

# Quiz-4 (ADA-2024) Set-1 - SOLUTION, Full Marks-10

April 16, 2024

**Roll Number:**

**Section:**

1. Let  $G$  be any flow network with integer valued capacities. Which of the following statements is **FALSE**?

- (A) Maximum flow of  $G$  is bigger than the minimum cut of the graph.
- (B) Every pair of disjoint set of vertices  $A$  and  $B$  where  $s \in A$  and  $t \in B$  is a valid cut (i.e., it has a valid flow function).
- (C) Every valid flow function has a corresponding legal cut.
- (D) Max flow of  $G$  is equal to min cut of  $G$ .

**Question Cancelled; 2 marks given to all students**

2. Which of the following algorithms is used to find the minimum spanning tree in a graph with positive and negative edges?

- (A) Kruskal's algorithm.
- (B) Dijkstra's algorithm.
- (C) Bellman-Ford algorithm.
- (D) Prim's algorithm

**Question Cancelled; 2 marks given to all students**

3. Read the following statements.

- I) Let  $G$  be a directed graph with positive edge weights  $w : E(G) \rightarrow R$ . Suppose that we modify the graph  $G$  into  $G'$  as follows. For every edge  $e \in E(G)$ , we set  $w'(e) = w(e)/2$  to be the modified weights in  $G'$ . Then, every shortest path from  $s$  to  $t$  in  $G$  is a shortest path from  $s$  to  $t$  in  $G'$ .
- II) Let  $G = (V, E)$  be a flow network with a source  $s$ , a sink  $t$ , and a positive capacity  $c$  on every edge  $e$ . Suppose  $(A, B)$  is the unique  $s - t$  minimum cut in  $G$  w.r.t these capacities. Consider a modified graph  $G'$  where the capacity of every edge is increased by 1. Then  $(A, B)$  is still a minimum  $(s, t)$ -cut for  $G'$ .

Which of the following statements is **CORRECT**?

- (A) I only
- (B) II only
- (C) Both I and II
- (D) Neither I nor II

**Answer: A**

4. Read the following statements.

- I) If a graph contains a negative weight cycle then Dijkstra's algorithm may or may not terminate.
- II) The Bellman-Ford algorithm guarantees that it will always produce a shortest path between two given vertices  $u$  and  $v$  in any weighted graph.

Which of the following statements is **INCORRECT**?

- (A) I only
- (B) II only
- (C) Both I and II
- (D) Neither I nor II

**Answer: B**

5. Consider the following flow network with source as node 0 and sink as node 5. What

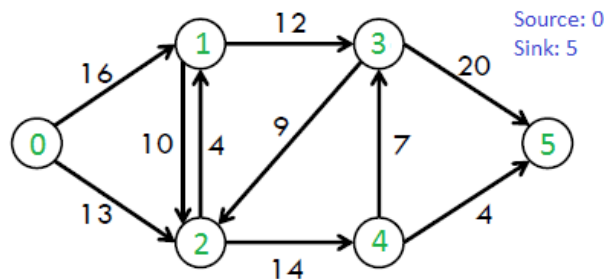


Figure 1: Flow Network

is the maximum flow from source to sink in the above graph?

- (A) 22
- (B) 23
- (C) 24
- (D) 25

**Answer: B**