

University of Asia Pacific
Department of Computer Science and Engineering
Mid-Semester Examination Fall-2022
Program: B.Sc. in CSE

Course Title: Algorithms
Time: 1.00 Hour

Course No. CSE 207

Credit: 3.0
Full Mark: 60

There are Four Questions. Answer three questions including Q-1 and Q-2.

1. a. Explain three Asymptotic Notations of algorithm with graphical representation. [12]
b. Elaborate why binary search is preferred over linear search. [8]
2. a. Given the algorithm below, compute the *Time Complexity* and include the *detailed steps* of your computation. Here, "id" is your registration number. [10]

```
fun(a[m], b[n])
  for( i = 1; i <= m; i++)
    if ( id is even )
      for( j = 1; j <= n; j = 2*j)
        if( a[i] == j)
          return j
    else
      for(j = 1; j*j <= n; j++)
        if(b[j] == i)
          return i
  return -1
```

- b. Solve the following recursive Time Complexity equation using Master Theorem. [10]

$$T(n) = 4T(n/3) + cn^p$$

where, p = last 2 digits of your registration number % 4

3. a. Construct an array of size 11 which satisfies the conditions below and then simulate the Merge Sort for the array you just constructed. [20]

Condition 1: The Range of the values of the array should be your $[ph]$ to $[ph+30]$ where " ph " is the last 2 digits of your phone number. Example: If the last 2 digits of your phone number are 00, the array should contain values between 0 and 30. If the last 2 digits of your phone number are 23, the array should contain values between 23 and 53.

Condition 2: The array must include the value id and $ph+30$. Example: If the last 2 digits of your phone number are 00, the array must contain 0 and 30.

Condition 3: Not more than 2 consecutive numbers should be in ascending order (sorted). As for example you cannot have 8, 4, 6, 10, 7 as part of the array as 3 consecutive numbers 4, 6, 10 are sorted among themselves.

OR

4. a. Determine the Maximum Subarray Sum using the Divide and Conquer approach [20] for the following array:

-5	2	-3	7	X	7	-5	-Y	3
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Use the following formula to find X and Y:

$X = \text{last digit of your ID} + 5$

$Y = \text{second last digit of your ID} + 3$

For example, if your ID is 21211025, then, $X = 5 + 5 = 10$ and $Y = 2 + 3 = 5$.

University of Asia Pacific
Department of Computer Science and Engineering
Mid-Semester Examination Fall-2022
Program: B.Sc. in CSE

Course Title: Database Systems

Course No. CSE 211

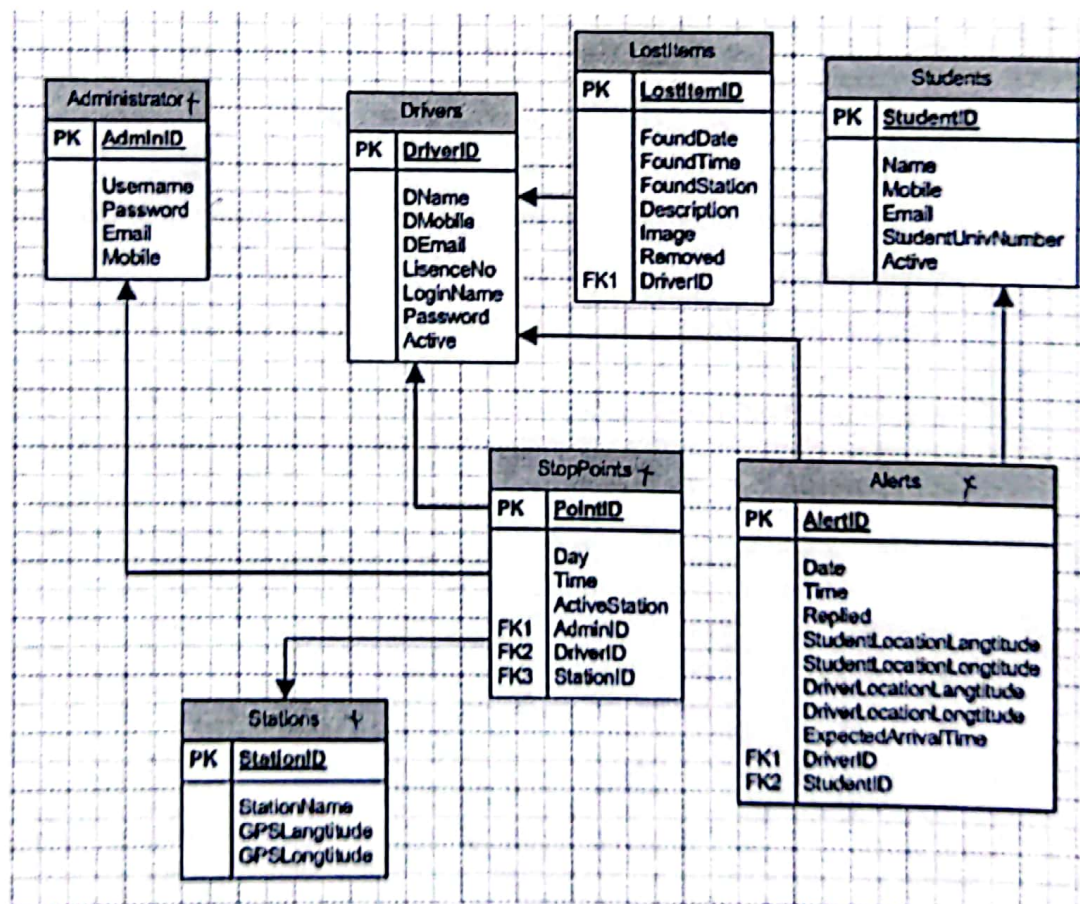
Credit: 3.0

Time: 1.00 Hour.

Full Mark: 60

There are Four Questions. Answer three questions including Q-1 and Q-2.

1. a. Explain Super key, Candidate key, Primary and Foreign key with a suitable example. [10]
- b. Suppose you have already created the tables in below. Now you want to drop all the tables. [10]
Solve the problem by writing the DDL commands in a correct sequence.



2. a. Consider the following schema:

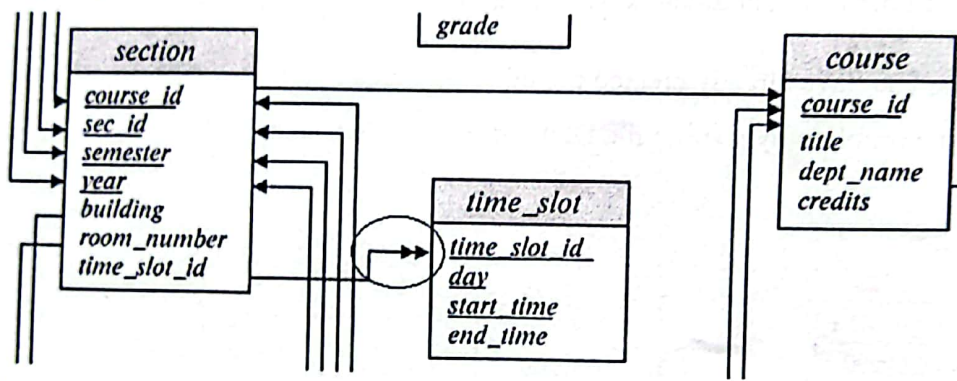
employee (person_id, street, city)

works (person_id, person_name, company_name, salary)

company (company_name, city)

Construct the DDL for creating the above-mentioned tables in question with proper integrity constraints.

b. Illustrate the reason for choosing the double markings in the university database schema in lieu of single marking that generally indicates in a foreign key constraint. Discover the other options as well.



3. a. i) Construct the DDL for adding a new column "country" in employee and company table. (see question 2.a.)

ii) Construct a SQL to insert information of 2 persons into works table. (see question 2.a.)

b. Suppose the 'food' table has following tuples (see right). Now, construct a DML that will produce output like: (see below).

	shop_name	food_name	avg_price
1	hut	pizza_mac	550
2	maloncho	pizza_mac	500
3	hut	burger	450

N. B. average price is over 400 and in descending order

SELECT * FROM [dbo].[Food]

	shop_name	food_name	size	price
1	maloncho	pizza_mac	large	700
2	maloncho	pizza_mac	medium	500
3	maloncho	pizza_mac	small	300
4	maloncho	burger	large	600
5	maloncho	burger	medium	400
6	maloncho	burger	small	200
7	hut	pizza_mac	large	750
8	hut	pizza_mac	medium	550
9	hut	pizza_mac	small	350
10	hut	burger	large	650
11	hut	burger	medium	450
12	hut	burger	small	250

OR

4. a. i) Construct a SQL to drop the salary attribute from works table. (see question 2.a.)
ii) Construct a SQL to select all tuples from company table where city attribute starts with 'Sa'. (see question 2.a.)

- b. Suppose the 'food' table has following tuples (see right). Now, construct a DML that will produce output like: (see below).

	food_name	size	avg_price
1	pizza_mac	large	725
2	burger	large	625
3	pizza_mac	medium	525
4	burger	medium	425

N. B. average price is over 400
and in descending order

SELECT * FROM [dbo].[Food]

	shop_name	food_name	size	price
1	maloncho	pizza_mac	large	700
2	maloncho	pizza_mac	medium	500
3	maloncho	pizza_mac	small	300
4	maloncho	burger	large	600
5	maloncho	burger	medium	400
6	maloncho	burger	small	200
7	hut	pizza_mac	large	750
8	hut	pizza_mac	medium	550
9	hut	pizza_mac	small	350
10	hut	burger	large	650
11	hut	burger	medium	450
12	hut	burger	small	250

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid-Semester Examination Fall-2022
Program: B.Sc. in CSE

Course Title: Math IV

Course No. MTH 205

Credit: 3.00

Time: 1.00 Hour

Full Mark: 60

There are Four questions. Answer three questions including Q-1 and Q-2.

1. a. Solve the homogeneous differential equation $x(x+y)dy = y(x-y)dx$. [10]
- b. Solve the following DE by separation of variables $(x+y)^2 \frac{dy}{dx} = a^2$. ✓ [10]
2. a. Solve the Bernoulli's equation $x \frac{dy}{dx} + y = x^2 y^2$. [10]
- b. Form an ODE from the equation $y = e^x (A \cos x + B \sin x)$. ✓ [10]

3. a. Write down the condition of exact differential. If the DE is non-exact, make it exact [10]
 $(2x \log x - xy)dy + 2ydx = 0$.
- b. Using integrating factor solve $(1-x^2) \frac{dy}{dx} + 2xy = x\sqrt{1-x^2}$. [10]

OR

4. a. Define exact and non-exact DE. If it is exact solve it [10]
 $(2xy^2 - 3)dx + (2x^2y + 4)dy = 0$. ✓
- b. Using integrating factor solve $(1+x^2) \frac{dy}{dx} + 2xy - 4x^2 = 0$. ✓ [10]

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid-Semester Examination Fall-2022
Program: B.Sc. in CSE

Course Title: Economics

Course No. ECN 201

Credit: 2.00

Time: 1 Hour

Full Marks: 40

There are three questions. Answer two questions including Q-1

1.

Q	P
10	5
15	10
25	12
30	15
40	20

- a. Calculate price elasticity and give interpretation. [10]
- b. Describe different types of price elasticity of demand with the help of diagrams. [5]
- c. When demand is price elastic, a price increase decreases total revenue. - Explain. [5]

2. $P = 100 - 2Q$

$$P = 10 + Q$$

- a. Calculate the equilibrium price and quantity. [10]
- b. Explain the impact of change in income on equilibrium price and quantity with the help of appropriate graph. [10]

OR

3. $P = 500 - 2Q$

$$P = 50 + Q$$

- a. Calculate the equilibrium price and quantity. [10]
- b. Explain the impact of change in input price on equilibrium price and quantity with the help of appropriate graph. [10]



University of Asia Pacific (UAP)

Department of Computer Science & Engineering

Mid Term Examination

Year: 2nd year 2nd semester

Semester: Fall, 2022

Course no. CSE 209

Course title: Digital Logic & System Design

Credit: 4.0

Full Marks: 60

Time: 1 hour

Instructions:

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

1. a) Discuss the universality of NOR gate. 05
b) Implement the following Boolean function with only NOR gate 05
$$y = A'C + AB' + BC'$$

c) Implement the following function using K-map. 10
$$F(A, B, C, D) = \sum(0, 1, 2, 4, 6, 8, 12, 13, 14, 15)$$

OR
2. a) Draw the internal circuit of IC # 74293(Counter). 05
b) Design MOD 14 up counter using IC # 74293. 05
c) Design MOD 8 up/down counter using J-K flip-flop. You can use other logic gates, if necessary. 10
2. a) Design a BCD adder using IC # 7483 (4-bit parallel adder) and basic logic gates. Briefly describe its operation. 10
b) Design the MOD 10 Johnson counter using D flip-flop and briefly describe its operation. 10
3. a) Consider a counter circuit that contains eight JK FFs wired in the arrangement $Q_7Q_6Q_5Q_4Q_3Q_2Q_1Q_0$ 05
(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?

b) A photo detector circuit is being used to generate a pulse each time a customer walks into a certain establishment. The pulses are fed to a seven-bit counter. The counter is used to count these pulses as a means for determining how many customers have entered the store. After closing the store, the proprietor checks the counter and finds that it shows a count of 0001101. He knows that this is incorrect because there were many more than thirteen people in his store. Assuming that the counter circuit is working properly.

- (i) What could be the reason for the discrepancy?
- (ii) How can you overcome from the discrepancy?

05

c) Design a logic circuit that follows the following requirements:

- (i) Output X will equal to (C AND D) when A and B are the different.
- (ii) X will remain HIGH when A and B are same.

10