7. (a) Write a short note on Static and Dynamic RAM's (5)

(b) Discuss PROM, EPROM and EEPROM type of memories. (5)

(c) Draw the architecture of 8085 microprocessor and discuss its main components. (5)

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May, 2023
B.Sc. (H) Physics Semester-IV
Digital Systems & Applications (BPH-403A)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) Given that $16_{10} = 100b$, find the value of b. (1.5)

(b) What do you mean by a universal gate? Implement OR gate using NAND gates only. (1.5)

(c) State De Morgan's theorems. (1.5)

(d) Explain how many minimum input lines are required to implement a decoder circuit which has 10 output lines? (1.5)

(e) What is a multiplexer? Why is it call as data-selector? (1.5)

(f) How many clock pulses are required for loading a 4-bit data and receiving it at output in a SIPO shift register? (1.5)

(g) Explain 'Preset' and 'Clear' operations in Flip-flops. (1.5)

(h) What are D and T flip-flops? Why are they called so? (1.5)

(i) For a 32-bit system, a memory is specified as 1GB. How many memory locations are there? (1.5)

(j) Write main features (any three) of 8085 microprocessor. (1.5)

PART–B

2. (a) Draw the Diode Logic (DTL) circuit for NAND gate and explain its working. (5)

(b) Prove the following using Boolean algebra and implement simplified expression using NAND gates only (5)

$(A + B)(\overline{A} + C)(B + C) = (A + B)(\overline{A} + C)$.

(c) Write the Boolean expression, truth table and implement the circuit of a full subtractor using NAND gates only. (5)

3. (a) Convert $(378.5)_{10}$ in equivalent binary, octal, hexadecimal and BCD code. (5)

(b) What is overflow condition in binary arithmetic? Add –75 to +26 using 8-bit in 2's complement arithmetic. (5)

(c) Solve the following expression using K-map and implement the simplified expression using NAND gates only: (5)

$Y(A,B,C,D) = \Sigma (m_0, m_1, m_2, m_3, m_5, m_8, m_9, m_{10}, m_{12}) + \Sigma (d_7, d_{13})$.

4. (a) Implement a 4-to-10 line decoder circuit using NAND gates, write the decoding function, make a truth table and explain its working. (5)

(b) What is an encoder circuit? Make the truth table, write the encoder equations and implement the circuit of an octal-to-binary encoder. (10)

5. (a) Implement an SR flip-flop circuit using D-type flip-flop. Make the excitation table of the circuit. (5)

(b) What are shift registers? Explain with suitable circuit diagram the working of a 4-bit PISO shift register. (10]

6. (a) Differentiate between asynchronous and synchronous counters. (5]

(b) Draw the circuit diagram, output table and waveforms of a MOD-12 asynchronous up counter and explain its working. (10)