TRƯỜNG ĐHBKHN VIỆN ĐIỆN	**FINAL EXAM – 20192** EE2130E – Digital System Design – N.1 Time: **90'**	Chữ ký giảng viên phụ trách HP	Chữ ký Bộ môn

Question 1: (3 marks) *(Note: you must show all your work in order to obtain full marks)*:

Consider the number X=-12.21_{10} and ansswer the questions below, showing all your work:
a) Convert the number X above to its binary representation, using an approximation to 4 decimal places. (1 marks)
b) Use the binay value for X obtained in part a) to determine its representation in the IEEE-754 normal floating point representation. (1 marks)
c) Take the sign and interger part of the number X above, and sotr it as a 16-bit 2's complement number. (1 marks)

no fraction

Question 2 (2 marks) *((Note: you must show all your work in order to obtain full marks)*:

The logic circuit in Figure 1 has 4-bit binary with A (LSB); D (MSB); the ON/OFF status of L1 LED is controlled by the digital out-put Y. Design a combinational circuit that controls L1 LED in Figure 1 using only NAND gate 2-input. L1 LED is ON when Decimal of coresponding with 4-bit input is more than 5.

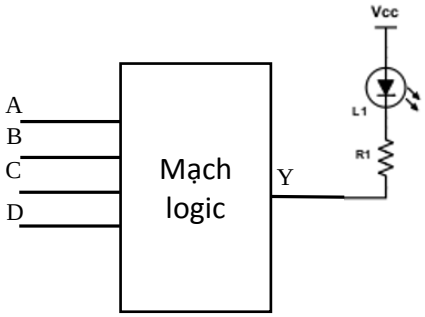

Figure.1

Question 3 (2 marks):
Design a combinational circuir that accept a 3-bit binary input and produces a 3-bit binary output under these conditions:
If the 3-bit binary input is less than 5, the circuit will give an output value equals to the input value pluss one.
Your answer must include all the required steps i.e., the Truth Table, the Karrnaugh maps and the circuit diagram for a minimum cost solution (in terms of the number of logic gates required.

Question 4 (3 marks): Show how to design a circuit for a clocked synchronous state machine with edgetriggered D flip-flops that controls two timed traffic lights on two adjacent roads, to regulate the flow of traffic as presented below in Figure 2.

- The circuit has one input X (if X=0, then the traffic lights stay at the current state but if X=1, then the traffic light should operate as normal according to the clock signal provided).
- The circuit also has 6 outputs connected to the traffic light elements (see Figure 2). The control machine contains 8 different states to represent the relation between the two traffic lights (see Table 1).

Your answer must show how each of the design process steps are applied to this circuit, from generating the State Diagram (and State/Output Table) for the diagram, through to drawing the logic diagram for the circuit. You must also apply the Simple state assignment encoding scheme.

State	Traffic Light 1	Traffic Light 2
1	Red	Green
2	Red	Yellow
3	Red	Red
4	Red and Yellow	Red
5	Green	Red
6	Yellow	Red
7	Red	Red
8	Red	Red and Yellow

Table 1

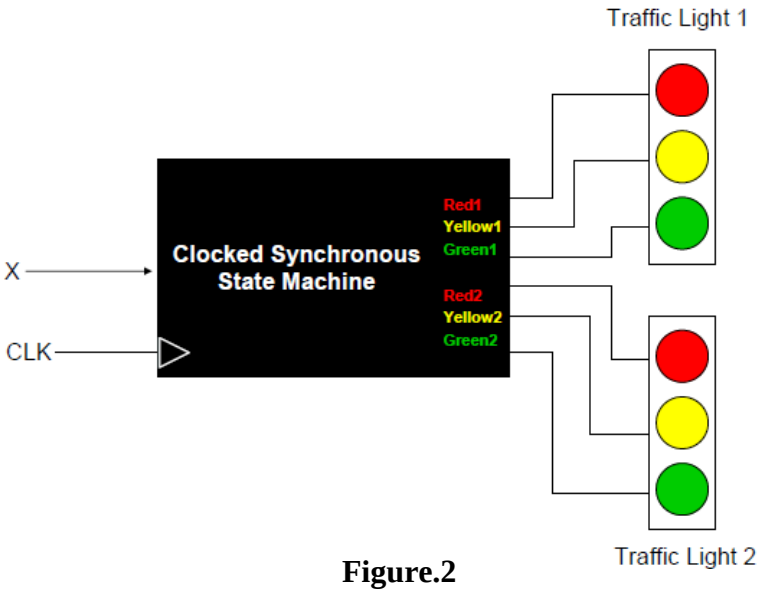

Figure.2