QUESTION: Implement Bellman Ford Algorithm to find the shortest path tree.

a. your graph must have at least 10 nodes

b. Your graph must have at least 15 edges.

c. Some of the edge weights must be negative.

d. Run the program on 2 cases - 1. The graph has negative edges but NO negative cycle. 2. Graph has a negative cycle.

e. Your program must catch the negative cycle.

f. submit code

g submit the screen shot of execution.

ANSWER, ASSUMPTIONS, GRAPH USED and STEPS FOLLOWED:  
a. All possible edges with their weights and respective source and destinations are combined in an ArrayList.

b. Distance of selected source vertex is set as 0 whereas for other vertices, the distance is set as maximum possible value.

c. Bellman Ford algorithm has been implemented. Below shown graph has been used for Case 1 of attached output screenshots.

5

-2

-2

9

7

2

8

-4

-3

7

6

1

-4

7

9

8

-3

5

2

7

6

Expected Output of said Graph:

-2

-2

7

-4

-3

1

-4

-3

7

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
|  |  |  |  |  |  |  |  |  |  |  |
| Distance from A | 0 | 2 | 4 | 7 | -2 | 1 | 3 | 5 | 8 | -1 |
| Parent Node |  | C | D | A | B | A | H | I | F | G |

Case 1 : Output Screenshot

A picture containing screenshot

Description automatically generated

Below shown graph has been used for Case 2 of attached output screenshots(Negative Weighted cycle).

5

-2

-2

9

7

2

8

-4

-3

7

6

1

-4

7

9

8

5

2

7

6

**-13**

BDCB forms a negative weighted cycle for which Bellman Ford Algorithm fails. Below is output screenshot.

A picture containing screenshot

Description automatically generated

-------------------------------------------------------------END-------------------------------------------------------------