QP Code : 15141

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

N.B.:
(1) **Question No.1 is compulsory**
(2) Attempt any **four** questions out of remaining **six** questions
(3) Figures to right indicate full marks
(4) Assume suitable data if **necessary**.
(5) Notations carry usual meaning.

Q.1 (A)   Define mechatronics and state advantages of the mechatronic systems   05

(B)   Examine stability by Routh's criterion of control system having characteristic equation   05

$$s^8 + 5s^6 + 2s^4 + 3s^2 + 1 = 0$$

(C)   Explain the functions of ports 0, 1, 2, and 3 in 8051 microcontroller   10

Q.2 (A)   For 8051 microcontroller draw   10
    (i) Neat functional block diagram (architecture)
    (ii) Pin diagram

(B)   Obtain the state-space representation of the system having transfer function   10

$$\frac{C(s)}{R(s)} = \frac{24}{s^3 + 9s^2 + 26s + 24}$$

Q.3 (A)   Two double acting hydraulic cylinders A, B are selected for an industrial application. The sequence of movement for cylinder piston is proposed as below—   10

A- Delay B+ (A+B-)Delay

Draw step displacement diagram and develop the electrohydraulic circuit using 4/3 double solenoid as final directional control valves. The piston motions mentioned in bracket is simultaneous.

(B)   Explain following set of instructions of 8051 microcontroller   10
    1. ADDC, 2. POP, 3. INC, 4. DEC, 5. XRL

Q.4 (A)   Draw programmable ladder logic diagram for the following sequence of motion of double acting cylinder A (select appropriate final directional control valve):   10

A+ DelayA-

(B)   With a neat sketch explain interfacing of LCD display with 8051 microcontroller.   10

Q.5 (A)   Two pneumatic cylinders: A (single acting) and B (double acting) are selected for an industrial application. The sequence of   10

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