Q1 let us take a graph

12 nodes

Level 0 → rooted @ 1 20 edges

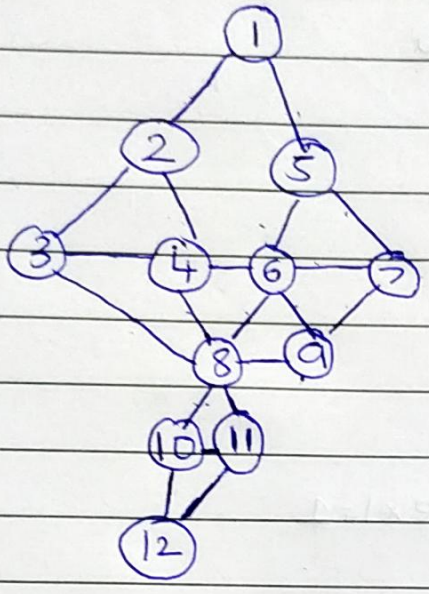
Level 1

level 2

level 3

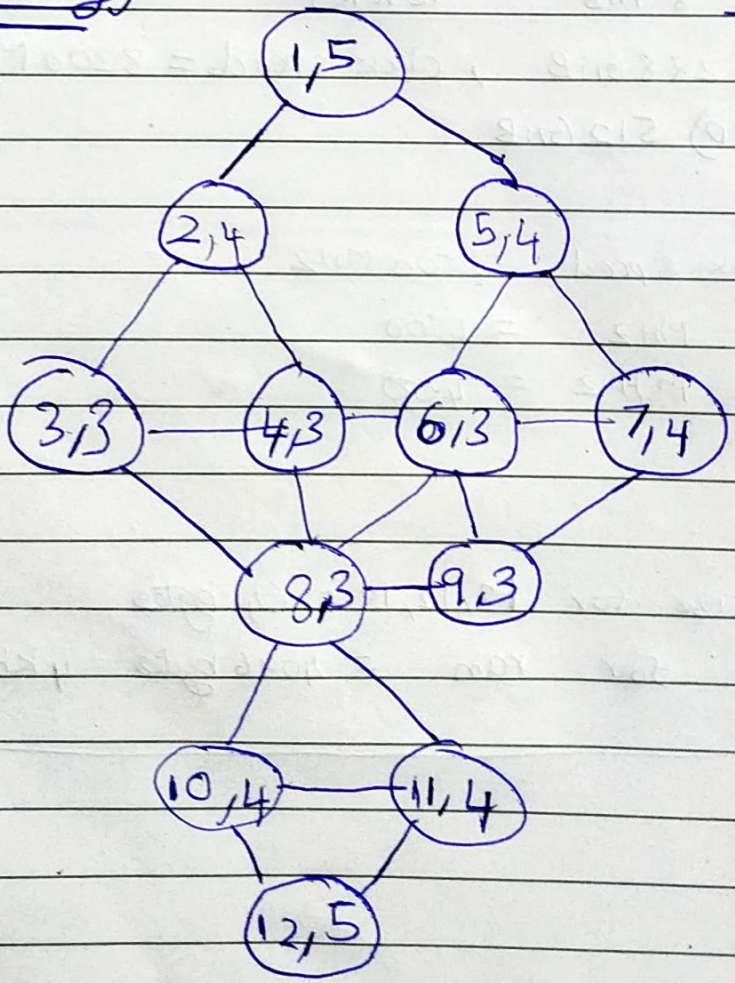
level 4

level 5



node, ecc graph

(node, Eccentricity)



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(Q2)

eccentity (u) → longest of [shortest paths from a fixed node u to all other nodes V in graph G)

B_i → max of all eccentrity at level i

Algorithm:

1) Take a node and root the graph at the node
2) Now from the bottom most level do a BFS on each node at that level and find ecc of it.
   Let B_i → max of all ecc at level i
3) if $B_i > 2(i-1)$, Then we can stop our BFS's as any node above it will not have a ecc greater than ecc of all nodes found till now

For our graph

		B_i	Condition ($B_i > 2(i-1)$)	Result
level 5:	Nod (12) → ecc(12) = 5	$B_5 = 5$	$5 > 2(5-1)$	False
level 4:	Node (11) → ecc(11) = 4 Node (10) → ecc(10) = 4	$B_4 = 4$	$4 > 2(4-1)$	False
level 3:	Node (9) → ecc(9) = 3 Node (8) → ecc(8) = 3	$B_3 = 3$	$3 > 2(3-1)$	False
Level 2:	Node (7) → ecc(7) = 4 Node (6) → ecc(6) = 3 Node (4) → ecc(4) = 3 Node (3) → ecc(3) = 3	$B_2 = 4$	$4 > 2(2-1)$	True

So in level 2 $B_2 > 2(2-1)$ → so we need no do BFS for level 1 nodes

Efficetively we do (1+9) BFS traversal
↱ Rooting

our example we do very high no of traversal eventhough using iFUB,

one reasons is nodes : edges ratio