King Saud University
College of Computer and Information Sciences
Computer Science Department

Course Code	CSC 220		
Course Title	Computer Organization		
Semester	S2 – 1440/1441 (Spring-2019-20)		
Exam	Midterm 1		
Date	05/03/2020	**Duration**	**90 minutes**
Student Name			
Student ID			
Section No.			

Course Learning Outcomes		**Relevant question**	**Full mark**	**Student mark**
Knowledge	**CLO 1, 2, 4**	**1**	**8**	
Cognitive Skills	**CLO 1, 2**	**2**	**6**	
Cognitive Skills	**CLO 1, 2, 4**	**3**	**6**	

Important Rules:

1. Answer all questions
2. No calculator/electronic device is allowed during the exam

Feedback/Comments:

Question 1. (8 Marks: 5×1+3)

(a) Short Questions

i. Convert 110110111_2 to Octal and Hexadecimal systems

Octal system	Hexadecimal system

ii. Convert 46_{10} to Binary and to BCD

Binary system	BCD

iii. Convert 10.25_{10} to Binary and to the Octal systems

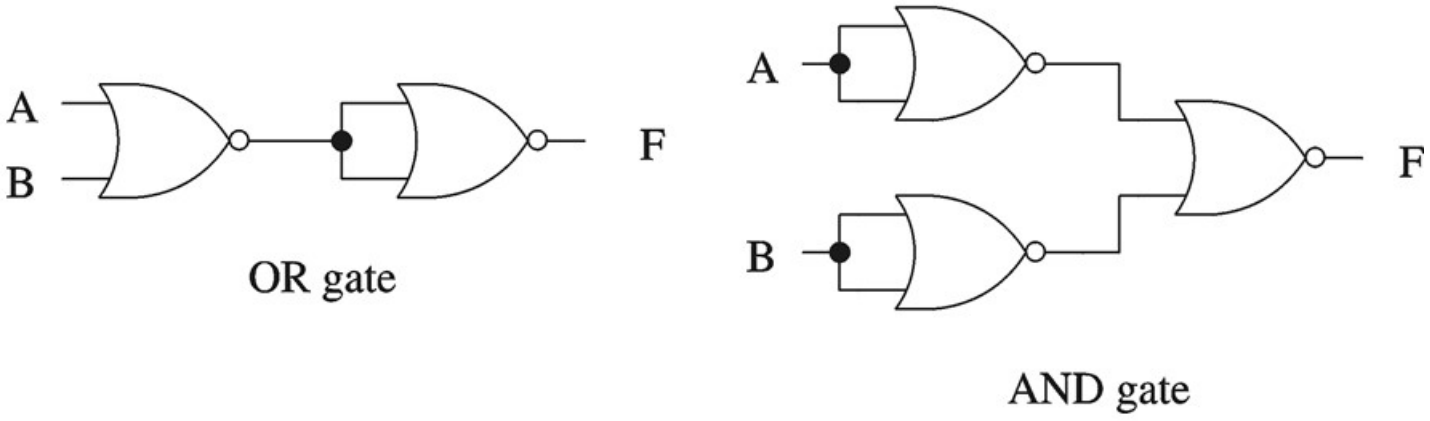
Binary system	Octal system

iv. Convert 14.2_8 to Binary and to Hexadecimal systems

Binary system	Hexadecimal system

v. Show how to obtain AND and OR gate using only NOR gate.

Ans:



(b) What will be the decimal value for the binary number 1010 1010 when it is represented in the following systems?

i. Signed magnitude notation?

ii. One's complements

iii. Two's complements?

Ans:

i. -32
ii. -85
iii. -86

Question 2 (6 Marks: 2+2+2)

(a) The truth table for a logic circuit is given below. Obtain the logic expression of the circuit as sum of product (SOP) and implement the circuit with basic gates.

Inputs			Output
A	B	C	F
0	0	0	**0**
0	0	1	**1**
0	1	0	**0**
0	1	1	**1**
1	0	0	**0**
1	0	1	**1**
1	1	0	**1**
1	1	1	**1**

(b) Simplify the following logic expression using K-map and implement it using only NAND gates.

$$F(A,B,C,D) = \sum_m(0,4,7,8,15) + \sum_d(2,6,13,14)$$

(c) Represent the logic function $F(A,B,C) = \bar{A}\bar{B} + B + A\bar{B}C$ using NOR gates only.

Question 3 (6 Marks: 2+2+2)

(a) Given two decimal numbers A = -25 and B = 17, convert them into 2's complement representation using 8 bits and show how to obtain A-B.

Ans

A (2's comp. using 8 bits)	B (2's comp. using 8 bits)	A-B (2's comp. using 8 bits)
1110 0111	0001 0001	1101 0110

(b) Design a full adder circuit (write the truth table, obtain the simplified functions, and implement them using logic gates).

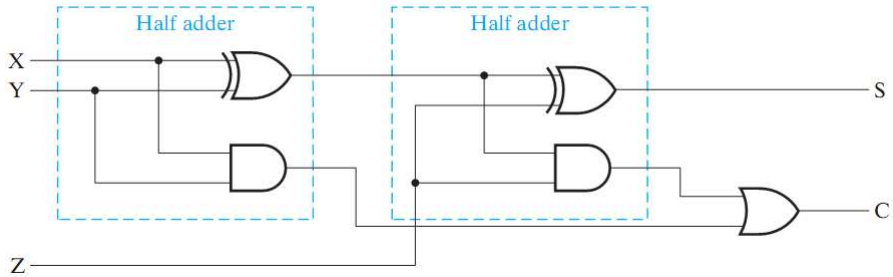
Ans:

Truth table

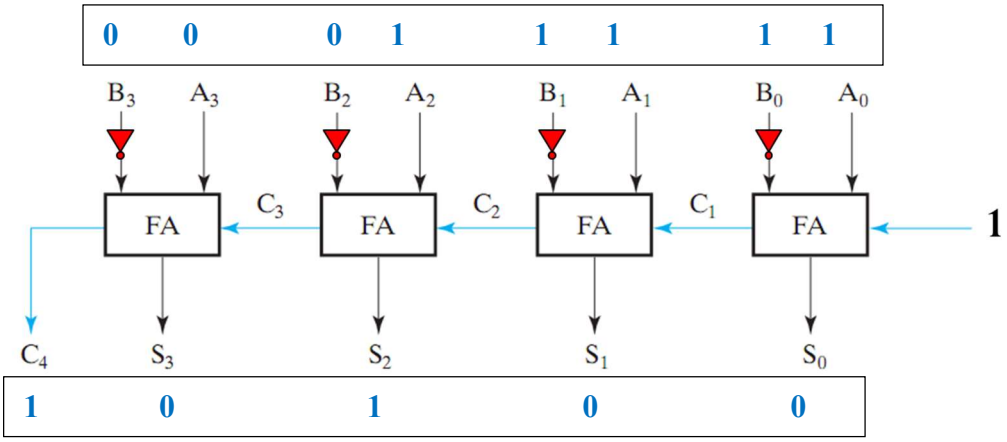
X	Y	Z	C	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

$S = X'Y'Z + X'YZ' + XY'Z' + XYZ = X \oplus Y \oplus Z$

$C = XY + XZ + YZ = XY + Z(X \oplus Y)$



(c) Draw the **4-bit** binary subtractor circuit. Show the **inputs and outputs** of the circuit to compute **(7 –3).**



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