

KATHMANDU UNIVERSITY  
End Semester Examination  
February, 2025

Marks Scored:

Level : B.E.

Year : IV

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : MEPP 427

Semester : I

F. M. : 10

Date 13 FEB 2025

SECTION "A"

Choose the most appropriate answer and **encircle**.

[10Q. × 0.5 = 5 marks]

1. Temperature cannot be measured using \_\_\_\_\_  
a. Thermocouple      b. RTD      c. fiber optics      d. variable reluctance
2. The sensor should be \_\_\_\_\_ to the measured property.  
a. insensitive      b. sensitive      c. accurate      d. reliable
3. \_\_\_\_\_ does not include in basic forms of kinematic chains.  
a. four-bar      b. slider crank      c. crank-shaft      d. camshaft
4. Which is not an ideal op-amp property?  
a. Input impedance is infinite  
b. Output impedance is high  
c. Difference input voltage (voltage between + and – inputs) is zero.  
d. Open loop gain is infinite.
5. The extraction and retraction force for double acting hydraulic cylinder is different because  
a. it uses different pressure pumps for each action  
b. pressure on each side is different  
c. effective area of the piston is different  
d. type of fluid use is different
6. The application of microcontrollers is in the field  
a. remote sensing      b. temperature monitoring  
c. lightning      d. all of above
7. \_\_\_\_\_ motor is used in high torque machines like air compressors, high-pressure water pumps, vacuum pumps,  
a. Induction      b. Synchronous      c. Three Phase      d. Single Phase
8. A rigid piece of material connecting joints in a **robot**  
a. Link      b. Manipulator      c. Pose      d. Joints
9. Linear velocity of Rack and Pinion of 50 Hz frequency that moved at 2 m distance parallel to the screw axis is \_\_\_\_\_ m/s  
a. 2.5      b. 25      c. 100      d. 1000

10. Simplifying Boolean expression  $A.(B + C) + A(C + B')$  gives \_\_\_\_\_.
- a. A                      b. B                      c.  $AB + AC$                       d. AC

**Write 'T' for TRUE statements and 'F' for FALSE statements.** [5Q × 0.5 = 2.5 marks]

11. Actuator is a device that generates a signal or stimulus. [ ]
12. Digital computers contain circuits that implement Boolean functions. [ ]
13. Active sensors don't require the application of external power for their operation. [ ]
14. Signal amplification is first used in telecom systems (telephone) Analog vacuum tube amplifier technology. [ ]
15. '0' is also called as high or true and '1' is also called as low or false. [ ]

**Fill in the blanks.** [5Q × 0.5 = 2.5 marks]

16. \_\_\_\_\_ are train of electrical pulses which together gives a certain value.
17. Linearization can be provided by an amplifier whose gain varies as a function of the input.
18. Thermocouple works under the principle of \_\_\_\_\_ effect.
19.  $X.Y + Y.Z + X'Z \equiv X.Y + X'Z$  is known as \_\_\_\_\_ Theorem
20. \_\_\_\_\_ is a conceptual, mathematical, or physical tool to assist an engineer for decision making.

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F. M. : 40

13 FEB 2025

SECTION "B"

[6Q. × 4 = 24 marks]

*Attempt ANY SIX questions.*

1. What is sensor and how do you differentiate it from transducers? Explain.
2. What is fluid power system? List types of Hydraulic actuation system and discuss on different types of rotary actuator types.
3. What is signal conditioning? What operations are involved in this process?
4. Classify the robot based on function and Cartesian coordinate system. Describe any two.
5. What is Boolean function explain different types of AND, OR, NOR, NOT Gates with suitable example
6. Write on the industrial application of sensors and discuss on role of it in your mechatronics project.
7. Differentiate between. (*ANY TWO*)
  - i. AC motor and DC motor
  - ii. Microcontroller and Microprocessor
  - iii. Active sensor and Passive sensor

SECTION "C"

[ 2Q. × 8 = 16 marks]

*Attempt ANY TWO questions.*

8. Define the term mechatronics with a Venn diagram. "Mechatronics systems comprise the synergetic (combined effect) functional and spatial integration of mechanical components with electronic systems and embedded information technology." Elaborate the sentence in your own words and discuss its scope and industrial applications.
9.
  - a. List out the components of the Pneumatic system and draw its symbolic representation diagram.
  - b. Discuss on use and type of different kinds of bearings.
10.
  - a. Define robotics and explain any three robotic terms.
  - b. Explain different filtering process in signal conditioning with suitable figures.

