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DEPARTMENT OF MECHANICAL ENGINEERING
ME6702 - MECHATRONICS

QUESTION BANK

UNIT 1: INTRODUCTION

PART-A

1. List down the key elements of Mechatronics.
2. Name few types of proximity sensors.
3. What do you understand by the term static and dynamic characteristics of transducers?
4. Difference between absolute encoder and incremental encoder.
5. Distinguish between position sensor and light sensor.
6. Mention the functions of a mechatronics system
7. List any four types of sensors and mention their features?
8. Name the few emerging areas of mechatronics.
9. What is meant by closed loop system?
10. Define threshold.
11. Classify photo sensors.
12. Generalized block diagram of measurement system.
13. Describe the principle used to measure temperature.
14. Define impedance of an element.
15. Classify the types of sensors.
16. Explain the principle of piezoelectric pressure sensor.
17. List out the functions of signal conditioner.
18. Explain the use of display system.
19. Write any two applications of Hall Effect sensor.
20. Explain the principle of photo conductivity.
21. Describe the function of comparison element.
22. Classify the types of potentiometer.
23. List out the types of systems.
24. Describe the function of intelligent mechatronics systems.
25. What is meant by settling time?
26. Describe the applications of eddy current.
27. Explain the principle of RTD.

PART-B

1. Explain the working, construction and specification of the following: capacitance sensor, Hall Effect sensor, Thermo couples and photodiodes.
2. Discuss micro processor based controllers with example.
3. Explain the working principle of automatic camera.
4. Describe neatly potentiometer sensor.
5. Explain the temperature measurement using Thermocouples

6. Discuss how displacement is sensed by LVDT. With neat sketch show how it can be made phase sensitive.

7. How is Bourdon tube is used to measure pressure?
8. Explain the principle of the following: Bonded strain gauge, acceleration sensor, RTD.
   Write short notes on:
   i. Photovoltaic transducer
9. Incremental encoders
   Explain the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor.
   Explain the working of pneumatic load cell.
10. How is Bernoulli's principle used to measure flow rates?
11. Define all the dynamic characteristics of sensors
12. Explain the functions of a capacitive sensor in a robot end effector.
13. Formulate the factors to be considered for the selection of sensor? Explain in detail with any two examples.
14. Illustrate about eddy current sensor with neat diagram.
15. Briefly explain about static characteristics of sensors.

UNIT-II: 8085 MICROPROCESSOR AND 8051 MICROCONTROLLER

PART-A

1. Differentiate microprocessor and microcontroller.
2. List any two types of data transfer operations.
3. What are the branch control operations?
4. Compare branch control and machine control operations.
5. Define microprocessor.
6. Give one example for logical instruction program in 8051.
7. Explain about different ports of 8051.
8. Classify the addressing modes of 8085.
9. What is the function of control unit in 8085?
10. What is the function of timing unit in 8085?
11. Describe the features of 8085.
12. List the group of pins in 8085.
13. What is meant addressing mode of 8051 PPI?
14. Define the function of address bus.
15. Explain about register addressing with one example.
16. Define program counter.
17. Illustrate the program status word of 8051.
18. Give one example program for addition of two 8 bit numbers.
19. Differentiate machine language and assembly language program.
20. Classify the types of microprocessor operations.

PART B

1. Discuss architecture of 8051 microcontroller.
2. Explain about the pin configuration of 8085 microprocessor.
   (i)Illustrate the flags of program status word register of 8085 microprocessor
   (ii) Illustrate the register set of 8085 microprocessor.
3. Show the different types of addressing modes of 8085 microprocessor.
4. Describe the various types of instruction set in 8085 microprocessor.
5. Explain the timing diagram of memory read and memory write cycle in 8085 microprocessor.
6. Explain about architecture of 8085 microprocessor.
7. Illustrate various addressing modes of 8051 microcontroller.
   a. Explain with neat sketch about the following
   b. Pin diagram of 8051 microcontroller.
   c. Program status word of 8051 microcontroller.
   d. Write note on various buses in 8085 microprocessor.
   e. Describe the features of 8085 microprocessor.
8. Discuss about the assembly and running of program in 8051.
9. Summarize the instruction set of 8051 microcontroller.
10. (i) Explain the program for logical instructions in 8051 microcontroller.
    (ii) Compare microprocessor and microcontroller.
11. List the three versions of JMP instructions in 8051 microcontroller
12. Explain the features of 8051 microcontroller.

UNIT-III: PROGRAMMABLE PERIPHERAL INTERFACE

PART-A:

1. Express the types of excitation are possible in a stepper motor?
2. What are the salient features of 8255 PPI?
3. Describe the basic functionality of 8255 PPI
4. Give an example program for displaying the seven segments LED.
5. Differentiate input and output handshaking signals.
6. How to select an operating mode in 8255 PPI?
7. What do you meant by DAC?
8. Define micro stepping.
9. Define the function of chip select pin.
10. List out the function of BSR mode.
11. What is the typical use of PPI?
12. Illustrate the classification of ports in 8255.
13. Explain about different ports of 8255.
14. Prepare the process of port c pin selection.
15. Classify the types of data converters.
16. Describe the control word for interfacing switches &LEDs through 8255 PPI.
17. What is the use of BSR mode in 8255 PPI?
18. How does the interfacing take place through 8255 PPI.
19. Describe the need of interfacing.
20. List out different I/O modes of 8255 PPI.

PART-B:

1. (i) Explain the features of 8255 PPI.
   (ii) Explain the need for interfacing.
2. Illustrate the concept of LED display interfacing.
3. What are the requirements for temperature control system? Explain it.
4. Explain the functional description of various pins in 8255 PPI.
5. Explain the types of I/O modes of 8255.
6. (i) Briefly explain about DAC interfacing.
   (ii) Explain the concept of serial interfacing with 8255 PPI.
7. Describe the various operating modes of 8255 PPI.
8. Describe the concept of interfacing with stepper motor.
9. Discuss the concept of ADC interfacing.
10. Explain the architecture of 8255 PPI.
11. Explain about keyboard interfacing.
12. Design the temperature control system with 8255 PPI.
13. Illustrate the concept of traffic control interface.
14. Give the programs for the following,

(a) ADC conversion
(b) Ramp wave form generation

UNIT IV: PROGRAMMABLE LOGIC CONTROLLER

PART-A:

1. Explain the features of PLC.
2. List out the input and output devices.
3. Explain the general rules to write a ladder logic diagram.
4. Quote the advantages of PLC over traditional control systems.
5. Classify the types of logic gates.
6. Differentiate PLC with Personal computer.
7. Create a ladder diagram for Cascaded timers.
8. Create a ladder logic diagram for NAND gate.
9. Describe the effective use of internal relays.
10. Illustrate the ladder diagram for latching.
11. Explain about sinking.
12. List any two applications of latching circuit.
13. List out the elements of PLC.
14. Name the types of timer.
15. List any two applications of Counters.
16. What do you mean by sourcing?
17. State the reason, why PLC is more useful?
18. Classify the memory elements of PLC.
19. Explain the factors to be considered for selection of PLC.
20. Explain the data handling operations in PLC.

PART-B:

1. Describe the temperature control system using PLC.
2. (i) Write the factors to be considered for selecting a PLC.
   (ii)Explain a circuit that can be used to start a motor and then after a delay of 100s start a pump when the motor is switched off there should a delay of 10s before the pump is switched off.
3. (i) Explain about latching circuit with suitable example.
   (ii)Explain about timers.
4. Classify the types of timers.
5. Explain the architecture of PLC with neat sketch.
6. Write various data handling operations.
7. Define the function of sequencing. Draw the ladder diagram for A+B+ A-B
8. Define the function of sequencing. Draw the ladder diagram for A-B-A+B+
9. Explain about ladder diagram for various logic functions.
10. Apply the concept of latching to control the motor and also draw the ladder diagram.
11. Explain about input and output processing of PLC.

12. Write mnemonics codes for various logic operations.
13. (i) Describe about internal relays in detail.
    (ii) Describe about counters.
14. Describe the function of shift register with suitable timing diagram.

UNIT V – ACTUATORS AND MECHATRONIC SYSTEM DESIGN

PART-A

1. What are the different types of stepper motor based on construction?
2. Describe the function of stepper motor.
3. What is magnetic flux?
4. Differentiate stepper motor and servomotor.
5. Point out any one advantage of field control DC Servomotor.
6. Point out few advantages of AC Servomotor.
7. Compare AC & DC Servomotors.
8. Define servomotor.
9. Explain the condition to rotate a servomotor.
10. Define the significant difference between traditional and mechatronics systems.
11. Classify the types of stepper motor based on stator windings.
12. List out the main components of a AC Servomotor
13. List out the advantages of stepper motor.
14. Generalize the mechatronics approach is useful in temperature control of air conditioning system.
15. What are the disadvantages of stepper motor?
16. Illustrate to achieve a control in a DC Servomotor.
17. Discuss how the Potentiometer is replaced in servo system?
18. List out the important stages of design process.
19. Generalize the functions of engine management system.
20. Tell the materials with which that drag cup is made in a rotor.

PART-B:

1. (i) Describe the stages of mechatronics design process.
    (ii) Describe the difference between traditional and mechatronics systems.
2. Explain the concept of Car engine management system by mechatronics approach.
3. (i) Explain the advantages of AC servomotors.
    (ii) What are the difference between stepper motor and servo motor?
4. Explain the construction and working principle of stepper motor.
5. Classify the types of stepper motor. Explain in detail
6. List out the specifications of stepper motor.
7. Write about Automatic car park barrier system.
8. Write shorts on the following,
    (i) Torque-Speed characteristics of servomotor.
    (ii) Comparison of AC & DC Servomotors.
9. (i) List out the advantages and disadvantages of stepper motor.
    (ii) Describe the construction and working principle DC Servomotor with neat diagram.

10. Explain the construction and working principle of AC servo motor.
11. Describe the DC servomotor control theory for the following (i) Field control (8) (ii)Armature Control (8)
12. Illustrate the traditional and mechatronics design process for wind screen wiper. (16)
13. Develop a mechatronics solution for pick and place robot.
14. Describe traditional and mechatronics concept for bathroom scales.
