

(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 sequence of the movement is as given below:- 10
- (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 sequence of the movement is as given below:- 10
- 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 Coil Actuator. 10
- Q6) a) Explain the constructional features and working of an Engine Management system with a neat sketch 10
- b) Explain the following: 10
- i) Universal Asynchronous Receiver and Transmitter ii) Key elements of mechatronics
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N.B.:-

1. Question No.1 is compulsory
2. Solve any three out of remaining questions
3. Assume suitable data if required and mention it clearly
4. Figures to right indicate full marks

- Q1 A] Explain different types of tolerance grades 5
 B] Write short note on-Planning for quality. 5
 C] Explain principle of interference. 5
 D] Explain importance of surface conditions. 5
- Q2 A] Explain following:- 10
 1) Plug gauges and ring gauges
 2) Filler gauges
 B] Explain following parameters with respect to surface roughness measurement:- 10
 1) R_a Value
 2) R_z Value
 3) R_y Value
 4) Roughness and Waviness
- Q3 A] Explain Construction and working of Pneumatic Comparators. State their advantages and limitations. 10
 B] How will you set up policy and objectives of quality control? Explain concept of quality of design. 10
- Q4 A] Explain construction and working of Tool makers microscope with the help of suitable sketch. 10
 B] Explain following:- 10
 1) Scatter diagrams
 2) Pareto Charts
- Q5 A] Explain construction and working of Profile Projector. State various applications of Profile projector 10
 B] Explain following:- 10
 1) X bar Charts
 2) R Charts
 3) P Charts
 4) Np Charts
- Q6 A] Explain Principle, Construction and working of Parkinson's Gear tester 10
 B] Sketch OC curve and explain various elements of it. Also explain double sampling plans 10