

VALLIAMMAI ENGINEERING COLLEGE

DEPARTMENT OF MECHANICAL ENGINEERING

SUBJECT CODE / NAME: ME6702 / MECHATRONICS YEAR/SEM: IV /VII

UNIT 1: INTRODUCTION

PART A:

1. List out the types of systems. BT-1
2. Describe the function of intelligent mechatronics systems. BT-2
3. What is meant by settling time? BT-1
4. Describe the applications of eddy current. BT-2
5. Explain the principle of RTD. BT-4
6. Name the few emerging areas of mechatronics. BT-1
7. What is meant by closed loop system? BT-1
8. Define threshold. BT-1
9. Classify photo sensors. BT-3
10. Generalized block diagram of measurement system. BT-6
11. Explain the use of display system. BT-6
12. Write any two applications of hall effect sensor. BT-2
13. Explain the principle of photo conductivity. BT-5
14. Describe the function of comparison element. BT-2
15. Classify the types of potentiometer. BT-3
16. Describe the principle used to measure temperature. BT-1
17. Define impedance of an element. BT-1
18. Classify the types of sensors. BT-3
19. Explain the principle of piezoelectric pressure sensor. BT-5
20. List out the functions of signal conditioner. BT-6

PART B:

1. (i) Discuss the concept of shaft speed control in mechatronics approach with neat block diagram. (8) BT-2
(ii) Explain about measurement system. (8) BT-4
2. Briefly explain about static characteristics of sensors. (16) BT-4
3. (i) Discuss about dynamic characteristics of sensors. (8) BT-2
(ii) Discuss any two types of light sensor. (8)
4. Explain with a neat sketch about strain gauge. (16) BT-4
5. Illustrate about eddy current sensor with neat diagram. (16) BT-3
6. Explain about potentiometer. (16) BT-4

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| 7. Describe the concept of LVDT and capacitance sensor. (16) | BT-1 |
| 8. How will you classify the mechatronics system? (16) | BT-5 |
| 9. Explain the following (i) Temperature sensor (ii) Hall effect sensor (8+8) | BT-5 |
| 10. (i) Illustrate the difference between open loop and closed loop control system. (8) | BT-3 |
| (ii) Describe the concept of control system. (8) | BT-2 |
| 11. Prepare the concept of strain gauge. (16) | BT-6 |
| 12. Describe the following | BT-1 |
| (i) Automatic Control of water level. (8) | |
| (ii) Strain gauge elements. (4) | |
| (iii) Bimetallic strips. (4) | |
| 13. Illustrate with neat sketch about the basic elements of closed loop system. (16) | BT-3 |
| 14. Formulate the factors to be considered for the selection of sensor? Explain in detail with any two examples. (16) | BT-6 |

UNIT-II: 8085 MICROPROCESSOR AND 8051 MICROCONTROLLER

PART A:

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

PART B:

1. Discuss architecture of 8051 microcontroller. (16) BT-2
2. Explain about the pin configuration of 8085 microprocessor. (16) BT-4
- 3.(i) Illustrate the flags of program status word register of 8085 microprocessor (8) BT-3
(ii) Illustrate the register set of 8085 microprocessor. (8)
4. Show the different types of addressing modes of 8085 microprocessor. (16) BT-3
5. Describe the various types of instruction set in 8085 microprocessor. (16) BT-1
6. Explain the timing diagram of memory read and memory write cycle in 8085 BT-4
microprocessor. (16)
7. (i) Write note on various buses in 8085 microprocessor. (8) BT-6
(ii) Describe the features of 8085 microprocessor. (8) BT-1
8. Explain about architecture of 8085 microprocessor. (16) BT-4
9. Illustrate various addressing modes of 8051 microcontroller. (16) BT-3
10. Discuss about the assembly and running of program in 8051.(16) BT-2
11. Summarize the instruction set of 8051 microcontroller. (16) BT-2
12. (i) Explain the program for logical instructions in 8051 microcontroller. (8) BT-4
(ii) Compare microprocessor and microcontroller. (8) BT-5
13. (i) List the three versions of JMP instructions in 8051 microcontroller. (8) BT-1
(ii) Explain the features of 8051 microcontroller. (8) BT-5
14. Explain with neat sketch about the following
(i) Pin diagram of 8051 microcontroller. (8) BT-5
(ii) Program status word of 8051 microcontroller. (8)

UNIT-III: PROGRAMMABLE PERIPHERAL INTERFACE

PART A:

1. Express the types of excitation are possible in a stepper motor? BT-2
2. What are the salient features of 8255 PPI? BT-6
3. Describe the basic functionality of 8255 PPI BT-1
4. Give an example program for displaying the seven segments LED. BT-2
5. Differentiate input and output handshaking signals. BT-4
6. How to select an operating mode in 8255 PPI? BT-4
7. What do you meant by DAC? BT-6
8. Define micro stepping. BT-1
9. Define the function of chip select pin. BT-1
10. List out the function of BSR mode. BT-1
11. What is the typical use of PPI? BT-1
12. Illustrate the classification of ports in 8255. BT-3

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| 13. Explain about different ports of 8255. | BT-5 |
| 14. Prepare the process of port c pin selection. | BT-5 |
| 15. Classify the types of data converters. | BT-3 |
| 16. Describe the control word for interfacing switches & LEDs through 8255 PPI. | BT-2 |
| 17. What is the use of BSR mode in 8255 PPI? | BT-6 |
| 18. How does the interfacing takes place through 8255 PPI. | BT-5 |
| 19. Describe the need of interfacing. | BT-2 |
| 20. List out different I/O modes of 8255 PPI. | BT-1 |

PART B:

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| 1. (i) Explain the features of 8255 PPI. (8) | BT-4 |
| (ii) Explain the need for interfacing. (8) | |
| 2. Illustrate the concept of LED display interfacing. (16) | BT-3 |
| 3. What are the requirements for temperature control system? Explain it. (16) | BT-5 |
| 4. Explain the functional description of various pins in 8255 PPI. (16) | BT-4 |
| 5. Explain the types of I/O modes of 8255. (16) | BT-4 |
| 6. (i) Briefly explain about DAC interfacing. (8) | BT-5 |
| (ii) Explain the concept of serial interfacing with 8255 PPI. (8) | |
| 7. Describe the various operating modes of 8255 PPI. (16) | BT-1 |
| 8. Describe the concept of interfacing with stepper motor. (16) | BT-2 |
| 9. Discuss the concept of ADC interfacing. (16) | BT-2 |
| 10. Explain the architecture of 8255 PPI. (16) | BT-4 |
| 11. Explain about keyboard interfacing. (16) | BT-5 |
| 12. Design the temperature control system with 8255 PPI. (16) | BT-6 |
| 13. Illustrate the concept of traffic control interface. (16) | BT-3 |
| 14. Give the programs for the following | BT-2 |
| (a) ADC conversion (8) | |
| (b) Ramp wave form generation (8) | |

UNIT IV: PROGRAMMABLE LOGIC CONTROLLER

PART A

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| 1. Explain the features of PLC. | BT-5 |
| 2. List out the input and output devices. | BT-1 |
| 3. Explain the general rules to write a ladder logic diagram. | BT-4 |
| 4. Quote the advantages of PLC over traditional control systems. | BT-1 |
| 5. Classify the types of logic gates. | BT-3 |
| 6. Differentiate PLC with Personal computer. | BT-2 |

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| 7. Create a ladder diagram for Cascaded timers. | BT-6 |
| 8. Create a ladder logic diagram for NAND gate. | BT-6 |
| 9. Describe the effective use of Internal relays. | BT-2 |
| 10. Illustrate the ladder diagram for latching. | BT-3 |
| 11. Explain about sinking. | BT-4 |
| 12. List any two applications of latching circuit. | BT-1 |
| 13. List out the elements of PLC. | BT-1 |
| 14. Name the types of timer. | BT-1 |
| 15. List any two applications of Counters. | BT-1 |
| 16. What do you mean by sourcing? | BT-2 |
| 17. State the reason, why PLC is more useful? | BT-2 |
| 18. Classify the memory elements of PLC. | BT-3 |
| 19. Explain the factors to be considered for selection of PLC. | BT-5 |
| 20. Explain the data handling operations in PLC. | BT-4 |

PART B:

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| 1. Describe the temperature control system using PLC. (16) | BT-1 |
| 2. (i) Write the factors to be considered for selecting a PLC. (8) | BT-2 |
| (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. (8) | BT-5 |
| 3. (i) Explain about latching circuit with suitable example. (8) | BT-4 |
| (ii) Explain about timers. (8) | BT-5 |
| 4. Classify the types of timers. (16) | BT-3 |
| 5. Explain the architecture of PLC with neat sketch. (16) | BT-4 |
| 6. Write various data handling operations. (16) | BT-1 |
| 7. Define the function of sequencing. Draw the ladder diagram for A+B+ A-B(16) | BT-1 |
| 8. Define the function of sequencing. Draw the ladder diagram for A-B-A+B+(16) | BT-1 |
| 9. Explain about ladder diagram for various logic functions. (16) | BT-4 |
| 10. Apply the concept of latching to control the motor and also draw the ladder diagram. (16) | BT-3 |
| 11. Explain about input and output processing of PLC. (16) | BT-4 |
| 12. Write mnemonics codes for various logic operations. (16) | BT-6 |
| 13. (i) Describe about internal relays in detail. (8) | BT-4 |
| (ii) Describe about counters. (8) | BT-2 |
| 14. Describe the function of shift register with suitable timing diagram. (16) | BT-1 |

UNIT V – ACTUATORS AND MECHATRONIC SYSTEM DESIGN

PART A:

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

PART B:

1. (i) Describe the stages of mechatronics design process. (8) BT-2
(ii) Describe the difference between traditional and mechatronics systems. (8)
2. Explain the concept of Car engine management system by mechatronics approach. (16) BT-5
3. (i) Explain the advantages of AC servomotors. (8) BT-4

(ii) What are the difference between stepper motor and servo motor? (8)
4. Explain the construction and working principle of stepper motor.(16) BT-4
5. Classify the types of stepper motor. Explain in detail (16) BT-3
6. List out the specifications of stepper motor. (16) BT-1
7. Write about Automatic car park barrier system. (16) BT-1

8. Write shorts on the following BT-1
- (i) Torque-Speed characteristics of servomotor. (8)
 - (ii) Comparison of AC & DC Servomotors. (8)
- 9 (i) List out the advantages and disadvantages of stepper motor. (8) BT-1
- (ii) Describe the construction and working principle DC Servomotor with neat diagram. (8)
10. Explain the construction and working principle of AC servo motor. (16) BT-4
11. Describe the DC servomotor control theory for the following BT-2
- (i) Field control (8)
 - (ii) Armature Control (8)
12. Illustrate the traditional and mechatronics design process for wind screen wiper. (16) BT-3
13. Develop a mechatronics solution for pick and place robot. (16) BT-6
14. Describe traditional and mechatronics concept for bathroom scales. (16) BT-2