

International Islamic University Chittagong
Department of Electrical and Electronic Engineering
B. Sc. Engineering in EEE
Final Exam, Autumn 2022

Course Code: **EEE 2407**
Time: 2 hours 30 minutes

Course Title: **Digital Electronics**
Full Marks: 50

- (i) The figures in the right-hand margin indicate full marks
(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

Course Outcomes (COs) of the Questions	
CO1	Analyze different digital electronics circuits in terms of different systems of Boolean expression & their simplification, truth table, state table etc. Also will have knowledge on Number system, Boolean algebra & different types of Combinational and Sequential circuits.
CO2	Solve various problems related to digital electronics and design circuits like adder, comparator, converter, decoder, encoder, ROM, PLA, counter, register etc.

Bloom's Levels of the Questions						
Letter Symbols	R	U	App	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Part A

[Answer the questions from the followings]

- | | | | |
|--|------|-------|---|
| 1. a) Design a circuit that compares two 2-bit numbers, A and B, to check whether they are equal or unequal. The circuit has three output x, y, z, so that x=1 if A=B or y=1 if A>B or z=1 if A<B. | CO2 | C | 3 |
| 1. b) What is the difference between a BCD adder and Binary adder? Design a BCD adder to add two single digit decimal numbers. Your answer should include the detail design procedure. | CO1+ | An, C | 7 |
| | CO2 | | |
| 2. a) Design a BCD-to-decimal decoder showing the truth table and analysis. | CO2 | C | 5 |
| 2. b) What is a ROM? Implementation the Boolean function $F(A,B,C,D) = \sum (0, 1, 3, 4, 8, 9, 15)$ using multiplexer. | CO2 | R, Ap | 5 |

Or

- | | | | |
|---|-----|-------|---|
| 2. a) Design a combinational circuit using a ROM. The circuit accepts a 3-bit number and generates an output binary number equal to the square of the input number. | CO2 | C | 5 |
| 2. b) What is encoder? Implement a de-multiplexer using a decoder. | CO2 | R, Ap | 5 |

Part B

[Answer the questions from the followings]

- | | | | |
|--|-----|----|---|
| 3. a) Obtain the state table, state diagram and state equations of the following sequential circuit. | CO1 | An | 5 |
|--|-----|----|---|

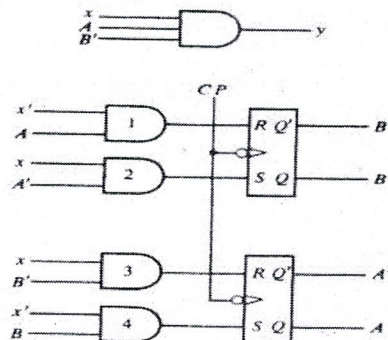
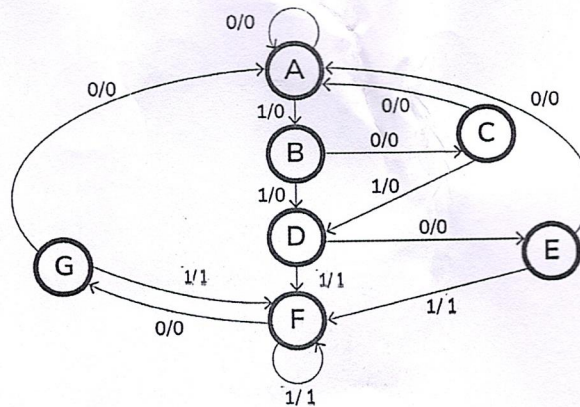


Fig: 01 for Ques. No 3(a)

3. b) i. What is the difference between sequential logic circuit and combinational logic circuit? CO1 An 1
 ii. Design a JK flip-flop showing the logic diagram, characteristics table and characteristics equation. Ap 4

Or

3. a) Reduce the number of states of the state diagram given below (Fig:02) CO1 An 5



3. b) i. What is the difference between synchronous and asynchronous Sequential circuit? CO1 An 1
 ii. Design a SR master-slave flip-flop showing logic diagram and timing relationship. Ap 4
4. a) i) What is the difference between Decade counters and BCD counters? CO2 An 2
 ii) Design a MOD-16 asynchronous down counter using J-K flip flop. Also, draw the timing diagram of the counter. C 4
4. b) Draw the logic diagram of a 4-bit Johnson Counter and also mention the sequence of a four-bit Johnson counter. CO2 R 4
5. a) i) What are the basic functions of a shift register? CO2 R 1
 ii) Explain the operation of a Parallel in/Serial out shift register with appropriate logic diagram. An 5
5. b) Determine the stored data in the following register as shown in Figure 5(a) after three clock pulses. Data input and clock waveforms are specified in Figure 5(b). Assume that the register initially contains all 1s and flip-flop changes state when clock pulse goes low to high. CO2 E 4

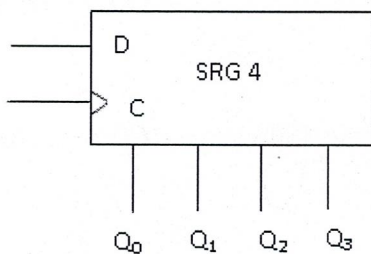


Figure 5(a)

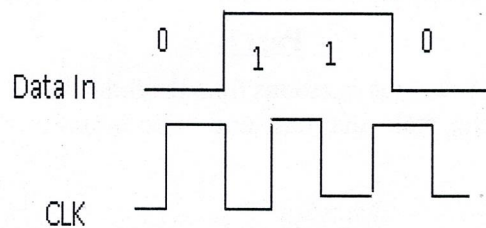


Figure 5(b)