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Total No. of Pages : 02

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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.

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- 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

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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.