[5153]-519

T.E. (Mechanical)

MECHATRONICS

(2012 Course) (Semester - II) (End Semester) (302050)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

   1)   *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*

   2)   *Neat diagrams must be drawn wherever necessary.*

   3)   *Figures to the right indicate full marks.*

   4)   *Assume suitable data, if necessary.*

Q1) a)   Using suitable diagram explain construction and working of Stepper motor. List any 2 industrial applications. **[6]**

   b)   Determine the transfer function of following diagram. **[4]**
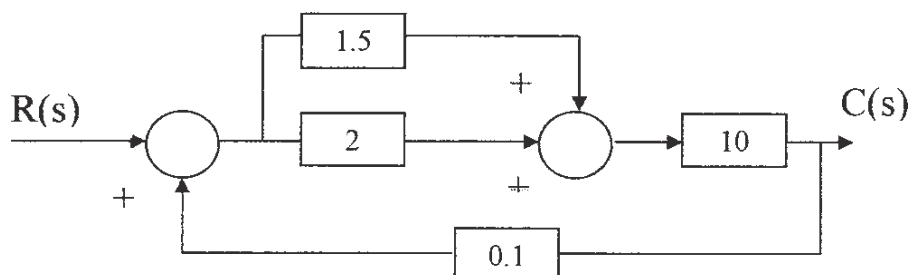
OR

Q2) a)   Using suitable diagram explain construction and working of sample and hold circuit. **[6]**

   b)   Define **[4]**

      i)   Resolution

      ii)   Hysteresis

Q3) a)   Define **[6]**
      i)   Sampling theorem
      ii)   Aliasing

   b)   Using suitable diagram explain construction and working of voltage amplifier. **[4]**

OR

P.T.O.

Q4) a) Find the approximate change in metal wire of resistance 120 ohm that results from a stain of 1000 μm/m. **[4]**

b) Using suitable diagram explain construction and working of R-2R DAC **[6]**

Q5) a) Draw a suitable block diagram of SCADA and explain its architecture. **[8]**

b) Draw block diagram of basic structure of PLC system and explain the role played by following elements **[8]**
   i) I/O unit
   ii) CPU

<div align="center">OR</div>

Q6) a) What is the function of timers in PLC programming? Classify time. Explain any 2 of them. **[8]**

b) Draw a ladder diagram for the following sequence. **[8]**

   i) Two push buttons PB1 and PB2 are used to operate Green and Red lamps.

   ii) When PB1 is pushed alone, it should switch off Green lamp, and switch on the red lamp.

   iii) If PB2 is pushed alone, No lamp should glow.

Q7) a) Obtain transfer function of the following system. **[8]**
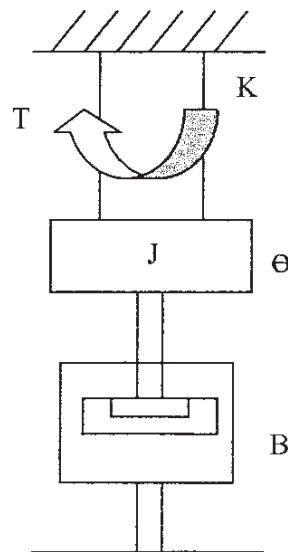
b) Define following terms **[8]**

    i)   Steady state error

    ii)   Rise time

    iii) Damping frequency

    iv) % overshoot

<div align="center">OR</div>

Q8) a) Using suitable diagram explain transient response specification. **[8]**

b) Compare Time Domain and Frequency domain techniques for analysis of systems. **[8]**

Q9) a) Draw a suitable diagram and derive transfer function of Proportional Integral and derivative (PID) controller in parallel. Compare it with PID in series as well. **[10]**

b) Discuss the role of transient specifications with respect to performance of PID **[8]**

<div align="center">OR</div>

*Q10)*a) An integral controller is used for speed control with a set point of 12 rpm within a range of 10 to 15 rpm. The controller output is 22% initially. The constant K_1 = -0.15% controller output. per second per percentage error. If the speed jumps to 13.5 rpm Calculate the constant output after 2 sec. for a constant e_p. **[8]**

b) Explain Derivation control with neat diagram and equation. Why derivative controller can not be used alone? **[10]**

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