University of Asia Pacific (UAP)

Department of Computer Science & Engineering

Mid Term Examination | Year: **2nd year 2nd semester** | Semester: **Spring 2023**
Course no. **CSE 209** | Course title: **Digital Logic & System Design** | Credit: **4.0**
Full Marks: **20** | Time: **1 hour**

Instructions:

1. There are **Three (3)** questions. Answer all of them. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1.	a) Discuss the universality of NAND gate.	2	CO1
	b) Implement the following Boolean function with only NAND gate $y = A`C + AB` + BC`$	2	CO1
	c) Simplify the following function using K-map. $F(A, B, C, D) = \sum(0, 2, 5, 7, 8, 10, 13, 15)$	3	CO1
2.	a) Design a BCD adder using IC # 7483 (4-bit parallel adder) and basic logic gates. Briefly describe its operation.	3	CO5
	b) Design MOD 8 up/down counter using J-K flip-flop. You can use other logic gates, if necessary.	4	CO5
3.	a) Consider a counter circuit that contains eight JK FFs wired in the arrangement $Q_7Q_6\ Q_5Q_4Q_3Q_2Q_1Q_0$. (i) Determine the counter's MOD number. (ii) Determine the output frequency in KHz when the input clock frequency is 32 MHz (iii) What is the range of counting states for this counter? (iv) Assume a starting state (count) of 01100110. What will be the counter's state after 1345 pulses?	4	CO3
	b) In Figure 1, the signal Sub and some EX-OR gates alter the 4-bit parallel adder (IC # 7483) inputs.	2	CO3

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i) Describe the operation of the circuit when Sub = 1.

ii) Describe the operation of the circuit when Sub = 0.

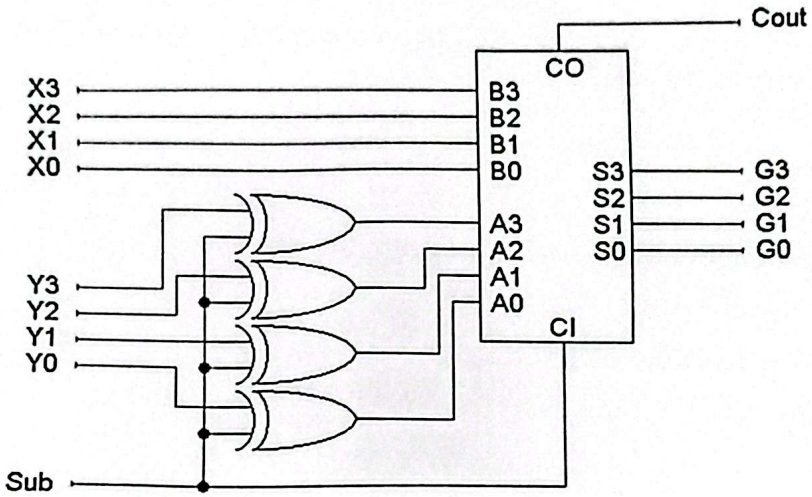

Figure 1

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Department of Basic Sciences and Humanities

Program: B.Sc. in CSE

Mid-Semester Examination | **Spring-2023** | **2nd year 2nd Semester**

Course Code: ECN 201 | Course Title: Economics | Credit: 2.00

Time: 1.00 Hour | Full Marks: 20

There are **two** questions. Answer all of them. Part marks are shown in the margins.

1. a. Describe different types of price elasticity of supply with the help of diagrams. **[5]** **[CO2]**

b. When demand is price inelastic, a price increase decreases total revenue. – True / False **[5]** **[CO2]**

2. $P = 200 - 2Q$

$P = 50 + Q$

a. Calculate equilibrium price and quantity. **[5]** **[CO1]**

b. Calculate consumer surplus, producer surplus and total surplus. **[5]** **[CO1]**

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Department of Computer Science and Engineering

Program: B.Sc. in CSE

Mid-Semester Examination **Spring-2023** **2nd year 2nd Semester**

Course Code: CSE 207 Course Title: Algorithms Credit: 3.00

Time: 1.00 Hour. Full Mark: 20

There are **Two** Questions. Answer all of them. Part marks are shown in the margins.

1. a. Explain the fundamental differences and similarities between the Divide and Conquer and the Dynamic Programming approaches in solving algorithmic problems. **[2]** **[CO1]**

b. Develop an algorithm or pseudocode to sort an array with a time complexity of O(*nlogn*). **[4]** **[CO4]**

c. Apply the Binary Search algorithm to the following data – [10, 25, 30, 38, 44, 59, 64, 73, 86, 99] for *target* = 86. **[4]** **[CO2]**

2. a. Suppose, you are a manager overseeing two retail stores – Store A and Store B. Each store has its daily sales data recorded over a week. Your task is to determine the length of the maximum consecutive sales streak during which both stores had positive sales on the same day. **[4]** **[CO2]**

Store A's daily sales over a week: [0, 2, 3, 5, 2, 0, 1].

Store B's daily sales over a week: [1, 3, 5, 2, 1, 0, 2].

b. Which algorithmic approach did you use in your answer **2a**? Analyze its time complexity. **[2]** **[CO3]**

c. Imagine you are a treasure hunter exploring a cave filled with valuable items of varying weights and values. Each item can only be taken once, and your goal is to maximize the total value of the items you can carry out of the cave while the weight limit of your backpack should not exceed. **[4]** **[CO4]**

Design a step-by-step dynamic programming algorithm to solve this treasure hunter's challenge.

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Department of Computer Science and Engineering

Program: B.Sc. in CSE

Mid-Semester Examination **Spring-2023** **2 nd year 2 nd Semester**

Course code MTH 205 Course Title: Math IV: Differential Equations and Laplace and Fourier Transformation Credit: 3.00

Time: 1.00 Hour Full Marks: 20

There are three questions. Answer all of them. Part marks are shown in the margins.

1. a. Solve the homogeneous differential equation $(x^2 - 3y^2)dx + 2xydy = 0$. [4] CO1

   b. Solve the DE by separation of variables $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}$. [3] CO1

2. a. Solve the Bernoulli's equation $x\frac{dy}{dx} + y = x^2y^2$. [5] CO1

   b. Find the ordinary differential equation (ODE), by eliminating a, b, c from the equation [2] CO1

$$xy = ae^x + be^{-x} + c$$

3. a. Write down the condition of exact differential. If the DE is non-exact, make it exact [3] CO1

$$x^2ydx - (x^3 + y^3)dy = 0$$

   b. Using integrating factor solve: $(1-x^2)\frac{dy}{dx} + 2xy = x\sqrt{1-x^2}$. [3] CO1

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Department of Computer Science and Engineering

Program: B.Sc. in CSE

Mid-Semester Examination | **Spring-2023** | **2nd year 2nd Semester**

Course Code: CSE 211 | Course Title: Database Systems | Credit: 3.00

Time: 1.00 Hour. | Full Mark: 20

There are **Two** Questions. Answer all of them. Part marks are shown in the margins.

1. a. **Discuss** any two types of database users from below: **[4] [CO1]**

i. Naive users
ii. Application programmers
iii. Sophisticated users
iv. Database administrators

b. The following relational schema form a part of an event management company database held in a relational DBMS: **[3×2 =6] [CO2]**

Event (E_ID, E_Name, E_Type)
Guest (G_ID, G_Name, E_ID, V_ID)
Venue (V_ID, V_Name, V_Address)

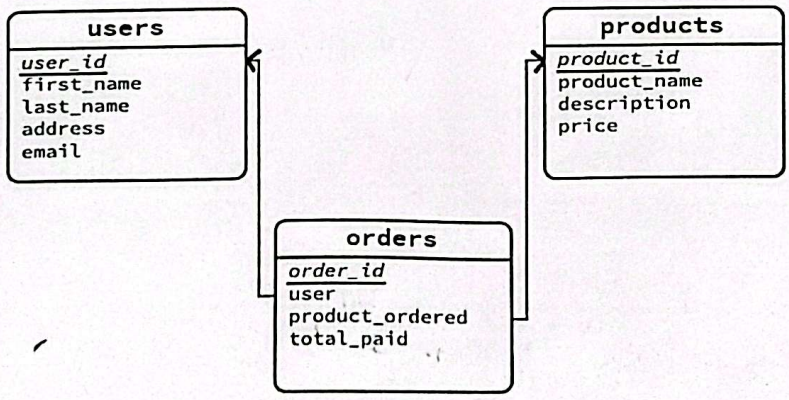
Construct (write down) the Relational Algebra for the following queries:

a) The guest's name having guest ID as 010203.

b) The event's name having the event type as Wedding but not Birthday.

c) The venue IDs where the address is Green Road, Dhaka.

2. a. **[4] [CO2]**



Construct (write down) the DDL for the above tables with necessary datatypes and constraints.

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b. The following relational schema form a part of an event management company database held in a relational DBMS: [3×2 =6] [CO2]

Event (E_ID, E_Name, E_Type)
Guest (G_ID, G_Name, E_ID, V_ID)
Venue (V_ID, V_Name, V_Address)

Construct (write down) the SQL for the following queries:

a) The guests' names having the venue address starting with 'E' and ending with 'a' (using subquery).

b) The total number of events for each type of events.

c) The guest IDs for the event ID as 3579.

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