

- 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.

1. (a) Attempt any **THREE** of the following: [12]
- Explain the significance of mechatronics. Also state any three applications of mechatronics system.
  - Define the terms :
    - Hard real time mechatronics system and
    - Soft real time mechatronics system
  - Draw a neat and labelled block diagram of a mechatronic system.
  - Define a transducer. Draw the basic block diagram of a transducer.
1. (b) Attempt any **TWO** of the following: [8]
- Explain the Hall effect with a neat and labelled figure. Also explain briefly its use for measuring displacement.
  - Give comparison between active and passive transducers with two examples of each.
  - Explain the principle of operation, construction and one application of photoelectric transducers.
2. Attempt any **FOUR** of the following: [16]
- Explain the principle and operation of the eddy current transducers for measuring displacement.
  - Define encoder and explain the principle, construction and state any two applications of Incremental Encoder.
  - Explain the capacitive transducers working on the principle of change of capacitance with change of area for measuring angular displacement.
  - Explain in brief the construction of Pyroelectric sensor.
  - Explain the working of an A.C. tacho generator alongwith its principle and one application.
  - Explain the principle of operation, construction and application of Electromagnetic velocity Transducers.
3. Attempt any **FOUR** of the following: [16]
- Explain torque measurement using strain gauge with the help of a neat labelled diagram.
  - State the needs of following signal conditioners :
    - Isolator
    - Filter
    - Amplifier and
    - Data converter.
  - Describe the principle of working and construction of a piezo-electric type accelerometer.
  - Explain the principle of a basic PID controller with a neat block diagram.
  - Draw neat and labelled constructional diagrams of (i) LVDT accelerometer and (ii) strain gauge accelerometer.
  - Draw a labelled block diagram of electronic controller. Explain the functions of (i) control section and (ii) Reverse direct action.
4. Attempt any **FOUR** of the following: [16]
- Explain electronic derivative controller using op-amps. Also state its advantages.
  - Draw a neat and labelled block diagram of a CNC based drilling machine
  - Draw only the neat and labelled block diagram of fuzzy logic control used in fully automatic washing machine.

- (d) Draw only a neat labelled block diagram for stepper motor control using a microcontroller.
- (e) Draw a neat and labelled block diagram of a microcontroller / PLC based pick and place robot. Also show its three movements with the help of a sketch of a pneumatic cylinder.
- (f) Explain briefly the principle of an electric relay with the help of a neat diagram.

5. Attempt any **TWO** of the following: [16]

- (a) Explain the principle of Double acting cylindrical actuator with a neat labelled diagram.
- (b) With the help of a neat and labelled ladder diagram, explain the application of PLC for controlling process tank and conveyor motor.
- (c) Explain briefly the construction and working of a jet type hydraulic proportional controller. State its advantages, disadvantages and applications.

6. Attempt any **TWO** of the following: [16]

- (a) Draw labelled block diagram of microcontroller based antilock brake system and explain its working.
- (b) Explain the principle and construction of MEMS accelerometer.
- (c) With the help of neat diagrams, explain the operation of an automatic car park barrier system briefly.

**Paper Discussion Schedule for T.Y. Diploma Sem.VI**

Date	Day	Timing	Centre
9 April 2017	Sunday	9 a.m. to 11 a.m.	Dadar, Nerul
9 April 2017	Sunday	12 p.m.to 2 p.m.	Thane

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