Quiz - 3

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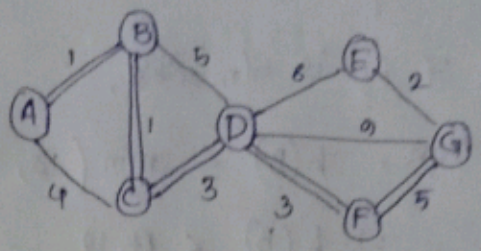
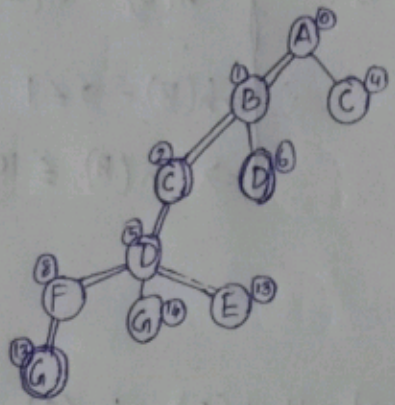
1 (a) Uniform Cost Search (Graph Search):

Fringe	Explored
A_0	
$C_4\ B_1$	A_0
$D_6\ C_2\ C_4$	B_1
$D_5\ D_6\ C_4$	C_2
$F_8\ G_{14}\ E_{13}\ D_6$	D_5
$G_{13}\ G_{14}\ E_{13}$	F_8
$G_{15}\ G_{13}\ G_{14}$	E_{13}
	G_{13} (T)



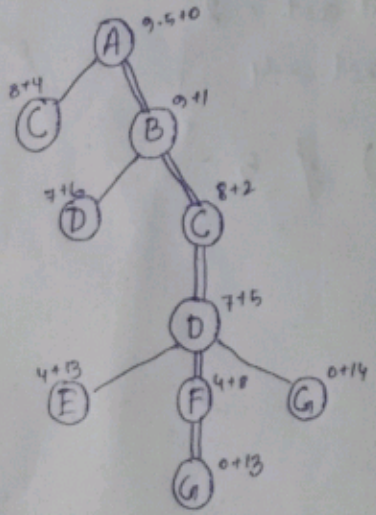
as C is once explored we will not visit C_4 again.

as D is once explored we will not explore D_6 again.

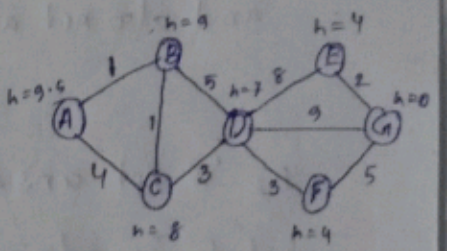


∴ Path ⇒
A → B → C → D → F → G
Cost = 13.

(b) A* Search with heuristic h_1 :



Fringe	Explored
$A_{9.5}$	
$C_{12}\ B_{10}$	$A_{9.5}$
$D_{13}\ C_{10}\ C_{12}$	B_{10}
~~$D_{12}\ D_{13}$~~	C_{10}
$G_{14}\ E_{17}\ F_{12}\ D_{13}$	D_{12}
$G_{13}\ G_{14}\ E_{17}$ ~~D_8~~	F_{12}
	G_{13} (T)

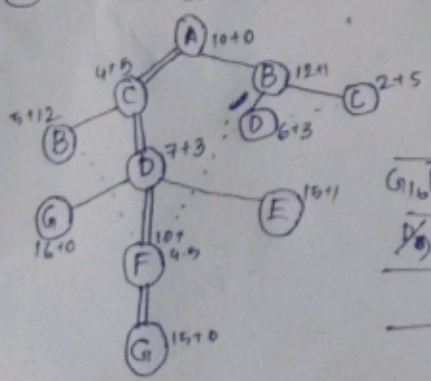


C_{12} will not be visited as C_{10} is already explored, D same for D_{13}.

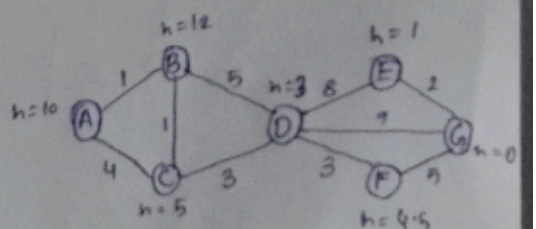
∴ Path ⇒ A → B → C → D → F → G

Cost = 13.

(c) A* search with heuristic h_2.



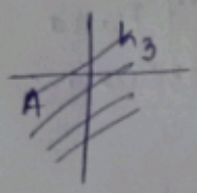
Fringe	Explored
A_{10}	
$C_9\ B_{13}$	A_{10}
$B_{17}\ D_{10}\ B_{13}$	C_9
$G_{16}\ E_{16}\ F_{14.5}\ B_{17}\ B_{13}$	D_{10}
~~$D_9\ C_7\ G_{16}\ E_{16}\ F_{14.5}\ B_{17}$~~	B_{13}
$G_{15}\ G_{16}\ E_{16}$	$F_{14.5}$
	G_{15} (T)

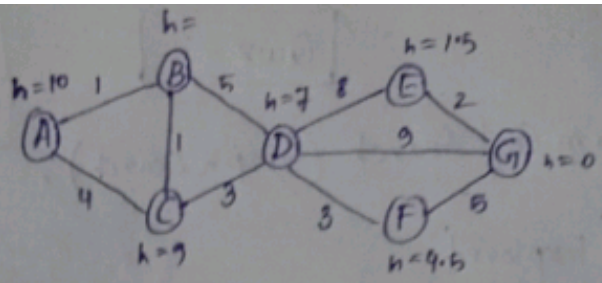


as B, C, D are explored so, B_{17}, D_9, C_7 are not explored.

∴ Path ⇒ A → C → D → F → G ∴ Cost = 15

2.





(a) if h_3 is admissible,

then, $h(B) \leq \min(13, 14, 15, 12)$

$\Rightarrow h(B) \leq 12 \quad \therefore h(B) \in [0, 12]$.

(b) if h_3 is consistent,

then, $h(B) - h(D) \leq 5$

$\Rightarrow h(B) - 7 \leq 5$

$\Rightarrow h(B) \leq 12$

$h(B) - h(C) \leq 1$

$\Rightarrow h(B) - 9 \leq 1$

$\Rightarrow h(B) \leq 10$

$h(A) - h(B) \leq 1$

$\Rightarrow 10 - h(B) \leq 1$

$\Rightarrow h(B) \geq 9$

$\therefore h(B) \in [9, 10]$

1.

h_1 is not consistent $\because h_1(E) - h_1(G) \not\leq 2$

and also not admissible $\because$ E → G actual cost = 2

but heuristic cost = 4.

h_2 is not consistent $\because h_2(B) - h_2(D) \not\leq 5$

but h_2 is admissible.