**AALIM MUHAMMED SALEGH COLLEGE OF ENGINEERING**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**QUESTION BANK**

**DEPARTMENT: MECH SEMESTER: VII**

**SUBJECT CODE / Name: ME 2401/MECHATRONICS**

**PART-B**

**UNIT-1**

**MECHATRONICS, SENSORS AND TRANSDUCERS**

1. Describe the building blocks mechatronics systems, indicate various modules involved in it?
2. Explain open loop and closed loop control system with neat sketch?
3. What are the basic elements of a closed loop system? Explain?
4. Identify various elements of a closed loop system in automatic water level controller and describe their functions?
5. Explain the functioning of a closed loop system with a neat sketch for controlling the speed of a shaft?
6. With neat sketch explain sequential control system?
7. What is a sequential controller? Explain how a microprocessors based controller operates a washing machine?
8. Explain the working principle of a automatic camera?
9. Classify transducers by function, performance and by the output basis?
10. What are the characters of sensors? Explain?
11. Explain the static performance characteristic of a sensor?
12. Explain dynamic characteristics of transducers?
13. Describe with neat sketch of potentiometer displacement sensors?
14. Discuss how resistance strain gauge is used as displacement sensors?
15. Explain the working principle of Hall Effect sensors with neat sketches?
16. How do Hall Effect sensors differ from photo-electric sensors?
17. Explain the working principle of photoelectric proximity sensors?
18. Explain three methods of velocity measurement?
19. Explain any one motion sensors?
20. Explain an incremental (optical) encoder, what are their applications?
21. How a tacho generator is used to measure angular velocity/
22. Explain the principle and application of proximity and light sensors?
23. With neat sketch explain the working of pneumatic proximity sensor?
24. Explain capacitive push-pull sensor and capacitive proximity sensor?
25. Explain the working principle of following sensors with neat sketches?
26. LVDT ii) Thermocouple
27. Explain the function of a capacitive sensor in a robot end effecter?
28. Explain any three force sensors with its neat sketches?
29. Explain tactile pressure sensor with neat sketches?
30. Explain the principle and applications of the following with neat sketches?
31. Explain the principle and applications of the following with neat sketches?
32. fluid pressure sensors ii) Temperature sensor
33. Explain the use of bellows and a diaphragm pressure gauge in pressure measurement?
34. Describe the function of bourdon tube pressure gauge in detail?
35. Explain any three sensors used for temperature measurement?
36. What is RTD? Explain the relationship between resistance and temperature for the RTD with temperature resistance curve?
37. Write short notes on i) Thermocouple ii) Piezoelectric transducer iii) Incremental encoder iv) Photovoltaic transducer

**UNIT-2**

**ACTUATION SYSTEMS**

1. Write short notes on fluid system?

2. Explain the working of pneumatic systems with the help of a neat sketch?

3. List down the elements of hydraulic systems and explain each briefly?

4. What is an accumulator? Explain.

5. Discuss why hydraulic pumps are used in hydraulic systems?

6. Explain sliding spool valve in control process?

7. Discuss how pilot-operated valve in control the flow of fluid?

8. Explain the purpose of a pressure sequence valve?

9. Compare physical components of hydraulic and pneumatic systems?

10. Explain rotary actuators with help of a sketch and compare it with linear actuator?

11. Explain various types of cam followers?

12. Explain any four types of cam followers?

13. Explain any four types of cams?

14. Write short notes on bevel gears?

15. Explain compound gear train with its diagram?

16. Explain the motion transmission in a planetary gear train and compare it with epicyclic gear train?

17. Describe the working ratchet and pawl mechanism with its neat sketch?

18. Discuss the importance of belt drives in mechanical actuation systems?

19. Differentiate open belt drive and cross belt drive?

20. Write short notes on chain drive?

21. Explain different types of lubrication in bearings?

22. Explain various types of ball and roller bearings?

23. Discuss the selection criteria in bearings?

24. Explain about solenoid and its applications?

25. Give classification of an electric motor?

26. Explain the operation of an electric motor?

27. Describe back e.m.f ?

28. Give classification of AC motor?

29. Differentiate the different between single phase and poly phase motors?

30. Explain working principle of a) Synchronous motor b)AC Servomotors

31. Explain the working principle of D.C motors?

32. Explain open loop and closed loop control of D.C motor?

33. Explain the working principle of brushless permanent magnet D.C motor?

34. What are the advantages of dc motor?

35. Explain the working principle of single phase squirrel cage and three phase induction motor?

36. Describe the workings of a 3 phase AC motor?

37. Explain the working principle of various stepper motor?

38. Explain the working principle of stepper motors in half step mode?

39. Explain the function of the brushes and commutation in a DC motor?

40. Explain dynamic braking?

41. Draw the electrical symbol for the following switching arrangement?

a) DPST b) DPDT c) Triple pole, single throw

42. List applications for each of the following switches

a) Push button b) Toggle switches c) Wafer switch d) Three position switch

43. List applications of an electromechanical relay

44. Semiconductor diodes conduct electricity in only one direction. True or false?

45. List the major differences between bipolar and JFET Transistors?

46. What are the major different between JFET and MOSFET?

47. What are the characteristics, advantages and disadvantages of three types of transistors circuit commonly used?

48. Explain SCR and the way to turn an SCR?

49. Explain how a thyristor can be used to control the level of a DC voltage?

50. Explain the principle of operation of a stepper motor?

51. Describe a DIAC and TRIAC?

52. Describe a PNP and NPN transistor?

53. For what type of machine are shut motors generally used?

54. Describe a 3 phase, AC synchronous motor, give their advantages and disadvantages?

**UNIT-3**

**SYSTEM MODELS**

1. What is block diagram explain the use of micro controller for house hold applications?

2. Draw the block diagram of 8085 microprocessor and explain the function of each element?

3. Explain about fluid systems building blocks?

4. Explain about building up a model for fluid systems?

5. Explain electronically proportional derivative (PD) controller with necessary circuits’ diagram?

6. Explain electronic proportional integral (PI) controller with necessary circuit diagrams?

7. Explain the characteristics of PID controller

8. Explain about electromechanical systems?

9. Explain about hydraulic power systems?

10. Differntiate open loop and closed loop systems?

11. Explain about velocity control and adaptive control?

12. Explain the applications of microprocessor control?

**UNIT-4**

**PROGRAMMING LOGIC CONTROLLER**

1. What are the advantages of PLC over relay logic?

2. Compare the PLC and general purpose computer?

3. Explain the basic function of the major parts of the CPU?

4. Explain the input modules and out put modules circuit with a neat sketch?

5. Write short notes on Timer?

6. What is meant by Internal relays? Explain?

7. Briefly explain how data handling is carried out in PLC?

8. Explain how you select a PLC and give specifications of a typical PLC?

9. Explain the functioning of cascaded Timer, on-off cyclic timers, and delay-off Timers with ladder diagram?

10. Explain different operations carried out by PLC in data handling?

11. Explain the use of internal relays in PLC to control a Pneumatic system with double solenoid valve and two cylinders?

12. What are ladder logic programs in PLC?

13. Sketch and explain latch circuits in PLC?

14. Explain data handling and manipulation?

15. Briefly explain logic gates functions with PLC ladder logic gates?

16. What is meant by counters and briefly explain its types?

17. Solve the all ladder logic programming problems?

**UNIT-5**

**DESIGN OF MECHATRONICS SYSTEM**

1. What are the various stages in designing a mechatronic system? Explain?

2. Briefly explain traditional and mechatronics design?

3. Compare the traditional and mechatronics design approaches?

4. Explain different possible design solution of timed switch?

5. Explain different possible design solution of windscreen wiper?

6. Describe the two configurations of stepper motor in operation?

7. Design hardware to interface 7 segment LEDs with 8085 microprocessor? Write software to display number from 0 to 9 continuously with a suitable delay time?

8. Explain the working of a weighing scale using mechatronics solution compare this over a traditional mechanical system?

9. Discuss the design aspects of a pick and place robot, in terms of the various mechatronic elements involved?

10. Design a pick and place robot using mechatronics elements and explain about the robot control?

11. Explain the various elements autonomous mobile robots?

12. Discuss in detail, various design factors to be considered while designing a mobile robot?

13. Explain different elements of a wireless surveillance balloon with neat sketch?

14. Discuss various application and advantages of wireless surveillance balloon?

15. Discuss mechatronic design of an automatic car park system?

Or

With necessary diagrams, explain the automatic car parking system

16. Discuss a mechatronics based engine management system?

Or

Explain the design of a mechatronic system used in an engine management system?

Or

Explain about basis of mechatronics system design considering vehicle engine management system as example

17. What is the role of sensors in car management system? Explain with a block diagram?