

**B.E DEGREE EXAMINATIONS: APRIL/MAY 2014**

(Regulation 2009)

Seventh Semester

**MECHANICAL ENGINEERING**

MEC123: Mechatronics

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. In a closed loop system the control action is \_\_\_\_\_
  - a) dependent on the output
  - b) independent on the output
  - c) partially dependent on the output
  - d) none of the above
2. Primary transducer is a
  - a) transducer which converts energy from one form to another form of required signals
  - b) transducer which converts the energy from one form to another in the final stage
  - c) transducer which senses the energy from the input signal
  - d) transducer which converts the energy from one form to another in the first stage
3. Module of a gear is given by
  - a) diameter pitch
  - b) reciprocal of diameter pitch
  - c) circular pitch
  - d) reciprocal of circular pitch
4. The motor which produces rotation through equal angles
  - a) Compound motor
  - b) Stepper motor
  - c) Shunt motor
  - d) series motor
5. \_\_\_\_\_ represents the forces opposing the motion in a mechanical system.
  - a) Mass
  - b) Spring
  - c) Dashpot
  - d) None of the above
6. In a proportional controller, the offset between set point and control point must be held to a minimum value. Therefore, the proportional band must be
  - a) as narrow as possible
  - b) as wide as possible
  - c) of moderate value
  - d) none of the above
7. The period of time it takes the CPU to completely evaluate the logic of a PLC is called \_\_\_\_\_.
  - a) Execution time
  - b) Ladder time

- c) Scan time
  - d) Interrupt time
8. A counter that starts from a specified number and increments down to zero is known as the
  - a) up counter
  - b) down counter
  - c) cascading counter
  - d) reset counter
9. Generation of possible solution stage is called as \_\_\_\_\_
  - a) Conceptualization
  - b) design
  - c) Solution
  - d) analysis of the problem
10. Wind screen Wiper uses \_\_\_\_\_ mechanism.
  - a) Slider crank
  - b) four bar
  - c) quick return
  - d) rack and pinion

**PART B (10 x 2 = 20 Marks)**

11. What are the basic elements of a measurement system and sketch its block diagram?
12. Define Hysteresis error.
13. Why sequential valves are necessary in pneumatic system?
14. What is MOSFET?
15. Write the equation for a translational spring and translational damper in a mechanical system.
16. What is meant by adaptive control?
17. What is internal relay?
18. What are the inputs of shift register?
19. Distinguish between traditional design approach and mechatronics approach?
20. What are the axes of a pick and place robot?

**PART C (5 x 14 = 70 Marks)**

21. a) i) Explain the basic elements of a closed loop control system with the help of an automatic water level controller. (7)  
ii) What is meant by sequential controller? Illustrate with a washing machine example. (7)

**(OR)**

- b) With neat sketch explain the incremental and absolute encoder.
22. a) i) With neat sketch explain the semi rotary actuator. (7)  
ii) With neat sketches explain the types of belt drives used for power transmission. (7)

**(OR)**

- b) i) Explain the working principle of brushless permanent magnet d c motors with neat sketches. (7)
- ii) Compare and contrast the characteristics of Thyristor with Triac. (7)

23. a) i) Explain the building blocks of thermal systems. (5)
- ii) Explain how stiffen and man affects the mechanical systems. (4)
  - iii) Explain, how domestic water level can be controlled using microprocessor? (5)

**(OR)**

- b) i) Explain the principle and characteristics of the proportional controller with neat sketches. (7)
- ii) Explain the principle and characteristics of the PID controller with neat sketches. (7)

24. a) Sketch the basic architecture of a PLC and explain the various components involved.

**(OR)**

- b) i) Explain master and jump control in PLC? (7)
- ii) With an example, explain the data movement and data comparison operation of PLC. (7)

25. a) i) What are the various stages in designing a mechatronics system? Explain. (7)
- ii) With neat sketch explain any two possible design solutions for timed switch. (7)

**(OR)**

- b) Design an engine management system and discuss the parameters relevant to the engine performance.

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