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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - JUN 2023**

**Semester :** Semester II - 2022

**Course Code :** EEE2015

**Course Name :** Sem II - EEE2015 - Digital Electronics

**Program :** EEE

**Date :** 21-JUN-2023

**Time :** 1.00PM - 4.00PM

**Max Marks :** 100

**Weightage :** 50%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.
  - (ii) Question paper consists of 3 parts.
  - (iii) Scientific and non-programmable calculator are permitted.
  - (iv) Do not write any information on the question paper other than Roll Number.
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**PART A**

**ANSWER ALL THE QUESTIONS**

**(10 X 3 = 30M)**

1. Form a single logical statement from the following information:  
(a) The light is ON if SW1 is closed.  
(b) The light is ON if SW2 is closed.  
(c) The light is OFF if both SW1 and SW2 are open.  
(CO1) [Knowledge]
2. Describe the functionality of a Flip Flop. Mention the applications of it.  
(CO4) [Knowledge]
3. Identify the decoding logic for each of the following codes if an active-HIGH (1) output is required.  
(a) 1101 (b) 1000  
Also draw the decoding logic diagram.  
(CO3) [Knowledge]
4. State the differences between encoder and priority encoder. Also mention the applications of encoder.  
(CO3) [Knowledge]
5. Draw the logic circuit represented by each expression:  
(a)  $AB + (AB)'$  (b)  $ABCD$  (c)  $A + (BC)'$   
(CO1) [Knowledge]
6. Using Boolean algebra techniques, reproduce the following expressions as much as possible:  
(a)  $A(A + B)$  (b)  $A(A' + AB)$   
(CO1) [Knowledge]

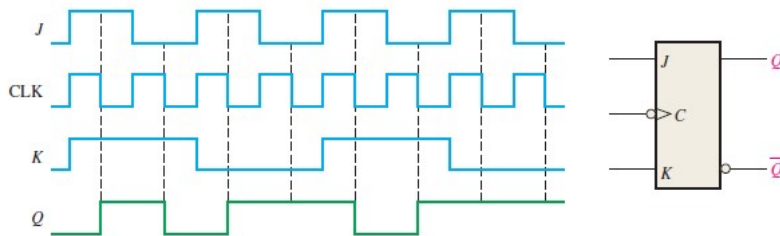
7. Most digital systems process binary data in groups that are multiples of four bits, making the hexadecimal number very convenient because each hexadecimal digit represents a 4-bit binary number. Write the following binary numbers to hexadecimal: (a) 1100101001010111 (b) 111111000101101001  
(CO1) [Knowledge]
8. Write the standard product term for each cell in a 3-variable Karnaugh map.  
(CO2) [Knowledge]
9. The NAND gate is a universal gate because it can be used to produce the NOT, the AND, the OR, and the NOR functions. State the number of NAND gates needed to produce the AND, OR and NOT gates.  
(CO2) [Knowledge]
10. Describe the functionality of sequential circuits along with the examples.  
(CO4) [Knowledge]

## PART B

ANSWER ALL THE QUESTIONS

(3 X 10 = 30M)

11. Mr. James intends to use a minimization technique, which is simpler and less error-prone compared to other methods to reduce the Boolean expression  $F = m(0,1,2,4,7,8,9,10,12)+d(3,6,13,15)$ . Put yourself in place of Mr. James, identify the technique which is suited for the above statement. Using the identified technique, express the minimized Boolean expression and implement the logic diagram for the same.  
(CO2) [Comprehension]
12. J-K flip-flop a type of flip-flop that can operate in the SET, RESET, no-change, and toggle modes. Determine if the flip-flop in Figure is operating properly, and if not, identify the most probable fault.



- (CO4) [Comprehension]
13. A decoder is a digital circuit that detects the presence of a specified combination of bits (code) on its inputs and indicates the presence of that code by a specified output level. You wish to detect only the presence of the codes 1010, 1100, 0001, and 1011. An active- HIGH output is required to indicate their presence. Develop the minimum decoding logic with a single output that will indicate when any one of these codes is on the inputs. For any other code, the output must be LOW  
(CO3) [Comprehension]

**PART C**

**ANSWER ALL THE QUESTIONS**

**(2 X 20 = 40M)**

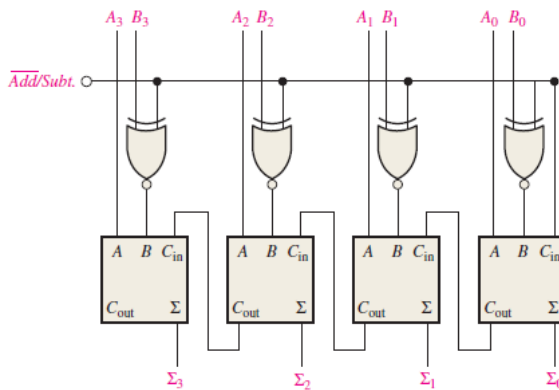
14. a. The application of a flip-flop is dividing (reducing) the frequency of a periodic waveform. It is required to get an f<sub>out</sub> waveform with a frequency of 1Khz by showing a flip flop arrangement, when an 8 kHz square wave input is applied as shown in below figure to the clock input of first flip-flop. (i) identify the number of flip flops needed to get the required f<sub>out</sub>. (ii) Also show the the waveforms of the connected flip flops.



- b. The serial in/serial out shift register accepts data serially—that is, one bit at a time on a single line. It produces the stored information on its output also in serial form. Show the Shifting of a 4-bit code of 1001 into the shift register.

(CO4) [Application]

15. a. The circuit shown in below Figure is a 4-bit circuit that can add or subtract numbers in a form used in computers (positive numbers in true form; negative numbers in complement form). Interpret what happens when the Add/Subt. input is HIGH and when Add/Subt. is LOW? The inputs are A = 1010, and B = 1101.



- b. Show the truth table and logic diagram of a 3 bit comparator with two inputs.

(CO3) [Application]