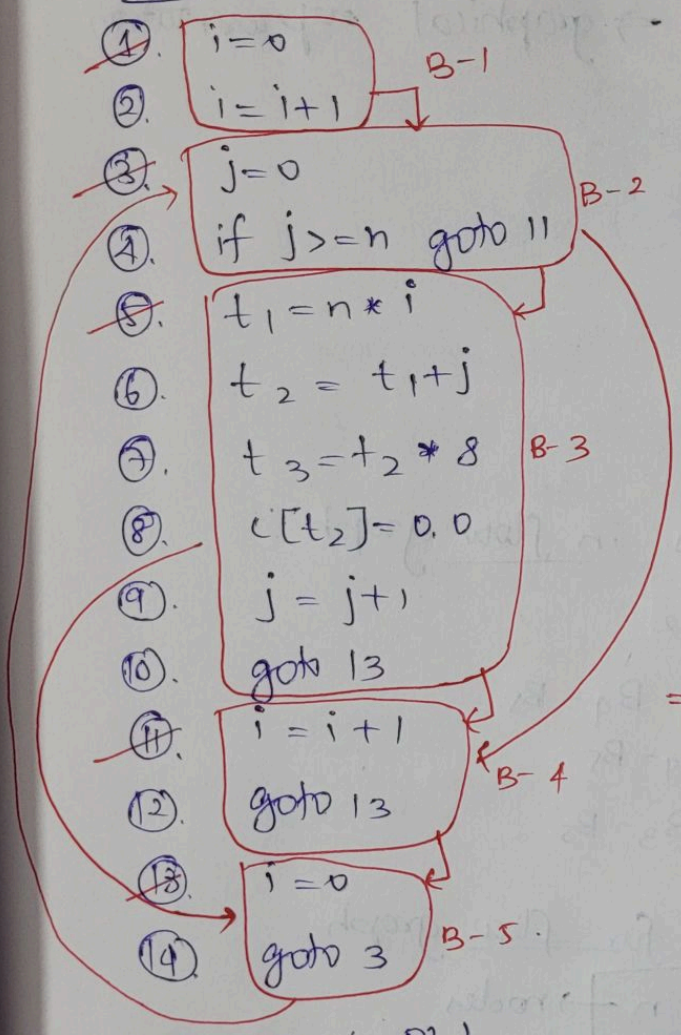
LOOPS IN FLOW GRAPH

Set of three - address statements :-

Ex :-



Find :-
(i) construct flow graph
(ii). Loops in flow graph
(iii). dominators tree for flow graph
(iv). Natural Loop.

⇒ flows & blocks

(i). Basic Block :

(i). Rule 1 ⇒ To find a leader ⇒ root node (1).

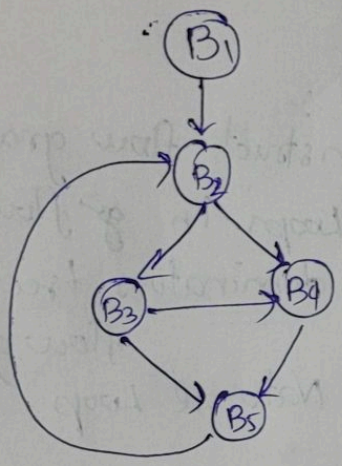
(ii). Rule 2 ⇒ conditional target statements are leader
(11), (13), (3)

(iii). Rule 3 ⇒ After Conditional statement, which statement follows is the leader.
(5) (11) (13).

∴ (1) (3) (5) (11) (13).

⇒ To draw basic block ⇒ ~~there are~~ it should not contain 2 leader statements.

(i) CONSTANT FLOW GRAPH: ⇒ graphical representation.



(ii). Find the loops in flow graph :-

$B_5 - B_2$

$B_5 - B_2 - B_3 - B_4 - B_5$

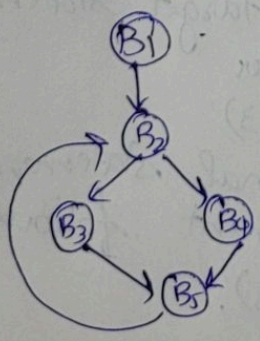
$B_5 - B_2 - B_4 - B_5$

$B_5 - B_2 - B_3 - B_5$

(iii). Dominator tree for flow graph.

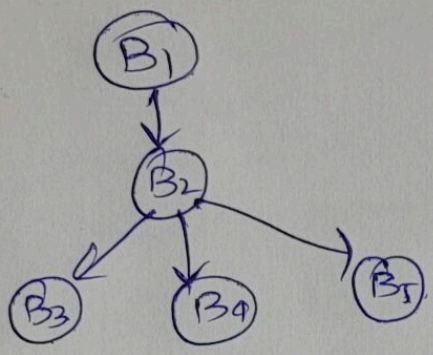
↳ d dom n → nodes

→ Every node dominates itself
→ Initial node dominates all nodes in Graph.



⇒ B_1 is a dominator of 2, 3, 4, 5
⇒ B_2 is a dominator of 3, 4, 5
⇒ B_3, B_4, B_5 is a dominator of itself.

Dominator tree flow graph



(iv). NATURAL LOOP :-

(i). Loop → single entry point → header that dominates all nodes in loop.

(ii). Back edge (travels back).

$n \to d$

Formula :-

Natural loop ⇒ d + { all nodes that can reach to n without going through d }.

$n \to d$

$5 \to 2$

⇒ {2, 3, 4, 5} ⇒ Natural loop.