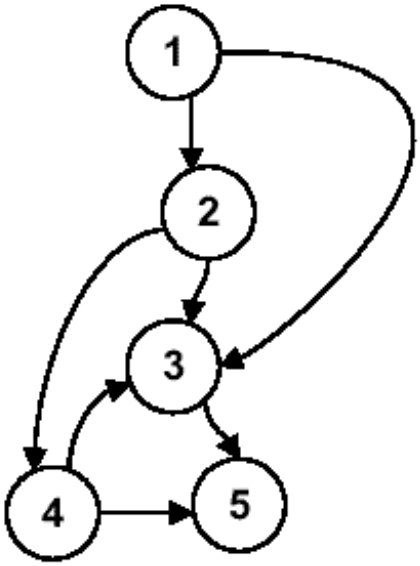
Tutorial 8

Suggested Answer

Question 1

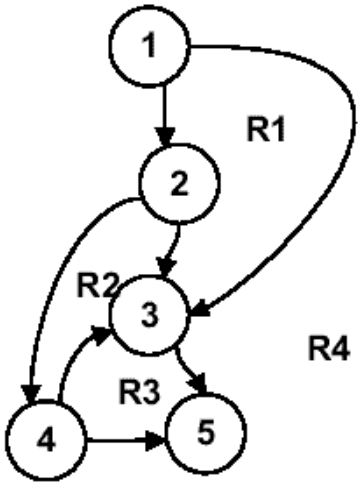
- Consider the following flow graph.
  A. Copy the diagram into your answer sheet, and based on this flowgraph, derive the value of V(G). Show all three methods of calculation, with full working.
  B. Based on this value of V(G), derive the basis set of test paths.

Question 1 (cont')



Answer

- Regions method: V(G) = no. of distinct regions = R1 to R4 = 4



Answer (cont')

- V(G) = predicate nodes + 1 = Predicate nodes (1, 2, 4) + 1 = 3 + 1 = 4
- V(G) = edges – nodes + 2 = 7 edges – 5 nodes + 2 = 4
- Basis set:
  - Path 1: 1-3-5
  - Path 2: 1-2-3-5
  - Path 3: 1-2-4-5
  - Path 4: 1-2-4-3-5

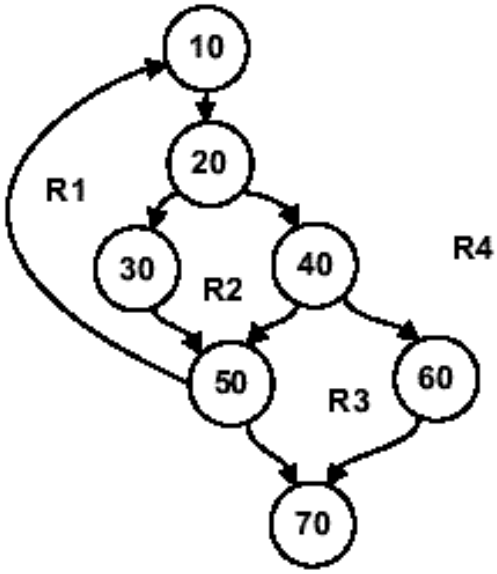
Question 2

- Consider the following section of code:
  A. Draw a labeled flow graph for the above source code.
  B. Based on the Basis Path Testing technique, calculate the value of cyclomatic complexity using all three methods of calculation. Ensure that all working is clearly shown for the three methods (e.g. predicate nodes and regions clearly highlighted).
  C. Based on the value of cyclomatic complexity calculated, derive the set of basis test paths.

Question 2 (cont')

```
10  Print "Hello"‘
20  If Condition Cl is true, then GOTO 30;
    Else GOTO 40
30  Accept Input; then GOTO 50
40  If Condition C2 is true, then GOTO 50;
    Else GOTO 60
50  While Condition C3 is true, GOTO 10;
    Else GOTO 70
60  Accept Input; then GOTO 70
70  Print "End of program"
```


Answer



Answer

- The Value of V(G)
  - V(G) = no. of regions = R1 to R4 = 4
  - V(G) = no. of Predicate nodes + 1= P (20, 40, 50) + 1 = 3 + 1 = 4
  - V(G) = E – N + 2 = 9 – 7 + 2 = 4
- Therefore there are 4 basic paths.
  - 10-20-30-50-70
  - 10-20-30-50-10-20-30-50-70
  - 10-20-40-50-70
  - 10-20-40-60-70

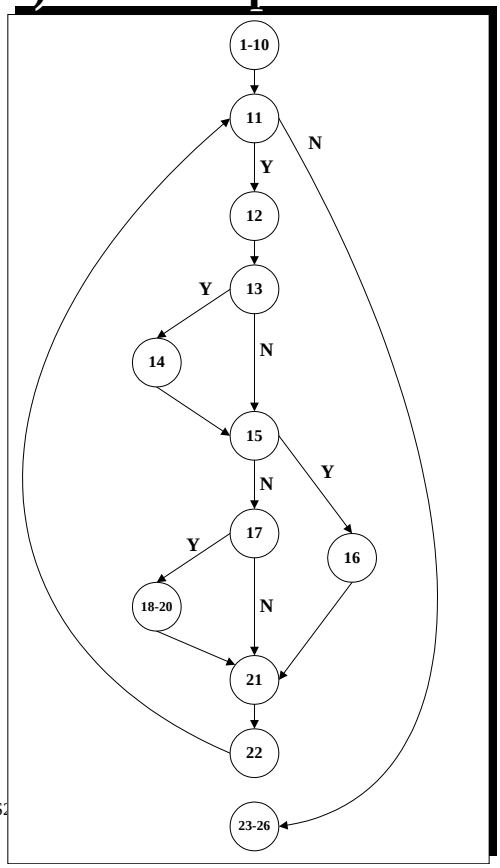
Question 3

- Consider the following program segment,
  A. Draw the Flow Graph.
  B. Calculate the McCabe's Cyclomatic Number V(G) to find out the total number of independent path.
  C. Identify each Independent Path.

Question 3 (cont')

```
1.  #define YES 1
2.  #define NO 0
3.  void main(void)
4.  {
5.      int c, nl, nw, nc, inword;
6.      inword = NO;
7.      nl = 0;
8.      nw = 0;
9.      nc = 0;
10.     c = getchar( );
11.     while (c != EOF) {
12.         nc = nc + 1;
13.         if (c == '\n')
14.             nl = nl + 1;
15.         if (c == ' ' || c == '\n' || c == '\t')
16.             inword = NO;
17.         else if (inword == NO) {
18.             inword = YES;
19.             nw = nw + 1;
20.         }
21.         c = getchar( );
22.     }
23.     printf("%d\n", nl);
24.     printf("%d\n", nw);
25.     printf("%d\n", nc);
26. }
```

1A) Flow Graph

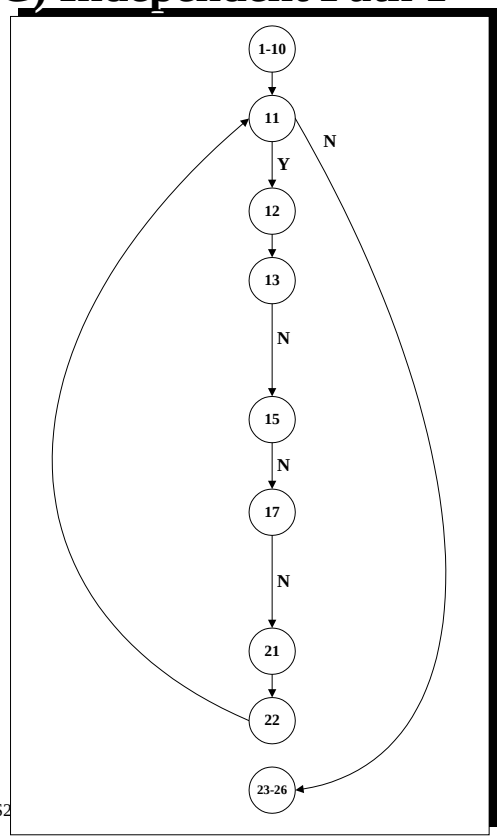


1B) Cyclomatic Number

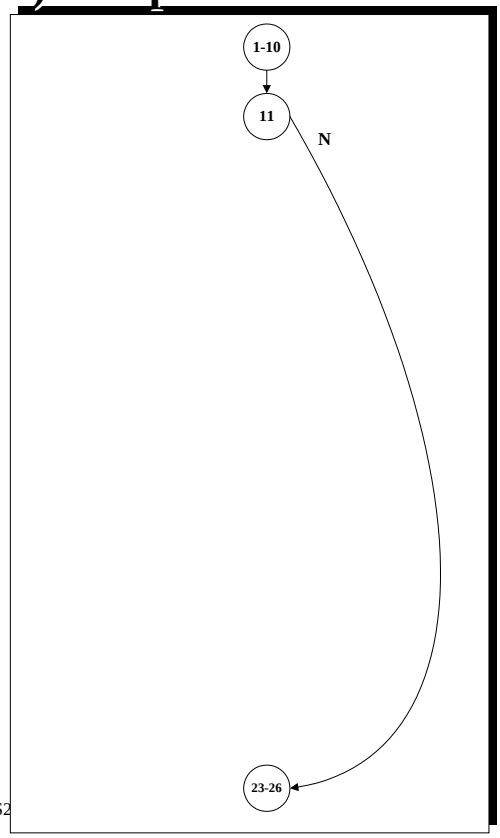
- V(G) = e – n + 2p
  - e = number of edges
  - n = number of nodes
  - p = number of disconnected components (p =1 for most programs)

- In this graph,
  V(G) = 15 - 12 + 2
  V(G) = 5

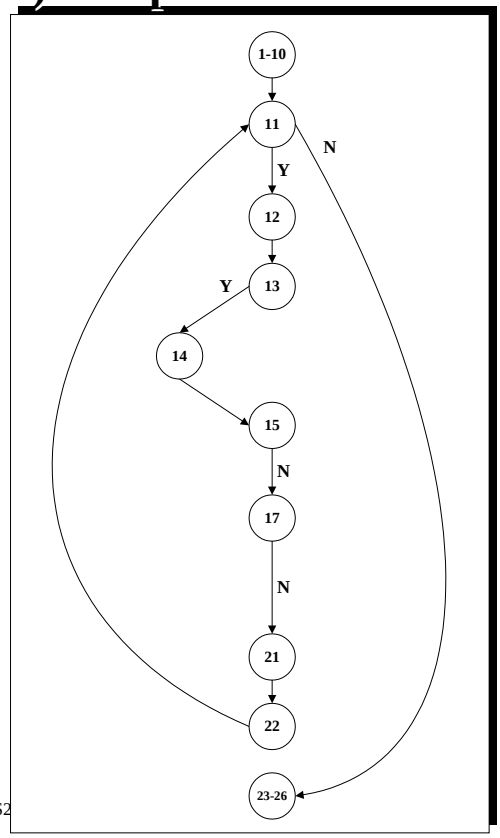
1C) Independent Path 1



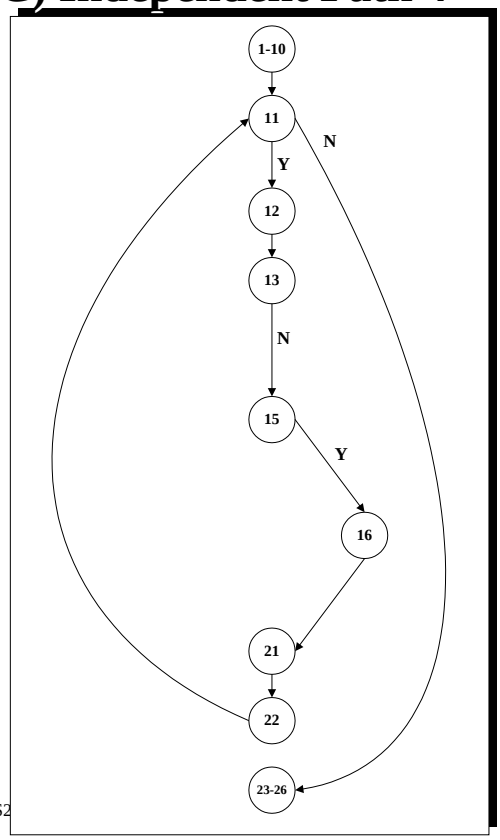
1C) Independent Path 2



1C) Independent Path 3



1C) Independent Path 4



1C) Independent Path 5