LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

FIRST SEMESTER – **APRIL 2023**

UPH 1502 – INTRODUCTION TO DIGITAL ELECTRONICS

Date: 09-05-2023   Dept. No.   Max. : 100 Marks
Time: 01:00 PM - 04:00 PM

SECTION A				
Answer ALL the Questions				
1.	**Define the following**			**(5 x 1 = 5)**
i	Positive and negative logic.		K1	CO1
ii	Multiplexer.		K1	CO1
iii	2's complement representation of a binary number.		K1	CO1
iv	ASCII.		K1	CO1
v	Race around condition.		K1	CO1
2.	**Fill in the blanks**			**(5 x 1 = 5)**
i	On a Karnaugh map two adjacent 1's are called a………….		K1	CO1
ii	A logic circuit with one input and many outputs is called a …………..		K1	CO1
iii	The result of binary subtraction of 011100 from 1011100 …………………….		K1	CO1
iv	………….. bits are required to represent decimal 15.		K1	CO1
v	When S=0, R=0, CLK=X then the output will be _____		K1	CO1
3.	**State true or false**			**(5 x 1 = 5)**
i	Fundamental products are also called as min terms.		K2	CO1
ii	A decoder has 2^n inputs and n address lines		K2	CO1
iii	The binary number for decimal 255 is 1001 1111		K2	CO1
iv	If the sign bit is one, the given number is negative.		K2	CO1
v	A flip flop cannot be used as a register		K2	CO1
4.	**MCQ**			**(5 x 1 = 5)**
i	Which among the below given Boolean expressions do not obey De Morgan's theorem? a) $\overline{X + Y} = \bar{X} \cdot \bar{Y}$ b) $\overline{X.Y} = \bar{X} + \bar{Y}$ c) $X.Y = \overline{X + Y}$ d) None of the above		K2	CO1

ii	How many bits of information does a flip-flop store? a) One bit b) two bits c) three bits d) ten bits	K2	CO1	
iii	Convert $(214)_8$ into decimal. a) $(140)_{10}$ b) $(141)_{10}$ c) $(142)_{10}$ d) $(130)_{10}$	K2	CO1	
iv	What is the 2's complement representation of 1101 0011? a) 0101 0101 b) 0010 1101 c) 0001 1100 d)1010 1000	K2	CO1	
v	A 3-input NOR gate has eight input possibilities, how many of those possibilities will result in a HIGH output? a) 1 b) 2 c) 7 d) 8	K2	CO1	

SECTION B

Answer any TWO of the following in about 150 words   **(2 x 10 = 20)**

5.	(a)Analyse and show that $\bar{A} B C + A\bar{B}C + A B \bar{C} + ABC = AB + BC + CA$ (6 marks) (b)Construct the logic gates EX-NOR and EX-OR gates and give the appropriate truth table. (4marks)	K3	CO2
6.	Sketch the circuit of clocked RS flip flop and with the truth table explain its working.	K3	CO2
7.	Explain the working of 4 input multiplexer with a block diagram and truth table.	K3	CO2
8.	With the truth table describe in detail the working of a full adder and draw the circuit for its SUM and CARRY expression.	K3	CO2

SECTION C

Answer any TWO of the following in 150 words   **(2 x 10 = 20)**

9.	Simplify: (a) Add using binary number system $(94)_{10}$ & $(125)_{10}$ (5 marks). (b) Subtract using binary number system $(56)_{10}$ from $(93)_{10}$ (5 marks).	K4	CO3
10.	With the diagram explain the BCD to seven segment decoder in detail.	K4	CO3
11.	State and prove Demorgan's theorem.	K4	CO3
12.	Explain the working of NAND latch with a neat circuit diagram	K4	CO3

SECTION D

Answer any ONE of the following   **(1 x 20 = 20)**

13.	(a) Summarize the working of NOR gate as an universal gate (12 marks)
	(b) Solve the following
	
	    i) Add 215 & 125 in binary number system (4 marks)
	
	    ii) Subtract 123 & 65 in binary number system (4 marks)
		K5	CO4

14.	(a) Convert
	    i. $(65534)_{10}$ to Hex
	    ii. $(FFFF.A)_{16}$ to decimal
	    iii. $(98.625)_{10}$ to octal
		K5	CO4

iv. $(111011011.111011)_2$ to Hex   ($4 \times 3 = 12$marks)

(b)) Explain the working of D- flip flop with the circuit diagram and truth table. (8 marks)

SECTION E

Answer any ONE of the following   **(1 x 20 = 20)**

15.	(a)Design a K-map and give the logic expression (i)Y = F (A,B,C,D) = $\sum$ (0,2,4,6,8) + $\sum_d$ (10,11,12,13,14,15) (8 marks) (ii) Y = F(A,B,C,D) = $\sum$ (0,1,3,5,7,9,11,12,13,14,15) (6 marks) (b) Change (i) $(1010111)_2$ to Gray code. (3 marks) (ii) $(111011)_G$ to binary code. (3 marks)	K6	CO5
16.	(a) Describe the working of JK flip flop with a neat diagram and truthtable. (12 marks) (b) $(3EF.8)_{16} = (X)_{10} = (Y)_2 = (Z)_8$. Find X, Y ,Z (8 marks)	K6	CO5

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