Total No. of Questions : 8]

SEAT No. :

P2930

[Total No. of Pages : 3

[5669]-519

T.E. (Mechanical/Sandwich)

MECHATRONICS (Comman)

(2015 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or 04, 05 or 06, 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 jf 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,

Step3: 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) Givenfour normallyopenswitches(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 in 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]**

Q7) a) Explain the terms: **[6]**

i) Steady state error

ii) Rise time

iii) Delay time

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

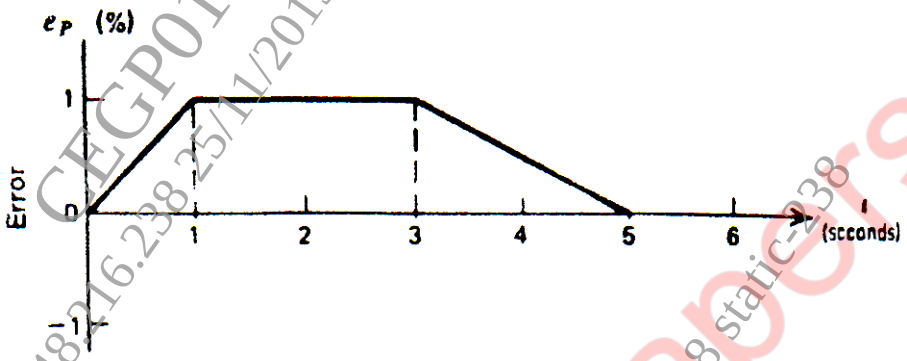

Figure.1

OR

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

b) Figure.2 shows an error time graph. Sketch the PI controller with $K_p = 5$, $K_1 = 1s^{-1}$ and initial controller output, $P_I(0) = 20\%$ **[10]**

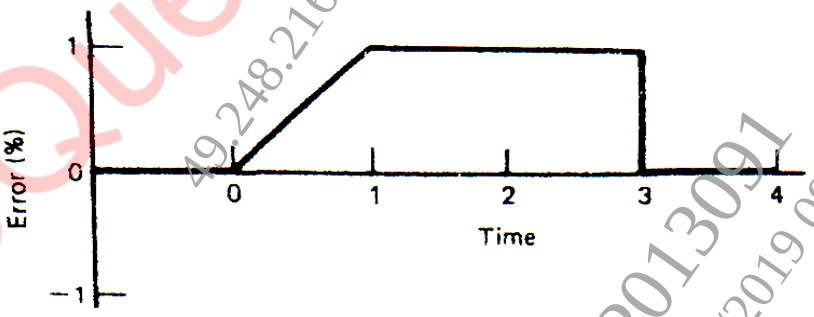

Figure.2

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