# Indian Institute of Information Technology Kota
## Department of Electronics and Communication Engineering
### ECT206- Microcontrollers and Interfacing
### II Year IV Semester End Term Examination-2024

**Time: 120 Minutes** **Date: 15/05/2024** **Max. Marks: 40**

Q.1 a) Differentiate between Microprocessor and Microcontrollers.

b) Differentiate between following instructions used in 8051 Assembly Language Programming:

i) MOV A,@R0 & MOV A, R0 ii) LJMP & SJMP

iii) MOV A,#23H & MOV A,23H iv) ACALL & LCALL

c) classify the following instructions according to their addressing modes. Also, explain the functions of these instructions.

i) INC 50H ii) ANL A,#30H

iii) MOV @R1,A iv) CPL A

**[2+2+2]**

Q.2 (i) Assume that 5 BCD data items are stored in RAM locations starting at 50H. Write a program to find the sum of all numbers. The result must be in BCD only.

(ii) Write a Program to add two 32-bit numbers stored in RAM Locations as shown below:

| First number: | | Second number: | | Result: | |
|---|---|---|---|---|---|
| **Address** | **Data** | **Address** | **Data** | **Address** | **Data** |
| 50H | A0H | 60H | FDH | 40H | |
| 51H | 3BH | 61H | 05H | 41H | |
| 52H | 39H | 62H | C7H | 42H | |
| 53H | 01H | 63H | 56H | 43H | |

**[3+3]**

Q.3 Explain 8255 PPI with block diagram, modes of operation and its control register format. Find the control word of the 8255 for the following configurations:

a) All the ports of A, B, and C are output ports (mode 0)

b) PA = in, PB = out, PCL = out, PCH = out.

**OR**

In the circuit shown in figure 1, connect a switch SW to pin P0.0. write a program to do following:

a) When SW=0, the DAC output gives a staircase waveform.

b) When SW=1, the DAC output gives a Triangular waveform.

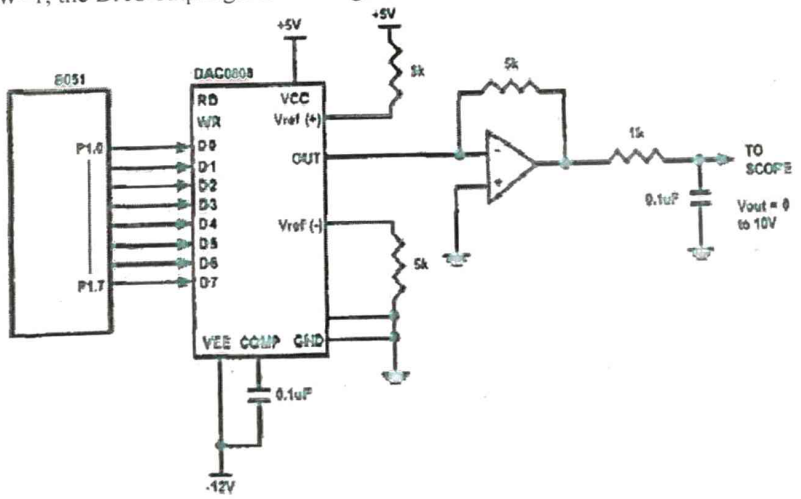


Figure 1

**[10]**

**P.T.O.**

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Q.4 A switch SW is connected to pin 2.7. write a program to monitor the status of SW and perform the following:

a) If SW=0, the DC motor moves clockwise.

b) if SW=1, the DC motor moves counterclockwise.

**OR**

Explain the process of scanning a keyboard matrix in the context of interfacing with the 8051 Microcontroller. Write a program to send Letters 'M', 'D' and 'E' to 2 x 16 LCD display using delays.

**[8]**

Q.5 Design a Water level controller system as shown in figure.

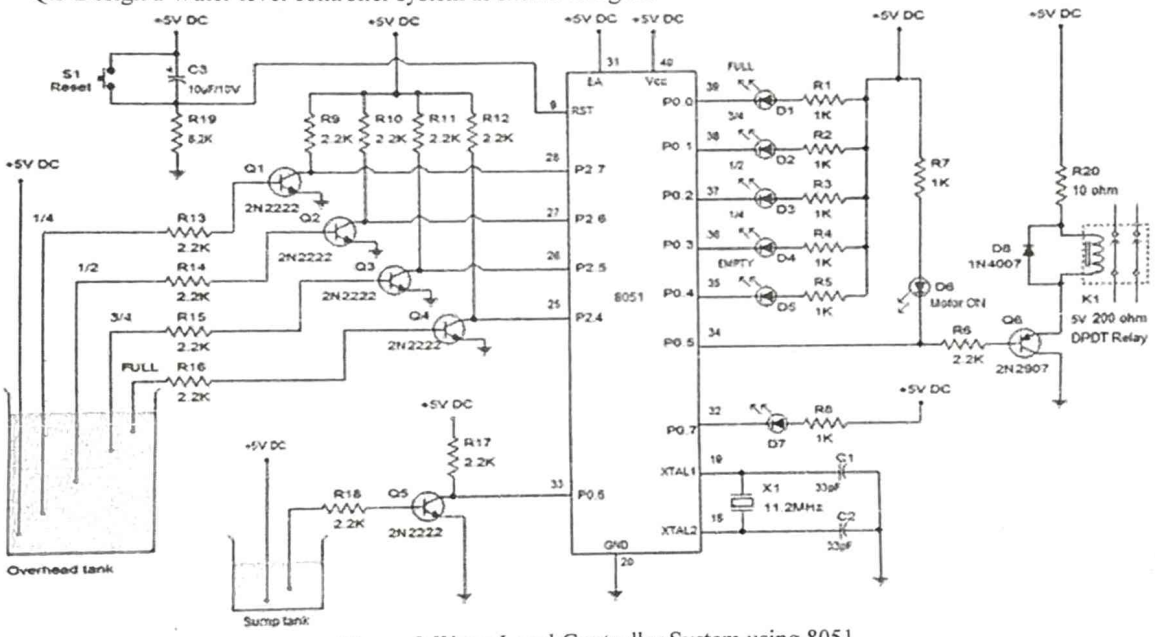


**Figure 2** Water Level Controller System using 8051

- The level sensor probes for the overhead tank are interfaced to the port 2 of the microcontroller through transistors. Have a look at the sensor probe arrangement for the overhead tank in Figure 2.
- A positive voltage supply probe goes to the down bottom of the tank. The probes for sensing 1/4, 1/2, 3/4 and FULL levels are placed with equal spacing one by one above the bottom positive probe.
- Consider the topmost (full level) probe, its other end is connected to the base of transistor Q4 through resistor R16. Whenever water rises to the full level current flows into the base of transistor Q4 which makes it ON and so its collector voltage goes low. The collector of Q4 is connected to P2.4 and a low voltage at pin P2.4 means the overhead tank is not FULL. When water level goes below the full level probe, the base of Q2 becomes open making it OFF. Now its collector voltage goes high and high at P2.4 means the tank is not full.
- The same applies to other sensor probes (3/4, 1/2, 1/4) and the microprocessor understands the current level by scanning the port pins P2.4, P2.5, P2.6 and P2.7. All these port pins are high (all sensor probes are open) means the tank is empty.
- Port pin P0.5 is used to control the pump. Whenever it is required to start pumping, the controller makes P0.5 low which makes transistor Q6 ON which in turn activates the relay K1 that switches the pump.
- Also, the LED d6 glows indicating the motor is ON. LED D7 is the low sump indicator. When the water level in the sump tank goes low, the controller makes P0.7 low which makes LED D7 to glow.

**[10]**