AQA Computer Science A-Level

4.3.1 Graph-traversal

Past Paper Questions

Specimen Paper 1

0 3 The Cat transportation company (CTC) is a business that specialises in preparing cats for cat shows.

They need to take five cats to the AQA cat show. They will transport the cats in their van. CTC owns only one van.

They cannot put all the cats in their van at the same time because some of the cats get stressed when in the company of some of the other cats. The cats would not therefore arrive in top condition for the cat show if they were all in the van at the same time.

The graph in **Figure 3** shows the relationships between the five cats (labelled 1 to 5). If there is an edge between two cats in the graph then they **cannot** travel in the van together at the same time.

Figure 3

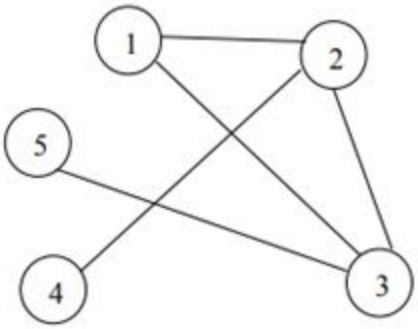

Figure 4 shows an algorithm, written in pseudo-code, that CTC use.

Figure 4

```
NoOfCats ← 5
Cat[1] ← 1
FOR A ← 2 TO NoOfCats
  B ← 1
  C ← 1
  WHILE B < A DO
    IF M[A, B] = 1
      THEN
        IF Cat[B] = C
          THEN
            B ← 1
            C ← C + 1
          ELSE B ← B + 1
        ENDIF
      ELSE B ← B + 1
    ENDIF
  ENDWHILE
  Cat[A] ← C
ENDFOR
```

The two-dimensional array, M, is used to store the adjacency matrix shown in **Table 4**.

Table 4 shows how the graph in **Figure 3** can be represented as an adjacency matrix.

Table 4

Vertex (in Figure 3)	1	2	3	4	5
1	0	1	1	0	0
2	1	0	1	1	0
3	1	1	0	0	1
4	0	1	0	0	0
5	0	0	1	0	0

0 3 . 4 Complete **Table 5** to show the result of tracing the algorithm in **Figure 4**.

[6 marks]

Copy your answer in **Table 5** into the Electronic Answer Document.

Table 5

				Cat				
NoOfCats	**A**	**B**	**C**	**1**	**2**	**3**	**4**	**5**

0 3 . 5 Explain the purpose of the algorithm in **Figure 4**.

[1 mark]