Module: INT102 **Assignment 2**

1. Assessment

The tasks contribute 10% to the overall assessment of INT102.

2. Submission

Please complete the assessment tasks and submit a pdf file via LM.

3. Deadline

12-May- 2023, Friday 17:30.

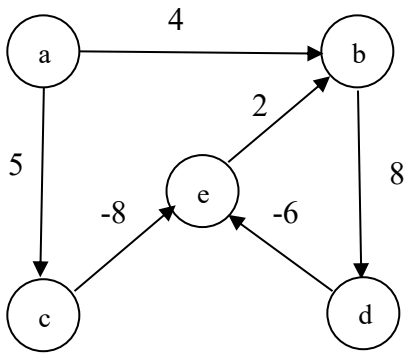
Question 1

1. Given a pattern AGTAA, create a shift table for letters A, G, C, T. **(4)**

2. Apply Horspool's algorithm to search the pattern in text AGCCGTGC, what is the number of comparisons. **(10)**

Question 2

For the following graph, run Bellman-ford algorithm to find all shortest paths from vertex *a*. for the following graph. **(16)**



Question 3

1. Using dynamic programming, fill the table in computing the length of the Longest Common Subsequence between sequences of GAGT and AGACCT. **(10)**

2. Based on the table, find a longest common subsequence of GAGT and AGACCT. **(5)**

Question 4

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

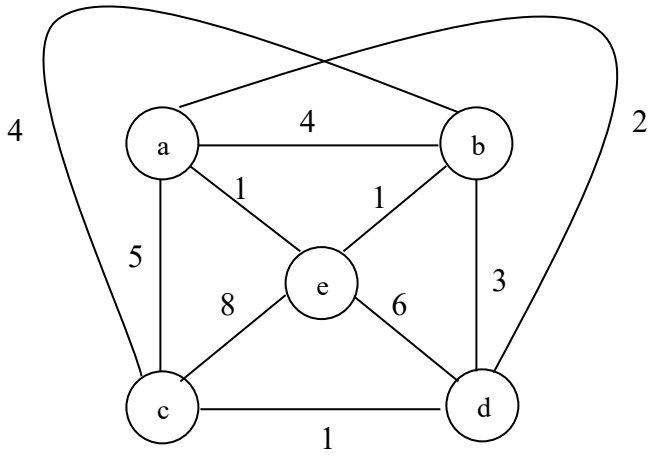
	A	C	G	T
A	**1**	**-3**	**-2**	**-3**
C	**-3**	**1**	**-3**	**-2**
G	**-2**	**-3**	**1**	**-3**
T	**-3**	**-2**	**-3**	**1**

1. Optimal global alignment **(15)**
   a. Using dynamic programming, fill in the table in computing the score of the optimal global alignment of GAGT and ACATGT.
   b. Based on the table, find all the optimal global alignments of GAGT and ACATGT.

2. Optimal local alignment **(15)**
   a. Using dynamic programming, fill in the table in computing the score of the optimal local alignment of GAGT and ACATGT
   b. Based on the table, find all the optimal local alignments of GAGT and ACATGT.

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)?

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)**