

Total No. of Questions : 8]

SEAT No. :

P2930

[Total No. of Pages : 3

[5669]-519

**T.E. (Mechanical/Sandwich)
MECHATRONICS (Common)**

(2015 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary

- Q1) a)** List and define any six static measurement characteristics. [6]
- b)** Draw a suitable schematic and explain the working of inductive type of proximity sensor. [7]
- c)** What is meant by Nyquist frequency and how it is used in sampling of analog signal. [7]

OR

- Q2) a)** Draw a block diagram of control system in Antilock braking system (ABS) and explain it in detail. [6]
- b)** Explain principle, construction and working of Servo motor with neat sketch. [7]
- c)** With neat sketch, explain the working of a 4-bit R-2R DAC. [7]

- Q3) a)** List and discuss 5 exclusive criterions for selection of a PLC. [10]
- b)** Draw ladder diagram for a simple traffic light controller for the following sequence of operations as below: [8]
- Step 1: Turn Green ON for 40 seconds,
Step 2: Turn Yellow ON for 5 seconds,
Step 3: Turn Red ON for 45 seconds,
Step 4: Repeat the sequence i.e. Step 1-Step 2-Step 3.

P.T.O.

OR

- Q4) a)** Give suitable examples and discuss the importance of Timer and Counter in a PLC. [10]
- b)** Given four normally open switches (P1, P2, S1 and S2), with DC motor, write a PLC program to satisfy following objectives: [8]
- i) When P1 (Start Button) is pushed the Cycle shall start. The cycle shall continue to remain ON until P2 (Stop Button) is pushed.
 - ii) When S1 is pushed and S2 is not pushed then Motor is ON clockwise direction.
 - iii) When S2 is pushed and S1 is not pushed then Motor is ON counter clockwise direction.
 - iv) When P2 is pushed the program stops.

- Q5) a)** Explain transfer function based modeling of Translational Mechanical system. [6]
- b)** What are zeros and poles? Calculate and plot the poles and zeros for the system with the transfer function $G(s) = 6(s+3) / (s^2+2s+2)$. Comment on the stability. [10]

OR

- Q6) a)** Explain the terms: [6]
- i) Natural frequency
 - ii) Damped natural frequency
 - iii) Damping factor
- b)** Explain in detail stability analysis using Routh Hurwitz Criterion with suitable example. [10]

[5669]-519

2

Q7) a) Explain the terms:

[6]

- Steady state error
- Rise time
- Delay time

b) Figure. 1 shows an error time graph. Sketch the PD controller with $K_p = 5$, $K_D = 0.5 \text{ sec}$ and initial controller output, $P_0 = 20\%$. [10]

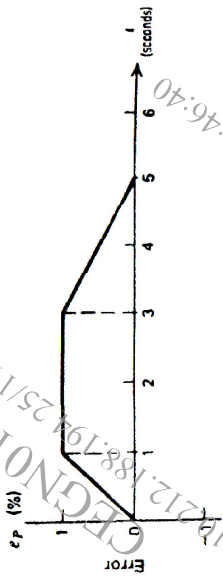


Figure.1

OR

Q8) a) Explain manual tuning of PID control. [6]

b) Figure.2 shows an error time graph. Sketch the PI controller with $K_p = 5$, $K_i = 1 \text{ s}^{-1}$ and initial controller output, $P_i(0) = 20\%$ [10]

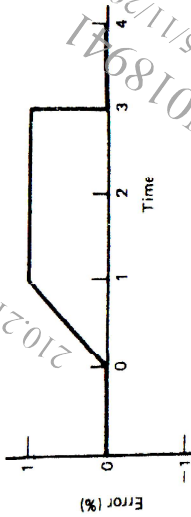


Figure.2

⊙ ⊙ ⊙ ⊙