KUMARAGURU
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Register Number: ………………..

B.E DEGREE EXAMINATIONS: NOV 2015

(Regulation 2009)

Seventh Semester

MECHANICAL ENGINEERINTG

MEC123**:** Mechatronics

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1.   LVDT stands for

   a)   Long variable differential transducer   b)   Linear variable differential transformer

   c)   Linear variable differential transistor   d)   Linear variable deformation transformer

2.   Unit of pressure is

   a)   N.m   b)   N/m

   c) $N.m^{-2}$ d) $N.m^{2}$

3.   In a 4/2 DCV, 4 and 2 represents number of ___ and respectively

   a)   port and position   b)   input and out put

   c)   position and port   d)   output and input

4.   If more than one gear in the shaft is engaged in power transmission the gear train is called as ___.

   a)   simple gear train   b)   synchronous gear train

   c)   composite gear train   d)   compound gear train

5.   If the value of error increases, the changing speed of controller output _____.

   a)   increases   b)   decreases

   c)   remains constant   d)   cannot be determined

6.   Which of the following is/are the drawback/s of proportional control?

   a)   Proportional control system is complicated and costly.

   b)   Proportional control system is not suitable for pressure temperature and flow control problems.

   c)   If there are sudden disturbance, the proportional control system takes time to stabilize.

   d)   If there are sudden disturbance, the proportional control system takes no time to stabilize.

7. The capability of conventional relay systems for complex operations is _____ that of the PLCs .
   a) poor than   b) excellent than
   c) as good as   d) unpredictable as

8. PLC can be _____ in plant to change the sequence of operation.
   a) only programmed   b) only reprogrammed
   c) programmed and reprogrammed   d) able to give a set point

9. A group of components which can complete certain tasks or achieve certain desired results in a desired manner while working together is called as_____
   a) output system   b) sequence system
   c) control system   d) programmed system

10. What is used to make considerable simplification in the devices such as watches and cameras etc. as compared to pure mechanical designs?
   a) Actuators with electrical auxiliary energy   b) Amplifiers with electrical auxiliary energy
   c) Actuators and amplifiers with electrical auxiliary energy   d) Transducers with electrical auxiliary energy

PART B (10 x 2 = 20 Marks)

11. What are the basic elements of a measurement system? Sketch a block diagram.
12. Identify at least four different mechatronics systems used in automobiles.
13. What is the role of accumulator in hydraulic systems. Classify their types.
14. What are the factors to be considered in selecting solenoids?
15. Define transfer function.
16. List various features of digital controllers.
17. What are shift registers? Where are they used?
18. What is meant by a "retentive timer"?
19. List the stages in designing a mechatronics system.
20. How does autofocus camera work?

PART C (5 x 14 = 70 Marks)

21. a) (i) Compare and contrast the control system for the domestic central heating system (7)
            involving a bimetallic thermostat and that involving a microprocessor.
       (ii) Explain any three sensors used for temperature measurement.   (7)

(OR)

b) (i) Compare open and closed loop system with suitable example. (7)

    (ii) Illustrate the static and dynamic characteristics of sensors. (7)

22. a) (i) List the various types of ball bearing? Mention the application of each type. (9)

    (ii) An actuator has a maximum stem movement of 40 mm. It is mounted with a (5) linear plug process control valve which has a minimum flow rate of 0 and a maximum flow rate of 0.2 m^3/s. What will be the flow rate when the stem movement is 20 mm?

(OR)

b) Discuss about the following actuation systems:

    (i) DC motor (7)

    (ii) Stepper motor (7)

23. a) A hot object with capacitance C and temperature T, cools in a large room at temperature T_o. If the thermal system has a resistance R, derive an equation describing how the temperature of the hot object changes with time and give an electrical analogue of the system.

(OR)

b) (i) Deduct a mathematical model for a machine mounted on the ground to study the (7) effects of ground disturbances on the machine bed displacement.

    (ii) Compare the control system performance for a system with proportional control (7) and a system with integral control.

24. a) (i) Demonstrate the basis of ladder programming used in PLC. (7)

    (ii) Describe the functions of timers, registers and counters. (7)

(OR)

b) (i) Explain the selection criteria for PLC. (7)

    (ii) Describe the functions of timers, registers and counters. (7)

25. a) Design a mechatronics system for a pick and place robot and explain the various mechatronics elements.

(OR)

b) (i) Explain about the basis of mechatronics system design considering vehicle (7) engine management system as an example.

(ii) Draw the block diagram showing the interaction of various elements in a (7) domestic washing machine.

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