**4.**

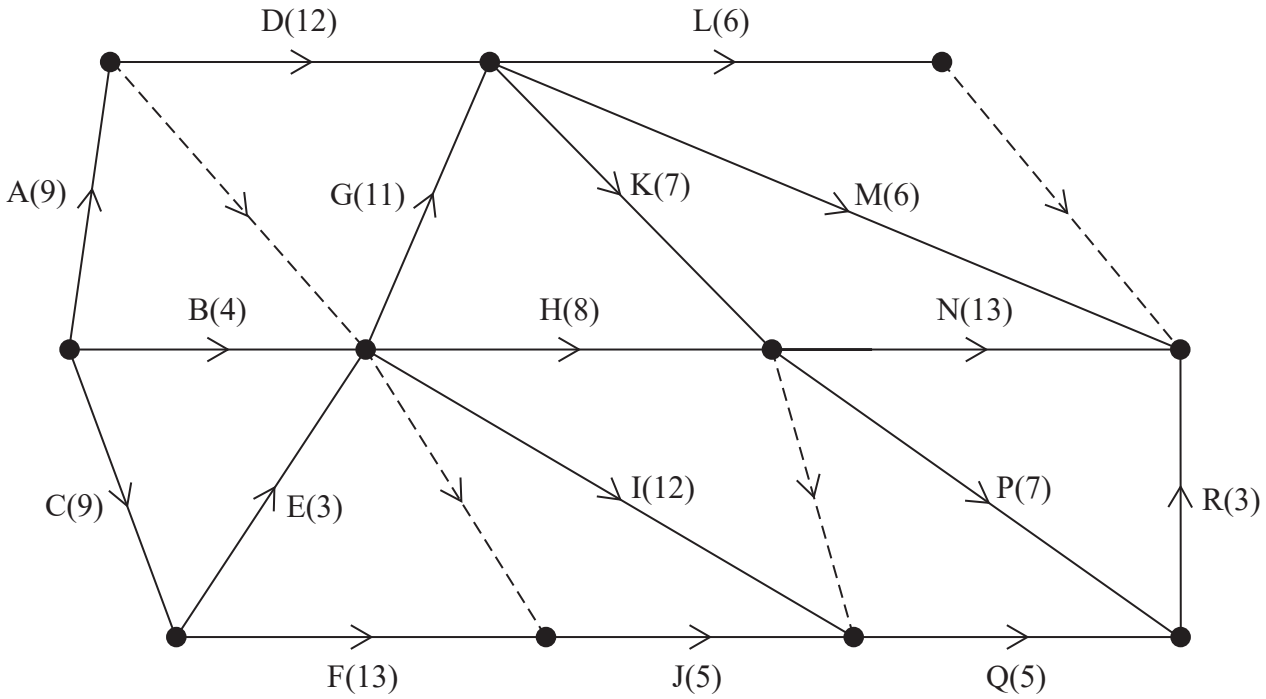



**Figure 2**

[*The sum of the durations of all the activities is* 133 *days*]

A project is modelled by the activity network shown in Figure 2. The activities are represented by the arcs. The number in brackets on each arc gives the time, in days, to complete the activity. Each activity requires one worker. The project is to be completed in the shortest possible time.

(a) Complete the precedence table in the answer book.

**(2)**

(b) Complete Diagram 1 in the answer book to show the early event times and the late event times.

**(4)**

(c) State the critical activities.

**(1)**

(d) Calculate the total float for activity J. You must make the numbers you use in your calculation clear.

**(1)**

(e) Calculate a lower bound for the number of workers needed to complete the project in the minimum time. You must show your working.

**(1)**

Diagram 2 in the answer book shows a partly completed scheduling diagram for this project.

(f) Complete the scheduling diagram, using the minimum number of workers, so that the project is completed in the minimum time.

**(4)**

**(Total for Question 4 is 13 marks)**