Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(CAD/CAM) (Elective-II) (Sem.–2)

MECHATRONICS

Subject Code : ME-514

M.Code : 23513

Time : 3 Hrs. Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**

1. a) Discuss the use of strain gauges in load cells. What will be change in resistance of an electrical resistance strain gauge with a gauge factor of 2.1 and resistance 50Ω if it is subjected to a strain of 0.001?

   b) Discuss the principle of Hall effect and its use in measurement systems.

2. Discuss the principle, construction, working and applications of linear variable differential transformers.

3. a) Discuss relative advantages and limitations of hydraulic and pneumatic actuation systems.

   b) Make truth tables for AND, OR, NOR and NAND logic functions and state their Boolean expressions. Also show that $A+\overline{A}.B=A+B$.

4. a) What are the main characteristics of op-amps? Draw the circuit diagram of an inverted op-amp and derive the relation for voltage gain.

   b) Draw the circuit of weighted-resistor type of DAC and derive the relation for converting a 4-bit digital value into analog value.

5. a) What are stepper motors? Discuss the working of a permanent magnet stepper motor. What digital input rate is required to produce a rotation of 600 RPM in a PM stepper motor having step angle of 7.5°?

   b) Compare the features of fluid power actuators and electric actuators.

6. a) Discuss the features, construction and working of Induction and Synchronous AC motors.

   b) Draw the block diagram of 8085 8-bit microprocessor. Discuss the general-purpose registers available in this microprocessor.

7. a) State the criteria used in selecting a PLC for a particular task or tasks. Draw ladder diagram for implementing NAND, NOR and XOR logics in PLC.

   b) What is the significance of mathematical modeling of dynamic systems? Derive the mathematical model for displacement of a simple mass-damper-spring system excited by an external force. What will be the steady state value of displacement of such a system having stiffness of 2N/cm when subjected to constant force of 10N?

8. Write short notes on :

   a) Pole placement technique

   b) Brushless DC motors

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.