84 : 12.F.nd.mk

Con. 10212-12. **KR-9056**

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume suitable **data** wherever **necessary**.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Explain mechatronics system used for domestic cloth washing machine using following components :— **5**
   (i) Mechanical systems
   (ii) Electrical systems
   (iii) Computer systems
   (iv) Sensors and actuators
   (v) Logic.
   (b) What are the parameters you will consider for selection of an actuation system for any Physical Industrial System ? **5**
   (c) Determine K_p, K_v and K_a (position, velocity and actuation errors respectively) for a system with, $G(s) = \frac{100}{s(s+0\cdot5)(4-s)(s+1000)}$ and $H(s) = 1$. **5**
   (d) Write short note on Variable Reluctance Stepper Motor. **5**

2. (a) How would you classify the control systems based on the TYPE of system ? A unity feedback system has, $(s) = \frac{40(s+2)}{s(s+1)(s+4)}$. Determine, **10**
   (i) Type of the system
   (ii) All error co-efficients
   (iii) Error for ramp input with magnitude 4.
   (b) Explain the functional block diagram of 8051. **10**

3. (a) Design a pneumatic circuit for work clamping on a milling table, the sequence is : A^+, B^+, B^-, A^-. **10**
   (b) How DAC is specified ? Explain interfacing of DAC with block diagram. **10**

4. (a) The unit impulse response of a certain system is found to be e^{-4t}. Determine its transfer function. **10**
   (b) Construct an electro pneumatic circuit with following conditions : **10**
   A transport cylinder A should automatically reciprocate to and fro. But another cylinder B is to be actuated by cylinder A just after it starts its forward motion and the cylinder B should retract before the cylinder A completes its forward journey after which cylinder A returns.

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5. (a) Explain the factors to be considered for selection of PLC for a control system. What is the use of ladder logic diagram in PLC programming ? **10**

   (b) Sketch the root locus for the system with : **10**

$$G(s)\,H(s) = \frac{K(s+4)}{s\left(s^2+2s+2\right)}.$$

6. (a) A unity feedback control system has $G(s) = \frac{80}{s(s+2)(s+20)}$. Draw the Bode plot. Determine G.M., P.M., ω_{gc} and ω_{pc}. Comment on stability. **10**

   (b) Explain interfacing of :— **10**

   (i) Stepper motor

   (ii) LCD display.

7. (a) A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2+6s+25}$. Find its rise time, peak time, peak overshoot and settling time if subjected to unit step input. Also calculate expression for its output response. **10**

   (b) Compare : **10**

   (i) Hydraulic and pneumatic systems

   (ii) Routh and Hurwitz criterions.
