

**MECHATRONICS
(MECH 3252)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

***Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.***

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Pressure relief valve is used to
(a) limit the maximum pressure in a hydraulic circuit
(b) reduce the pressure in a hydraulic circuit
(c) control flow in a hydraulic circuit
(d) all of these.
- (ii) In linear ball bush,
(a) bush can rotate
(b) bush can slide
(c) bush can both slide and rotate
(d) none of the above.
- (iii) In the common mode,
(a) both inputs are grounded
(b) the outputs are connected together
(c) an identical signal appears on both the inputs
(d) the output signal are in-phase.
- (iv) How many AND gates are required for a 1-to-8 multiplexer?
(a) 2
(b) 6
(c) 4
(d) 5
- (v) Decimal number 10 is equal to binary number
(a) 1110
(b) 1010
(c) 1001
(d) 1000
- (vi) 2's complement of binary number 0101 is
(a) 1011
(b) 1111
(c) 1101
(d) 1110
- (vii) With zero volts on both inputs, an OP-amp ideally should have an output
(a) equal to the positive supply voltage
(b) equal to the negative supply voltage
(c) equal to zero
(d) equal to CMRR.

- (viii) Which direction is followed for program editing?
(a) Left to right, bottom to top (b) Left to right, top to bottom
(c) Right to left, bottom to top (d) Right to left, top to bottom.
- (ix) What is the function of pin 9 in an 8051?
(a) Reset (b) Ground (c) Interrupt 0 (d) Interrupt 1.
- (x) Each statement below can be true (T) or false (F). Fig.1 shows a ladder diagram rung for which there is an output when:
(i) Inputs 1 and 2 are both activated.
(ii) Either input 1 or input 2 is activated.
(a) (i) T (ii) T, (b) (i) T (ii) F, (c) (i) F (ii) T, (d) (i) F (ii) F
Choose the correct alternative;

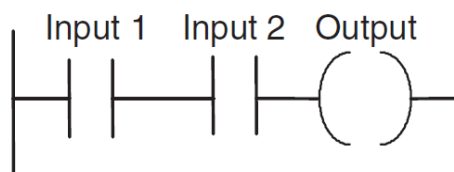


Diagram for Problem 1.Viii.

Fig.1

Group – B

2. (a) What different subject knowledge are required to understand a Mechatronic system? Explain with an example.
- (b) How rotary to linear motion is derived in a Mechanical system? Give sketches of two such mechanisms.
- (c) Explain the working principle of a Recirculating Ball-Screw-Nut system mentioning its purpose of use.
- 4 + 4 + 4 = 12**
3. (a) Show and describe a hydraulic circuit to operate a hydraulic actuator within two end limits using two limit switches.
- (b) Explain the operating principle of a Stepper Motor giving its full step sequence.
- 6 + 6 = 12**

Group – C

4. (a) Discuss about the different types of inputs of a system. Also write their expressions in time domain and frequency domain.
- (b) Derive the transfer function relating ambient temperature and the mercury temperature for a mercury thermometer by considering the mercury stored in the bulb as lumped system.
- 5 + 7 = 12**
5. (a) What is Instrumentation amplifier? Explain with circuit diagram.

(b) Write short notes on Schmitt trigger.

(5 + 2) + 5 = 12

Group – D

6. (a) What is logic gate?

(b) Draw the simplified logic circuit diagram for the following expression $F(A,B,C) = \Sigma(0,2,5,7)$.

2 + 10 = 12

7. (a) Explain the working of J-K flip flop.

(b) Explain with diagram how D flip- flop can be used to store 4 bit data.

6 + 6 = 12

Group – E

8. (a) Write down the major features of 8051 microcontroller.

(b) Write an 8051 C-program to get a byte of data from P0. If it is less than 100, send it to P1; otherwise, send it to P2.

5 + 7 = 12

9. (a) What are the advantages of a PLC over a hard wired relay logic system?

(b) A feeder drops material on the conveyor which sends material for further process through one more conveyor. Conveyor must start automatically when material is dropped on it. Implement automation of this in PLC using Ladder Diagram programming language.

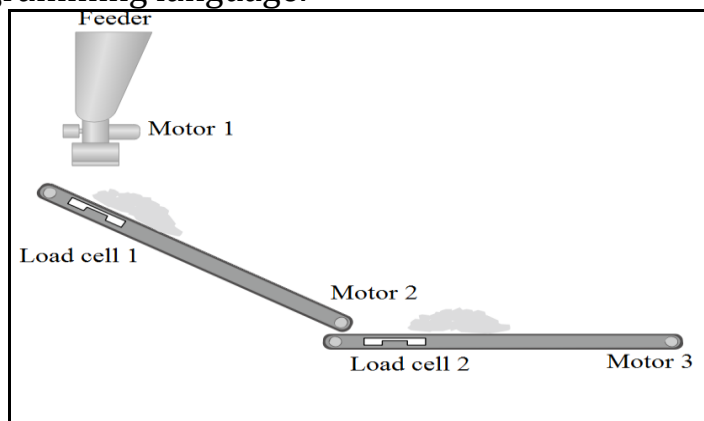


Fig.2

4 + 8 = 12

Department & Section	Submission Link
ME	https://classroom.google.com/c/MzY5NDczNzUzNDUw/a/MzY5NDczNzUzNDY1/details