

Total No. of Questions : 10]

P2553

SEAT No. :

[Total No. of Pages : 3

[5153]-519

T.E. (Mechanical)
MECHATRONICS

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

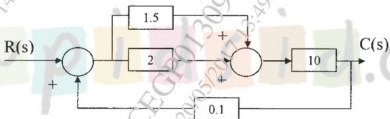
Time : 2½ Hours]

[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

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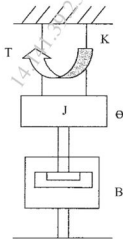
- Q4) a)** Find the approximate change in metal wire of resistance 120 ohm that results from a strain of $1000 \mu\text{m/m}$. [4]
b) Using suitable diagram explain construction and working of R-2R DAC [6]

- 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

OR

- 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

OR

- 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]

OR

- 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 $K_I = -0.15\%$ 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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