

Roll No. ....

Total Pages : 3

**321409**

May, 2023

**B.Sc.(H) Physics (Reappear) IV SEMESTER  
Digital Systems & Applications (BPH-403)**

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) Write the hexadecimal equivalent for the number  $(59.5)_{10}$ . (1.5)
- (b) Implement AND gate circuit using NOR gates only. (1.5)
- (c) Express +39 and -25 using 8-bits in 2's complement form. (1.5)
- (d) What is the difference between combinational and sequential circuits? (1.5)
- (e) Draw the circuit of 4-bit ODD parity generator using XOR gate. (1.5)
- (f) How many minimum output lines are there in an encoder circuit which has 90 input lines? (1.5)

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- (g) Draw the circuit of S-R latch using NOR gates and write its truth table. (1.5)
- (h) Define ROM and RAM memories. (1.5)
- (i) Give any two applications of IC-555. Why the IC is named so? (1.5)
- (j) Write main features of 8085 microprocessor. (1.5)

**PART-B**

- 2. (a) Draw the Diode Logic (DL) circuit for AND gate and explain its working. (5)
- (b) Prove the following using Boolean Algebra and implement simplified expression using NAND gates only.  $AB + A\bar{B}C + B\bar{C} = AC + B\bar{C}$ . (5)
- (c) What is the limitation of Half-adder circuit? Draw the truth table and implement the circuits of half-adder and full-adder using NAND gates only. (5)
- 3. (a) What do you mean by universal gate? Implement AND, OR, NOT and XOR gates using NAND gates only. (5)
- (b) Discuss main points of minterm and maxterm expressions. (5)
- (b) Solve the following expression using K-map and implement the simplified expression using NAND gates only :  
 $Y (A, B, C, D) = \Sigma m(1, 3, 7, 11, 15) + \Sigma d(0, 2, 5)$ . (5)

- (a) What is a multiplexer circuit? Implement a 4-to-1 multiplexer and explain its working. (5)
- (b) Implement a BCD decoder, make a truth table and explain its working. (10)
- 5. (a) Draw the MS flip-flop circuit and explain how it prevents racing problem. (5)
- (b) What are shift registers? Explain with suitable circuit diagram the working of a 4-bit shift register as a ring counter. (10)
- 6. (a) Design a Mod-10 asynchronous up-counter, make the truth table, draw the waveform diagram and explain its working. (10)
- (b) Draw the circuit of an astable multivibrator using 555 timer IC and explain its operation. Derive the expression for its frequency. (5)
- 7. (a) Differentiate between static and dynamic ROM's. (5)
- (b) Discuss the arithmetic and logical groups of 8085 microprocessor circuit. (10)