

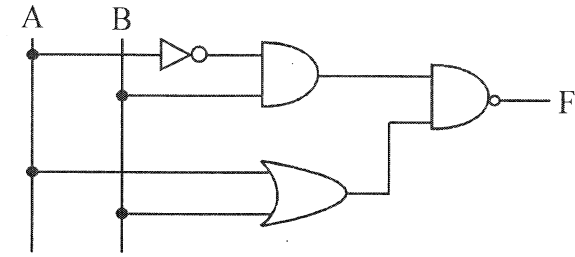
**U.G. 4th Semester Examination - 2021****PHYSICS****Course Code : BPHSCCHC 403****Course Title : Digital Systems and Applications**

Full Marks : 30

Time : 2 Hours

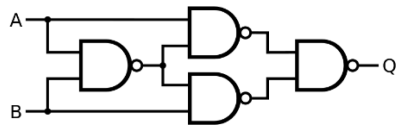
*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words with proper sketch or circuit diagram where necessary.**All abbreviations have their usual meanings.*

1. Answer any **ten** questions:  $1 \times 10 = 10$
- What is the duty cycle of a circuit?
  - What do you understand by BCD codes?
  - What is the function of encoders in digital circuits?
  - What are the main functions of shift registers?
  - What will be the output of the following circuit?



- Find the binary equivalent of the hexadecimal number  $(32.A4)_{16}$ .
- What will be the number of outputs of a decoder which has 'N' number of inputs?
- What do you mean by positive logic? If a digital circuit is operated between  $-0.2$  V to  $-3.0$  V and we take  $-0.2 = 1$  and  $-3.0 = 0$ . Is this logic positive or negative?
- Prove  $(A+B)(A+C) = A+BC$  using Boolean algebra.
- A circuit has three input and one output terminals. The output is 1 if any two of the three inputs are 1 and 0 for any other combination of inputs. Find the logical expression of the output.
- How many control-inputs are necessary for a 100 to 1 multiplexer?

l) Write down the truth table for the given circuit:



m) Subtract  $(1010)_2$  from  $(1100)_2$  by 1's complement method.

n) How many flip-flops are required to construct a mod-1024 ripple counter?

o) Compare static RAM with Dynamic RAM.

2. Answer any **five** questions:  $2 \times 5 = 10$

a) Write the advantages of integrated circuits over discrete circuits.

b) Draw a neat circuit diagram for a positive logic OR gate with two diodes.

c) Design a digital circuit with basic gates for the truth table:

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

d) What are the advantages and disadvantages of synchronous over asynchronous counter?

e) Draw a neat pin diagram of a 555-timer connected as an astable multivibrator.

f) What is the main difference between combinational logic circuit and sequential logic circuit? Give one example of each.

g) If A and B are two Boolean variables, show that

$$\overline{\overline{A}B} + \overline{A\overline{B}} = AB + \overline{A}\overline{B}$$

h) Draw the Karnaugh map of the Boolean expression  $F = \overline{A}B\overline{C} + \overline{A}\overline{B}\overline{C} + \overline{A}BC + A\overline{B}\overline{C}$  and hence find its simplified form.

3. Answer any **two** questions:  $5 \times 2 = 10$

a) What is a flip-flop? Draw the logic circuit and the truth table of an RS flip-flop using NOR gates. Explain the different states of an RS flip-flop.  $1 + (1+1) + 2$

b) Simplify the SOP representation of output  $Y = \sum m(2,3,5,6,7,10,11,13,14,15)$  into its simplest form and design the digital circuit to get that output.  $3+2$

c) Explain the operation of a 4-bit serial input shift register with proper block diagram.  $4+1$