

B.E DEGREE EXAMINATIONS: NOV/DEC 2012

Seventh Semester

MECHANICAL ENGINEERING

MEC123: Mechatronics

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A sensor, for an input of 4v, gives a digital output of a word of 8 bits. The resolution is
 - a) $4/8$ V
 - b) $8/4$ V
 - c) $4/2^8$ V
 - d) $2^8/4$ V
2. Absolute encoders are used to determine the angular position of a shaft and to avoid false counting when the shaft rotates
 - a) Binary code is used
 - b) Gray code is used
 - c) BCD code is used
 - d) Hexa code is used
3. A ball bearing is required to withstand radial and axial loads .The optimum bearing from the following is
 - a) Deep groove
 - b) Filling slot
 - c) Angular contact
 - d) Self aligning
4. A thermocouple is used with a compensation circuit because
 - a) The emf is not a linear function of temperature
 - b) To increase time constant of the sensor
 - c) To amplify the small thermoelectric emf
 - d) The cold junction is not held at zero degree celcius
5. Hydraulic capacitance is defined as being
 - a) $A/\rho g$
 - b) $\rho g/A$
 - c) A/ρ
 - d) ρ/A
6. Flemings Left hand rule is applicable to
 - a) DC motor
 - b) DC generator
 - c) Transformer
 - d) Induction motor
7. In continuous updating input and output processing there will be a built in delay in the order of
 - a) 5 ms
 - b) 6 ms
 - c) 3 ms
 - d) 1 ms
8. Internal relays are also called as

- a) Marker
 - b) Time delay
 - c) counter
 - d) Cascade control
9. The feedback is said to be negative feedback when the signal which is fed back _____ from the input value.
- a) add
 - b) Subtract
 - c) multiply
 - d) Divide
10. B type thermocouple temperature varies between _____ degree celcius
- a) -200 to 900
 - b) -200 to 400
 - c) 0 to 1400
 - d) 0 to 1800

PART B (10 x 2 = 20 Marks)

11. Define control system.
12. What is meant by Hall effect sensor?
13. Write a note on Ratchet and pawl mechanism.
14. Mention the various types of bearings used in actuation system.
15. What is the function of Derivative controller?
16. Write the classification of DC motors.
17. Write about timers in PLC.
18. List how the PLC is selected for any application.
19. List the stages of design process.
20. Compare traditional and mechatronics design.

PART C (5 x 14 = 70 Marks)

21. a) Write a note on
- (i) LVDT (7)
 - (ii) Encoders (7)
- (OR)**
- b) Explain briefly about
- (i) Piezoelectric sensors (7)
 - (ii) Temperature sensors (7)
22. a) Define mechanical actuation systems. Explain in detail about cams, gear trains and belt drives.

(OR)

b) Discuss in detail about different types of stepper motor and its specifications.

23. a) Explain briefly about the three stages of adaptive control methods.

(OR)

b) Explain the building blocks of

(i) Electrical system (7)

(ii) Thermal system (7)

24. a) Explain about the architecture of PLC and mention the steps involved in ladder programming.

(OR)

b) Write a note on

(i) Timers and Counters (7)

(ii) Shift registers and Data handling (7)

25. a) Design a mechatronics system for pick and place robot operations.

(OR)

b) Design a car engine management system and describe the various sensors used in this operation.
