* Discrete Mathematics (DM) - Assignment Number - 4

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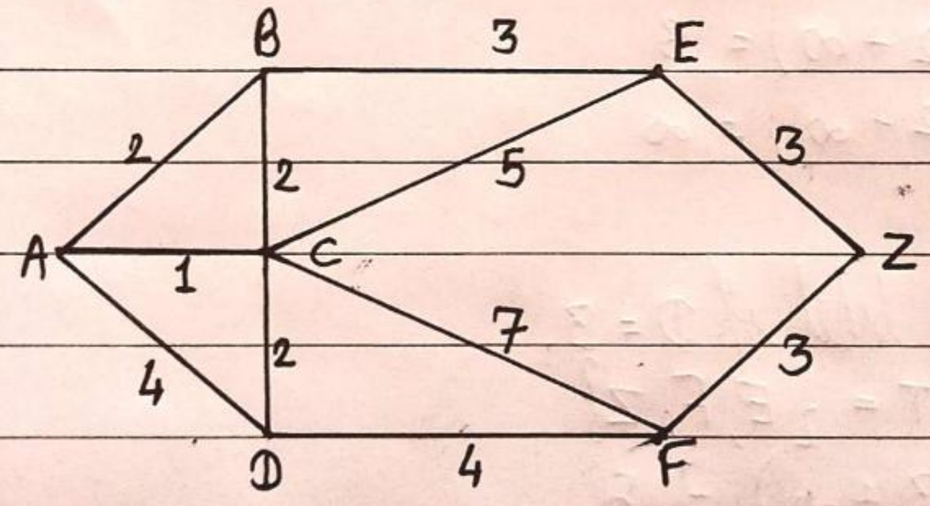
Q-1. Use Dijkstra's algorithm to find the shortest path between A and Z in figure.



→ According to Dijkstra's algorithm, the shortest path between A and Z can be calculated as follows :-

1. $P = \phi$, $T = \{A, B, C, D, E, F, Z\}$
   $L(A) = 0$, $L(x) = \infty \quad \forall \; x \in T \; , x \neq A$

2. $V = A$, the permanent label of $A = 0$.
   $P = \{A\}$, $T = \{B, C, D, E, F, Z\}$
   $L(B) = \min\{\infty, 0+2\} = 2$
   $L(C) = \min\{\infty, 0+1\} = 1$
   $L(D) = \min\{\infty, 0+4\} = 4$
   $L(E) = \min\{\infty, 0+\infty\} = \infty$
   $L(F) = \min\{\infty, 0+\infty\} = \infty$
   $L(Z) = \min\{\infty, 0+\infty\} = \infty$

3. V = C, the permanent label of C = 1.
P = {A, C}, T = {B, D, E, F, Z}

$L(B) = \min(2, 1+2) = 2$
$L(D) = \min(4, 1+2) = 3$
$L(E) = \min(\infty, 1+5) = 6$
$L(F) = \min(\infty, 1+7) = 8$
$L(Z) = \min(\infty, 1+\infty) = \infty$

	A	B	C	D	E	F	Z
A	0_A	2_A	1_A	4_A	∞	∞	∞
C		2_A	1_A	3_C	6_C	8_C	∞
B		2_A		3_C	5_B	8_C	∞
D				3_C	5_B	7_D	∞
E					5_B	7_D	8_E
F						7_D	8_E
Z							8_E

4. V = B, the permanent label of B = 2.
P = {A, C, B}, T = {D, E, F, Z}

$L(D) = \min(3, 2+\infty) = 3$
$L(E) = \min(6, 2+3) = 5$
$L(F) = \min(8, 2+\infty) = 8$
$L(Z) = \min(\infty, 2+\infty) = \infty$

5. V = D, the permanent label of D = 3.
P = {A, C, B, D}, T = {E, F, Z}

$L(E) = \min(5, 3+\infty) = 5$
$L(F) = \min(8, 3+4) = 7$
$L(Z) = \min(\infty, 3+\infty) = \infty$

6. V = E, the permanent label of E = 5
P = {A, C, B, D, E}, T = {F, Z}

$L(F) = \min(7, 5+\infty) = 7$
$L(Z) = \min(20, 5+3) = 8$

7. V = F the permanent label of F = 7
P = {A, C, B, D, E, F}, T = {Z}

$L(Z) = \min(8, 7+3) = 8$

∴ The shortest path length from A to Z is 8 and path is A → B → E → Z.