**** UNIT TEST SUPPLEMENTARY ANSWER BOOK ****

DATE:_____ BRANCH:_____ SEM:_____ ROLL NO :_____

SUBJECT :_____ SUPERVISOR'S SIGN _____

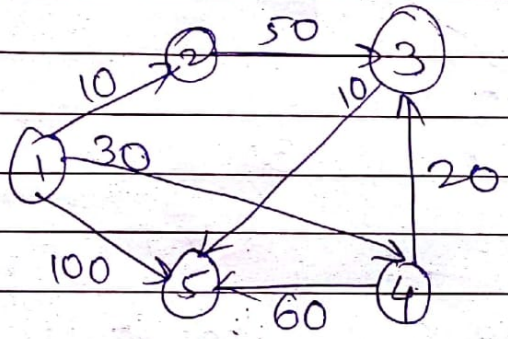
UNIT TEST [I] / [II]

(1)

START WRITING HERE

Single Source Shortest Path (Dijkstra's algo)

Q. 1]



1) let s be the source node
2) let V & NV be two arrays. V holds all visited vertices. NV holds all unvisited vertices.

	1	2	3	4	5
1	0	10	∞	30	100
2	∞	0	50	∞	∞
3	∞	∞	0	∞	10
4	∞	∞	20	0	60
5	∞	∞	∞	∞	0

$W =$

let s be the source node

$S = \{1\}$ $NV = \{2, 3, 4, 5\}$

Node	1	2 ✓	3	4	5
dist	–	10	∞	30	100
Pred	–	1	1	1	1

Select node 2 add it to S array

$S = \{1, 2\}$ $NV = \{3, 4, 5\}$

~~nodes~~ 2 $\xrightarrow{adj}$ 3

~~min~~ $dist[3] = \min\{dist[3], dist[2] + w[2,3]\}$

$= \min\{\infty, 10 + 50\}$

$dist[3] = 60$

$Pred[3] = 2$

Node	1 ✓	2 ✓	3 ✓	4 ✓	5
dist	–	10	60	30	100
Pred	–	1	2	1	1

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START WRITING HERE

$S = \{1, 2, 3\}$ $NV = \{4, 5\}$

node 4 is with min distance.

4 $\xrightarrow{adj}$ 3, 5

3 already visited

$dist[5] = \min\{dist[5], dist[4] + w[4,5]\}$

$= \min\{100, 30+60\}$

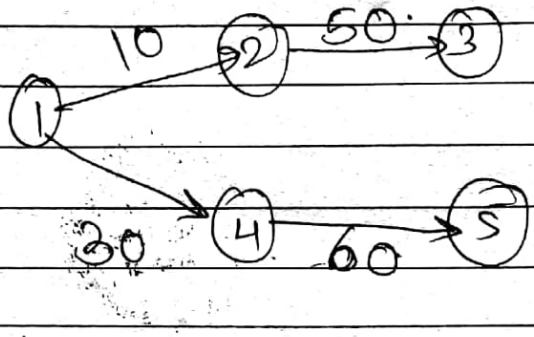
$= \min\{100, 90\}$

$dist[5] = 90$

$P[5] = 4$

mark 5 as visited.

node	1	2	3	4	5
dist	-	10	60	30	90
Pred	-	1	2	1	4



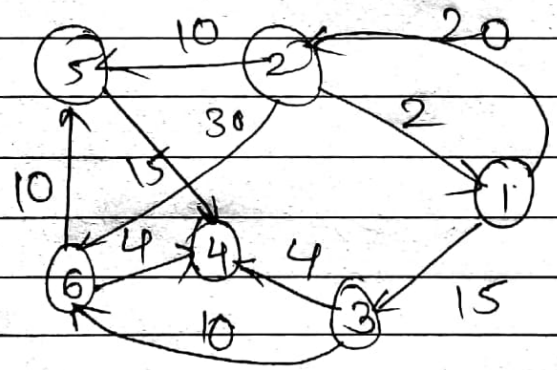
distance between 1 to 2 → 10

1 to 3 → 60

1 to 4 → 30

1 → 4 → 5 → 90

Q.2]



(a)

	1	2	3	4	5	6
1	0	~~20~~ ∞	15	∞	∞	∞
2	2	0	∞	∞	10	30
3	∞	∞	0	4	∞	10
4	∞	∞	∞	0	∞	∞
5	∞	∞	∞	15	0	∞
6	∞	∞	∞	4	10	0

3

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UNIT TEST [I] / [II]

START WRITING HERE

S = 1 NV = {2, 3, 4, 5, 6}

✓ ✓

node	1	2	3	4	5	6
distance	-	20	15	∞	∞	∞
Pred	-	1	1	1	1	1

1) Mark 3 as visited
2) add to array S = {1, 3}
3) find nodes adjacent to 3

adjacent
3 → 4 & 6

dist[4] = min{ dist[4], dist[u] + c[u,v] }

dist[4] = min{ ∞, 15 + 4 }

dist[4] = 19
Pred[4] = 3

dist[6] = min{ dist[6], dist[3] + c[3,6] }
= min{ ∞, 15 + 10 }
= 25

dist[6] = 25
Pred[6] = 3

node	1	2	3	4	5	6
dist	-	20	15	19	∞	25
Pred	-	1	1	3	1	3

select node with minimum distance
Node 4 selected

S = {1, 3, 4} NV = {2, 5, 6}

4 $\xrightarrow{adj}$ X

select node 2 as it has minimum distance add to S

S = {1, 3, 4, 2} NV = {5, 6}

2 $\xrightarrow{adj}$ X, 5, 6 (already visited)

dist[5] = min {dist[5], dist[2] + w[2,5]}

= min {∞, 20 + 10}

= 30

Pred[5] = 2

dist[6] = min {dist[6], dist[2] + w[2,6]}

= min {25, 20 + 30} ← no change for node 6

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UNIT TEST [I] / [II]

(4)

START WRITING HERE

node	1	2	3	4	5	6
	-	20	15	19	30	25
	-	1	1	3	2	3

Select node 6, add to $S = \{1,2,3,4,6\}$

$Nv = \{5\}$

6 adj → 4, 5

↓

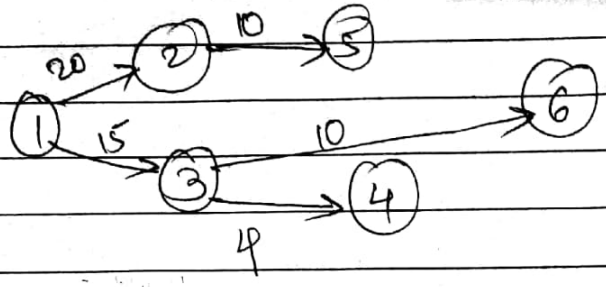
already visited

$dist[5] = \min\{ dist[5], dist[6] + w[6,5] \}$

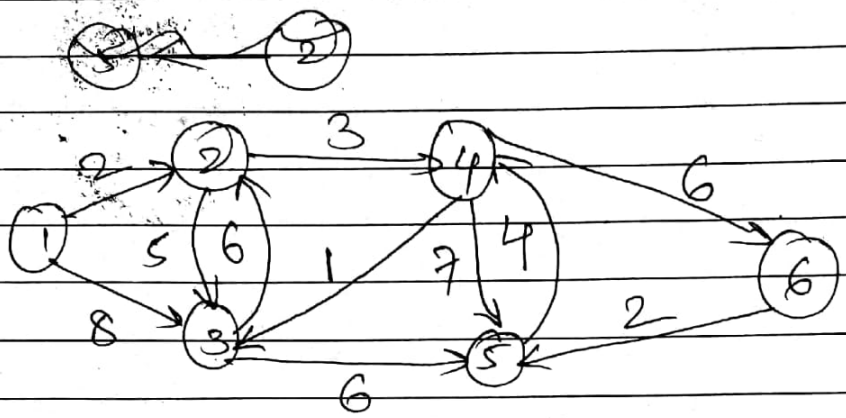
$= \min\{ 30, 25 + 10 \}$

$= \min\{ 30, 35 \}$

No Change



Q. 3]



W =	1	2	3	4	5	6
1	0	2	8	∞	∞	∞
2	∞	0	5	3	∞	∞
3	∞	6	0	∞	6	∞
4	∞	∞	1	0	7	6
5	∞	∞	∞	4	0	∞
6	∞	∞	∞	∞	2	0

S = { 1, } NV = { 2, 3, 4, 5, 6 }

node	1	2	3	4	5	6
dist	-	2	8	∞	∞	∞
P	-	1	1	1	1	1

mark 2 as visited

S = { 1, 2 } NV = { 3, 4, 5, 6 }

$2 \xrightarrow{adj} \{3, 4$

dist[3] = min { dist[3], dist[2] + w[2,3] }
= min { 8, 2+5 }
dist[3] = 7
Pred[3] = 2