

17660

15162

3 Hours / 100 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Answer each next main Question on a new page.
  - (3) Illustrate your answers with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
  - (8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

**Marks**

**1. Attempt any FIVE :**

**20**

- (a) Draw block diagram of mechatronic system and explain the key elements of mechatronics system.
- (b) Define : (i) Sensor (ii) Transducer with examples of each.
- (c) List any four advantages of mechatronic system.
- (d) State and elaborate the importance of mechatronics in various field of engineering.
- (e) Draw and explain the block diagram of fuzzy logic controller.
- (f) List the types of belt and give one application of each.
- (g) Explain in brief Spherical Robot. Why it is called as spherical robot ?

**2. Attempt any FOUR :**

**16**

- (a) List any four applications of Hall Effect Sensor.
- (b) Draw practical ABS system. List any four advantages of it.
- (c) Draw and explain MEMS microactuator.
- (d) Draw PI controller using Op-Amp and explain in brief.
- (e) Draw block diagram of pneumatic system. What is the role of filter in pneumatic system ?
- (f) Draw and explain the working principle of Inductive and Capacitive sensor.

**P.T.O.**

- 3. Attempt any FOUR : 16**
- (a) Draw block diagram of pick and place Robot. List the required movements of it.
  - (b) Draw and explain pneumatic PID controller.
  - (c) State the types of Actuators. Draw and explain single acting cylinder.
  - (d) How MEMS accelerometer is used as air bag sensors for car safety ? Describe in brief.
  - (e) Define degree of freedom. What is the significance of degree of freedom in robot ?
  - (f) Draw schematic of PLC based automatic car park barrier system.
- 4. Attempt any FOUR : 16**
- (a) Explain CNC drilling machine with neat diagram.
  - (b) How Torque is calculated using Torsion-bar torque transducer ? Explain.
  - (c) Draw and explain DC motor speed control using microcontroller.
  - (d) List out the types of gears & give their applications. (One each)
  - (e) State any four applications of stepper motor.
  - (f) Draw and explain the PLC ladder diagram for ON-OFF control of lamp.
- 5. Attempt any FOUR : 16**
- (a) How the piezoelectric effect is used to measure acceleration ? List the features of piezoelectric accelerometer.
  - (b) State the functions of (1) Isolators (2) Filters (3) Amplifiers and (4) Data converters in Mechatronic system.
  - (c) List the advantages of PLC based car parking system. (Any four)
  - (d) Draw block diagram of Robot system. List functions of an end effector.
  - (e) With neat block diagram explain the various components of MEMS.
  - (f) Draw and explain Gear type rotary actuator.
- 6. Attempt any FOUR : 16**
- (a) Explain the implementation of proportional type hydraulic controller.
  - (b) Compare pneumatic and hydraulic system (four points).
  - (c) Draw and explain LVDT accelerometer.
  - (d) List various photoelectric sensors. Explain any one of them in detail.
  - (e) Explain fuzzy logic control in fully automatic washing machine.
  - (f) Explain the working principle of solenoid valve. List the applications of solenoid valve.
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