(3 Hours) [Total marks: 80]

Instructions:
1. **Question 1 compulsory**.
2. Attempt any **three** questions from the remaining **five** questions.
3. Assume suitable data, **if necessary**.
4. **Figures/sketches** carry weightage.

Q1) Explain the following [Any four] **20**
    1) Components of Mechatronics
    2) Autonomous Robot
    3) Parameters to be considered for selection of an actuator
    4) Servo Amplifier
    5) Buffers

Q2) a) Explain the concept of Handshaking, Polling and Interrupt **07**

b) Explain harmonic drive with a neat sketch **07**
c) Explain the optimization of velocity profile optimization in DC motors **06**

Q3) a) Explain the following **10**
    i) Inertia Matching ii) Accumulator
b) Two double acting pneumatic cylinders are selected for an industrial application ;The **10**
sequence of the movement is as given below:-
$(AB)^-$, A+B+
Draw a pneumatic circuit

Q4) a) Explain SCADA with a neat sketch **07**

b) Mechatronics used in Office application with a neat block diagram **07**
c) Explain selection process of PLC **06**

Q5) a) Two double acting pneumatic cylinders are selected for an industrial application ;The **10**
sequence of the movement is as given below:-
A +, B-, Delay (A-B+) Delay, B-Delay.
Draw electro pneumatic circuit using 4/2 DC valve which is single solenoid and spring
operated using single cycle operation and also sketch the displacement diagram

b) With a neat sketch explain the constructional features, working and application of a Voice **10**
Coil Actuator.
Q6) a) Explain the constructional features and working of an Engine Management system with a **10**
neat sketch
b) Explain the following: **10**
i)Universal Asynchronous Receiver and Transmitter ii) Key elements of mechatronics
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