B.Sc. Semester-III Examination, 2022-23

PHYSICS [Honours]

Course ID : 32413 **Course Code : SH/PHS/303/C-7**

Course Title : Digital Systems and Applications

Time : 1 Hour 15 Minutes Full Marks : 25

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

UNIT-I

1. Answer any **five** of the following questions: 1×5=5

a) Discuss the advantages of Digital Signal over Analog Signal.

b) Represent $(-17)_{10}$ in two's complement representation.

c) How does a Karnaugh map differ from a truth table?

d) What is the basic difference between a memory latch and a flip flop?

e) What is the clock cycle time for a digital system that uses a 500 kHz clock?

f) Why preset and clear inputs are called overriding inputs?

g) Write basic differences between RAM and ROM.

h) Write one important application of register.

UNIT-II

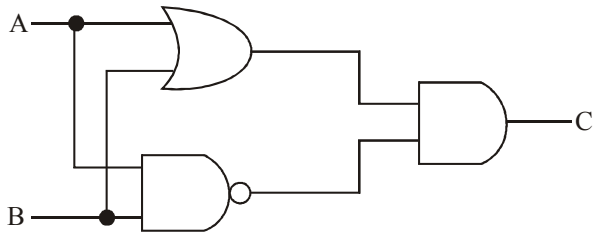
2. Answer any **two** of the following questions: 5×2=10

a) i) Reduce the expression:

$$F = \bar{A} \cdot \bar{B} \cdot \bar{C} + A \cdot B \cdot \bar{C} + A \cdot \bar{B} \cdot \bar{C} + \bar{A} \cdot B \cdot C$$

using K-mapping.

ii) Find the Boolean expression and Truth table of the following logic circuit. Identify the gate that given circuit realizes. 2+3=5



b) Why a multiplexer is called a data selector? Draw a logic circuit diagram of a 4:1 multiplexer and explain its operation. 1+1+3=5

c) Can we design a T-flip flop using RS flip flop? - Explain. Explain the function of clock signal of D-flip-flop. In which condition, race around problem arises in JK flip flop? 2+2+1=5

d) Draw the circuit diagram of a mono-stable multi-vibrator using Timer IC 555 and explain the operation of it. 2+3=5

UNIT-III

3. Answer any **one** of the following question: 10×1=10

a) What is a counter? Write the differences between asynchronous counter and synchronous counter. Draw a block diagram of a 3-bit synchronous counter and explain its operation. What do you mean by down counter? Write down the minimum number of flip flops required to design a synchronous decade counter. 1+2+4+2+1=10

b) i) If $F = A + \bar{B} \cdot C$; express F in terms of sum of minterms.

ii) What are different types of Registers? Discuss 4-bit Parallel in Parallel out Shift Register using Flip Flops. 1+(3+1)+5=10

OR

What is the basic difference between Address Bus and Data Bus? Briefly discuss the different parts of a basic Computer Organization system with block diagram. 2+8=10

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