm is available? (C.O.No.3) [Application]

16. What are the various techniques adopted for signal conditioning? Describe them in detail along with suitable figures, charts or plots. (C.O.No.3) [Application]

17. With the suitable circuit diagram explain the working of double acting cylinder to achieve the sequence of A+B+A-B-.

(C.O.No.3) [Application]