

1. Assessment

The tasks contribute 10% to the overall assessment of INT102

2. Submission

Please complete the assessment tasks using Microsoft Word and submit it in PDF via Learning. Please including **your name and student ID** on the cover page and name your file as **name_student ID**.

3. Deadline

26-May- 2021, Wednesday, 24:00. Time zone in Beijing, China (GMT+8)

Question 7 is compulsory.

Question 1

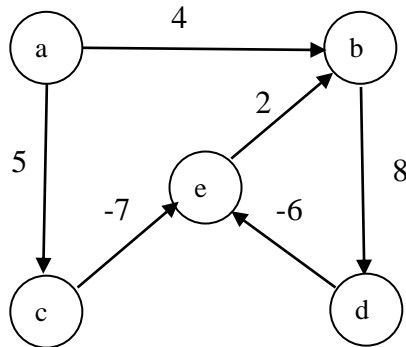
1. Given a pattern ATGAA, create a shift table for letters A, G, C, T. **5**
2. Apply Horspool's algorithm to search the pattern in text AGCAATGAA, what is the number of comparisons. **10**

Question 2

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

$$e_1 = (a, b), e_2 = (a, c), e_3 = (b, d), e_4 = (c, e), e_5 = (d, e), e_6 = (e, b)$$

run Bellman-Ford algorithm to find all shortest paths from vertex a .



Question 3

1. Using dynamic programming, fill in the table in computing the length of the Longest Common Subsequence between sequences of GAGT and AGCCCT **10**
2. Based on the table, find one of the longest common subsequences of GAGT and AGCCCT. **5**

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

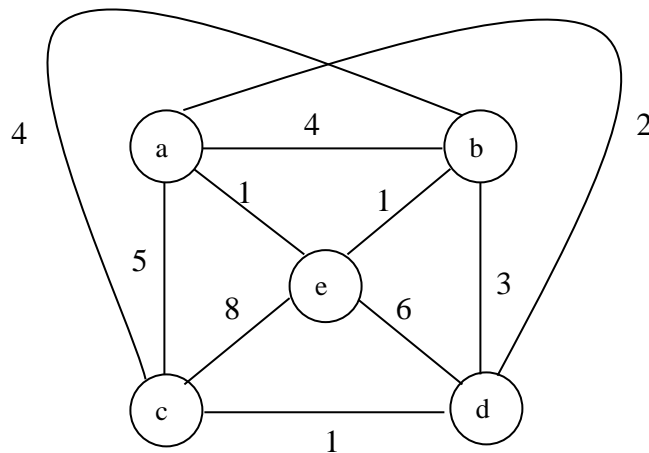
- a. Using dynamic programming, fill in the table in computing the score of the optimal global alignment of GAGT and AGACCT. **10**
- b. Based on the table, find an optimal global alignment of GAGT and AGACCT. **5**

2. Optimal local alignment

- a. Using dynamic programming, fill in the table in computing the score of the optimal local alignment of GAGT and AGACCT. **10**
- b. Based on the table, find an optimal local alignment of GAGT and AGACCT. **5**

Question 5

Apply the branch-and-bound algorithm to solve the travelling salesman problem for the following complete graph. **10**

**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 $NPC \subset NP$ | 3 |
| 3. $P \neq NP$, $NP = P \cup NPC$ and $P \cap NPC = \{\}$ | 3 |
| 4. $P \neq NP$, $P \cap NPC \neq \{\}$ | 3 |
| 5. $P \neq NP$, $P \cap NPC = \{\}$ | 3 |

Question 7 (COMPULSORY)

Do you complete the assignment independently?

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