



Instructor: Dr. Abrar Ahmed

Max Marks: 50

Time Allowed: 180 Minutes

Class: BCS 2B

Date: 03-07-25

Q(1) [CLO2](10 Marks)

- a) Find a simplified product-of-sums (POS) expression using Karnaugh maps for the following Boolean function :

$$f(A, B, C, D) = \sum m(0, 2, 5, 8, 10, 12) + \sum d(1, 4, 6, 7, 15)$$

- b) Draw the logic circuit diagram for the simplified POS term obtained in part (a).
c) Implement the simplified POS obtained in part (a) by using NOR gates only.

Q(2) [CLO3](5 Marks)

Analyze the following circuit shown in Figure 1 to express the functions F_1 and F_2 in terms of the inputs A, B and C . What is the relationship between F_1 and F_2 ?

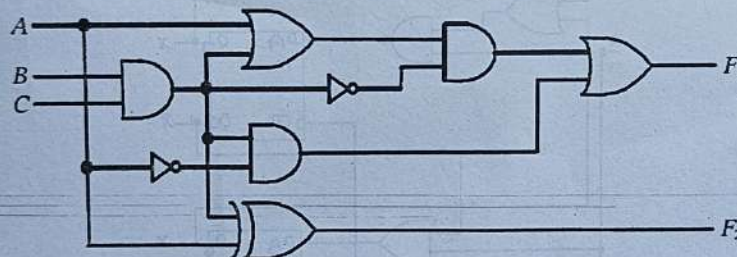


Figure 1. Circuit for Question 2

Q(3) [CLO4](10 Marks)

Design a 3-bit magnitude comparator circuit for two binary numbers $A = a_2a_1a_0$ and $B = b_2b_1b_0$ as inputs. The required circuit has three outputs namely EQ (if $A=B$), GT (if $A>B$) and LT (if $A<B$).

Q(4) [CLO4] (5 Marks)

For the circuit shown in Fig.2, complete the timing diagram for the given waveforms of clock signal and D input.

Q(5) [CLO4] (10 Marks)

Consider the sequential circuit shown in Fig. 3. Analyze this circuit by deriving:

- 1) State transition and output equations,
- 2) State transition table,
- 3) State diagram.

Q(6) [CLO4] (10 Marks)

Consider the sequential circuit shown in Fig. 4. Analyze this circuit by deriving:

- 1) State transition and output equations,
- 2) State transition table,
- 3) State diagram.

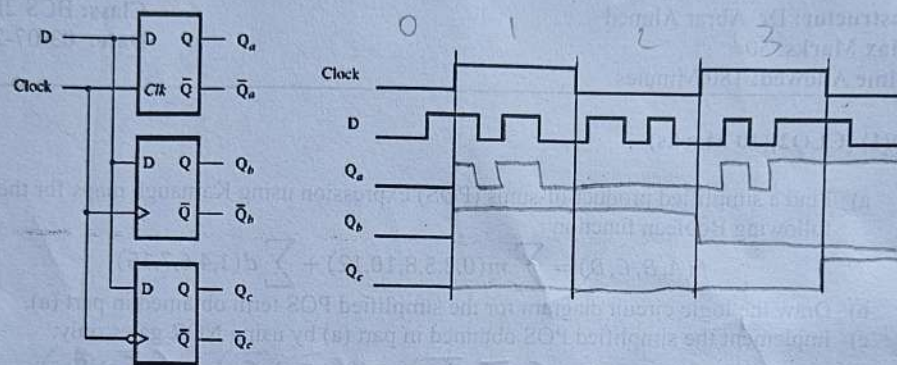


Fig 2. Circuit for Question (4)

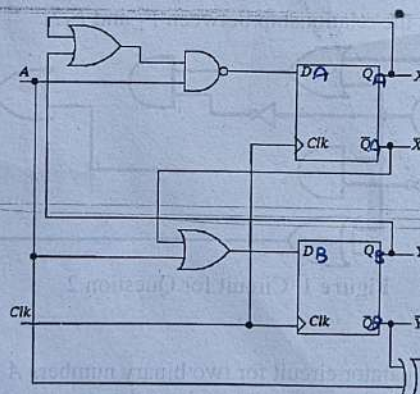


Fig. 3. Circuit for Question (5)

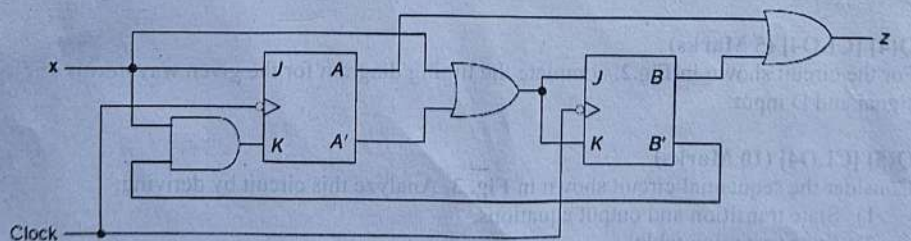


Fig. 4. Circuit for Question (6)

***** Good Luck *****