Q1.   (a)   if (a == b && c == d || e == b) x = 1;

100 :   if a == b   goto 102
101 :   goto 107
102 :   if c == d goto 106
103 :   goto 104
104 :   if e == f goto 106
105 :   goto 107
106 :   x = 1
107 :   (exit)

(b) if (a == b || c == d || e == b) x = 1;

100 :   if a == b goto 106
101 :   goto 102
102 :   if c == d goto 106
103 :   goto 104
104 :   if e == f goto 106
105 :   goto 107
106 :   x = 1
                         (exit)

107 :

(c) if (a==b && c==d && e==≠b) x=1;

    100: if a==b goto 102
    101: goto 107
    102: if c==d goto 104
    103: goto 107
    104: if e==f goto 106
    105: goto 107
    106: x=1
    107:                          (exit)

(Q2)   while   a<b   do
                 If   c<d   then
                      x=y+z
              else
                      x=y-z

Backpatching control-construct grammar
we get:

      S ⟶ while M_1 (E) do $M_2 S_1$

      S ⟶ if (E) $M_1 S_1$ N   else $M_2 S_2$

      S ⟶ if (E) $M S_1$

      M ⟶ ε
      N ⟶ ε

Constructing TAC and Reductions for given code:

Reductions

1. $M_1 \rightarrow \epsilon$

2. $E_1 \rightarrow id_a$

3. $E_2 \rightarrow id_b$

4. $E_3 \rightarrow E_1 \ relop \ E_2$

5. $M_2 \rightarrow \epsilon$

6. $E_4 \rightarrow id_c$

7. $E_5 \rightarrow id_d$

8. $E_6 \rightarrow E_4 \ relop \ E_5$

9. $M_3 \rightarrow \epsilon$

10. $E_7 \rightarrow id_y$

11. $E_8 \rightarrow id_z$

12. $E_9 \rightarrow E_7 + E_8$

13. $S_1 \rightarrow id_x = E_9$

14. $N_1 \rightarrow \epsilon$

15. $M_4 \rightarrow \epsilon$

16. $E_{10} \rightarrow id_y$

17. $E_{11} \rightarrow id_z$

(18) $E_{12} \longrightarrow E_{10} - E_{11}$

(19) $S_2 \longrightarrow id_x = E_{12}$

(20) $S_3 \longrightarrow$ if E_6 then $M_3 S_1 N_1$ else $M_4 S_2$

(21) $S_4 \longrightarrow$ while $M_1 E_3$ do $M_2 S_3$

we have, TAC :

```
100:  if a < b  goto 102
101:  goto 110
102:  if c < d  goto 104
103:  goto 107
104:  t01 = y + z
105:  x = t01
106:  goto 100
107:  t02 = y - z
108:  x = t02
109:  goto 100
110:
```

Parse tree (annotated):

- $S_4 \rightarrow$ while M_1 E_3 do M_2 S_3
  - $M_1 \rightarrow \varepsilon$
  - $E_3 \rightarrow E_1$ relop E_2
    - $E_1 \rightarrow id_a$
    - relop $\rightarrow <$
    - $E_2 \rightarrow id_b$
  - $M_2 \rightarrow \varepsilon$
  - $S_3 \rightarrow$ if E_6 then M_3 S_1 N_1 else M_4 S_2
    - $E_6 \rightarrow E_4$ relop E_5
      - $E_4 \rightarrow id_c$
      - relop $\rightarrow <$
      - $E_5 \rightarrow id_d$
    - $M_3 \rightarrow \varepsilon$
    - $S_1 \rightarrow id_z = E_9$
      - $E_9 \rightarrow E_7 + E_8$
        - $E_7 \rightarrow id_y$
        - $E_8 \rightarrow id_i$
    - $N_1 \rightarrow \varepsilon$
    - $M_4 \rightarrow \varepsilon$
    - $S_2 \rightarrow id_x = E_{15} - E_{12}$
      - $E_{12} \rightarrow fp_i$
      - $E_{15} \rightarrow id_z$

Scanned with CamScanner