

B.E. PRODUCTION ENGINEERING 2ND YEAR 2ND SEMESTER EXAMINATION - 2022

MICROPROCESSOR CONTROL AND MECHATRONICS

Time: 3 hours

Full Marks: 100

ANSWER ANY FIVE QUESTIONS

1. a) Explain the term 'mechatronics'. What do you mean by (i) a sensor, (ii) an actuator, (iii) a microprocessor, and (iv) a microcontroller? 4+8
- b) What do you mean by open loop and closed loop control systems? What are the advantages and disadvantages of closed loop control in comparison to open loop control? 3+5
2. a) What are meant by the following properties of a sensor?
(i) accuracy, (ii) sensitivity, (iii) resolution, (iv) repeatability 8
- b) Explain the working principle of measurement of linear displacement using strain-gauge connected in a wheat-stone bridge circuit. What are the advantages of half-bridge connection over quarter-bridge connection for the measurement of displacement with strain-gauges using wheat-stone bridge circuit? 8+4
3. a) Explain the working principle of an absolute encoder. What is the advantage of Gray code in such encoder? 8+4
- b) Explain the working principle of LVDT in measuring linear displacement. 8
4. a) What is the advantage of using 2's complement method over 1's complement method for adding signed binary numbers? Convert the following decimal numbers into 8-bit signed binary number using 2's complement representation:
(i) 107 (ii) -84 3+4
- b) What is the special characteristic of 'Gray' code? Convert the following Gray codes to binary numbers:
(i) 1100 (ii) 10110 2+2
- c) State and prove De-Morgan's theorems for multiple variables in general. 5
- d) What is the limitation of half adder? How is it overcome in full adder? 4

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- 5.a) Show a 4-bit controlled 2's complement adder-subtractor, and explain its operation. 10
- b) What are the different registers accessible to the programmer in 8085 microprocessor, and what are they used for? 10
- 6.a) Distinguish between direct and indirect addressing modes in general. 3
- b) Explain the different addressing modes for 8085 microprocessor with suitable examples. 12
- c) What addressing modes are used in the following 8085 instructions? '5
(i) LDA 1080 H (ii) ADD C (iii) SUB M (iv) MVI B, 80 H
- 7.a) Explain the operations performed by the following 8085 instructions (**any five**): 10
(i) MOV B, C (ii) MOV A, M (iii) LXI B, 2065 H
(iv) ADD C (v) ADI 23 H (vi) STA 216B H
- b) Write an assembly language program for 8085 microprocessor to add the numbers in registers C and D, then to subtract the number in register B from the sum, and to place the final result in memory location 8050 (hex). 10