# Xi’an JIAOTONG-LIVERPOOL UNIVERSITY

西 交 利 物 浦 大 学

# Coursework Submission Cover Sheet

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| Name | Jin(Surname) | Minhao(Other Names) |
| Student Number | 1717576 | |
| Programme | Information and Computing Science | |
| Module Title | Algorithmic Foundations and Problem Solving | |
| Module Code | CSE102 | |
| Assignment Title | Assignment 1 | |
| Submission Deadline | 7-May- 2019, Tuesday 17:30. | |
| Module Leader | Dr. Muhammad Alam | |

By uploading or submitting this coursework submission cover sheet, I certify the following:

* I have read and understood the definitions of PLAGIARISM, COLLUSION, and the FABRICATION Of DATA, as outlined in the Undergraduate Student Handbook of Xi’an Jiaotong-Liverpool University and as posted on the University Website.
* This work is my own, original work produced specifically for this assignment. It does not misrepresent the work of another person or institution as my own. Additionally, it is a submission that has not been previously published, or submitted to another module.
* This work is not the product of unauthorized collaboration between myself and others.
* This work is free of embellished or fabricated data.

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| For Academic Office use: | Date Received | Days Late | Penalty |
|  |  |  |

Feedback on the strength of the work

Feedback on the weakness that needs to be improved

**1st Marker Date Mark**

**2nd Marker Date Mark**

**(if applicable)**

***Students:*** *Please start your assignment on the next page.*

**Module: CSE102 Assignment 2**

1. **Assessment**

The tasks contribute 10% to the overall assessment of CSE102

1. **Submission**

Please complete the assessment tasks using Microsoft Word and submit via ICE. You are also asked to print out a copy of your answers and submit it in the class or my office by 7-May- 2019, Tuesday.

1. **Deadline**
2. May- 2019, Tuesday 17:30.

**Question 7 is compulsory.**

# Question 1

* 1. Given a pattern AGTAA, create a shift table for letters A, G, C, T. **5**

**Answer:**

|  |  |  |  |
| --- | --- | --- | --- |
| A | G | C | T |
| 1 | 3 | 5 | 2 |

* 1. Apply Horspool’s algorithm to search the pattern in text AGCAAGTAA, what **10**

is the number of comparisons?

**Answer:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | G | C | A | A | G | T | A | A |
| 1 | A | G | T | A | A |  |  |  |  |
| 2 | A | G | T | A | A |  |  |  |  |
| 3 | A | G | T | A | A |  |  |  |  |
| 4 |  | A | G | T | A | A |  |  |  |
| 5 |  |  |  |  | A | G | T | A | A |
| 6 |  |  |  |  | A | G | T | A | A |
| 7 |  |  |  |  | A | G | T | A | A |
| 8 |  |  |  |  | A | G | T | A | A |
| 9 |  |  |  |  | A | G | T | A | A |

The number of comparisons is 9.

# Question 2

In the following graph, assume the edges are arranged in the order of **10**

e1 = (a, b), e2 = (a, c), e3 = (b, d), e4 = (c, e), e5 = (d, e), e6 = (e, b) run Bellman-Ford algorithm to find all shortest paths from vertex *a*.

4

a

b

2

5

8

-8

e

-6

c

d

**Answer:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a | b | c | d | e |
| 0 | ∞ | ∞ | ∞ | ∞ |
| 0 | 4 | ∞ | ∞ | ∞ |
| 0 | 4 | 5 | ∞ | ∞ |
| 0 | 4 | 5 | 12 | ∞ |
| 0 | 4 | 5 | 12 | -3 |
| 0 | -1 | 5 | 12 | -3 |
| 0 | -1 | 5 | 7 | -3 |

# Question 3

1. Using dynamic programming, fill in the table in computing the length of the Longest **10**

Common Subsequence between sequences of GAGT and AGACCT

**Answer:**



1. Based on the table, find one of the longest common subsequences of GAGT and **5**

AGACCT.

**Answer:**

The longest common subsequences of GAGT and AGACCT is GAT.

**Question 4**

Using a gap penalty of d=-1 and scoring matrix as below

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **A** | **C** | **G** | **T** |
| **A** | **1** | **-3** | **-2** | **-3** |
| **C** | **-3** | **1** | **-3** | **-2** |
| **G** | **-2** | **-3** | **1** | **-3** |
| **T** | **-3** | **-2** | **-3** | **1** |

1. Optimal global alignment
   1. Using dynamic programming, fill in the table in computing the score of the **10**

optimal global alignment of GAGT and AGACCT.

**Answer:**



* 1. Based on the table, find an optimal global alignment of GAGT and **5**

AGACCT.

\_GA\_ \_GT

AGACC\_T

**Answer:**

An optimal global alignment alignment of GAGT and AGACCT is

1. Optimal local alignment
   1. Using dynamic programming, fill in the table in computing the score of the **10**

optimal local alignment of GAGT and AGACCT.



* 1. Based on the table, find an optimal local alignments of GAGT and **5**

AGACCT.

**Answer:**

An optimal global alignment alignment of GAGT and AGACCT are

(1) AG (2)GA (3)T

AG GA T

**Question 5**

Apply the branch-and-bound algorithm to solve the travelling salesman problem for the **10**

following complete graph.

4 2

a

4

b

1

1

5

8

e

6

3

c

d

1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | a | b | c | d | e |
| a | 0 | 4 | 5 | 2 | 1 |
| b | 4 | 0 | 4 | 3 | 1 |
| c | 5 | 4 | 0 | 1 | 8 |
| d | 2 | 3 | 1 | 0 | 6 |
| e | 1 | 1 | 8 | 6 | 0 |

Lb= ((1+2)+(3+1)+(1+4)+(2+1)+(1+1))/2=8.5

So lb=9 at least.

Requiring e is before d.

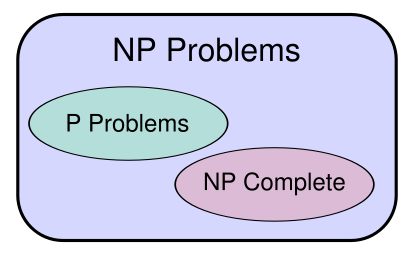


# Question 6

Which of the following statements do not contradict the current state of our knowledge about the complexity classes P, NP, and NPC (NP-complete problems)? Briefly justify your answer.

|  |  |  |
| --- | --- | --- |
| 1. P = NP = NPC |  | **3** |
| 2. P = NP but NPC ⊂ NP |  | **3** |
| 3. P ≠ NP, NP = P ∪ NPC | and P ∩ NPC = {} | **3** |
| 4. P ≠ NP, P ∩ NPC ≠{} |  | **3** |
| 5. P ≠ NP, P ∩ NPC = {} |  | **3** |

**Answer:**

**[](//upload.wikimedia.org/wikipedia/commons/b/bc/Complexity_classes.svg)**

**1. False. P and NPC problems belong to NP problems, so they are not equal.**

**2. False. There is a common belief that P and NP are not equal.**

**3. False. P ≠ NP and P ∩ NPC = {} are correct, but NP is more than P ∪ NPC.**

**4. False. P ≠ NP is correct, but P ∩ NPC = {}.**

**5. True.**

# Question 7 (COMPULSORY)

**Do you complete the assignment independently? 5**

**Answer: Yes, I complete the assignment independently.**