



‘সমানো মন্ত্র: সমিতি: সমানী’

**UNIVERSITY OF NORTH BENGAL**  
B.Sc. Honours 3rd Semester Examination, 2022

**CC7-PHYSICS**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.*

**GROUP-A**

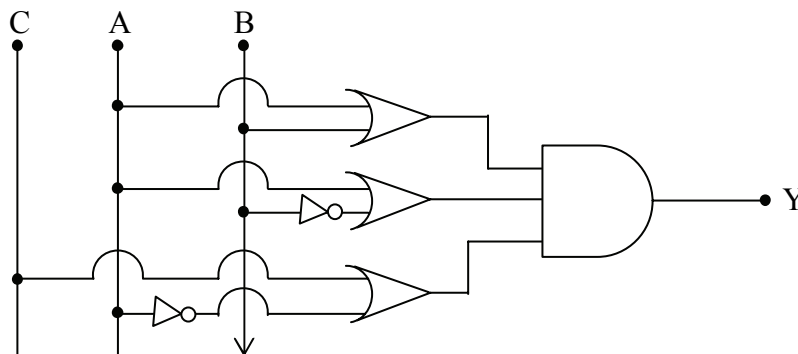
1. Answer any **five** questions from the following: 1×5 = 5
  - (a) Subtract  $(1101)_2$  from  $(100010)_2$ . 1
  - (b) What is the minimum number of bits required to encode 56 elements of information? 1
  - (c) Why is a 2 input XOR gate is called an inequality detector? 1
  - (d) Convert the hexadecimal number  $(1E.43)$  into binary number. 1
  - (e) State the De Morgan’s theorem. 1
  - (f) Simplify the Boolean expression  $AB + A\bar{C} + BC$ . 1
  - (g) What will be the output of a SR flip-flop, when both set and reset are disabled? 1
  - (h) What is meant by parallel load of a shift register? 1

**GROUP-B**

Answer any **three** questions from the following

5×3 = 15

2. (a) With proper circuit diagram and truth table explain the functioning of a full subtractor. 4
- (b) What are Maxterm and Minterm? 1
3. (a) Use NAND and NOR gates to create OR, AND and NOT gates. 1½ + 1½
- (b) Write the logic statement corresponding to the following logic circuit and simplify it. 2



4. What is multiplexer? Design a 4:1 multiplexer using basic gate. 1+4

5. (a) Explain the operation of IC 555 with proper block diagram. 3  
 (b) Differentiate between synchronous and asynchronous counters. 2
6. (a) Simplify the following logic expression using K-map 3  

$$Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + A\overline{B}C + A\overline{B}C + ABC$$
  
 (b) What are the key differences between RAM and ROM? 2

**GROUP-C**

**Answer any two questions from the following**

10×2 = 20

7. (a) What is a SR-Flip Flop? Why is JK Flip-Flop preferred over SR-Flip Flop? 1+1  
 (b) Construct a JK-Flip Flop using combination of SR-Flip Flop and logic gates and hence explain its functioning with a detailed truth table. 2+3  
 (c) What is race around condition and how is it removed in JK-Flip Flops? 1+2
8. (a) Construct a 4-bit parallel-in-serial out (PISO) shift register using JK flip flops and hence explain its working. 3+3  
 (b) Construct a 4 bit ripple counter and explain its working. 4
9. (a) What is a multivibrator? Draw the circuit diagram of an astable multivibrator and explain its principle of operation. Hence find the expression for the frequency of oscillation. 1+2+2+2  
 (b) Design a logic circuit with minimum number of logic gates to implement the following truth table 3

A	B	C	Y <sub>1</sub>	Y <sub>2</sub>
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	0
1	0	0	0	0
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

- 10.(a) Simplify the following using Boolean algebra: 1½+1½  
 (i)  $\overline{AB + BC + CA}$   
 (ii)  $A + AB + \overline{A}B$
- (b) Show that  $(A \oplus B) \oplus C = A \oplus (B \oplus C)$  3
- (c) Write short notes on any two of the following: 2+2  
 (i) Memory organization  
 (ii) Memory Map  
 (iii) Data storage in computer.

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