Q1.

The precedence table below shows the 12 activities required to complete a project.

Activity	Immediately preceding activities
A	–
B	–
C	–
D	A
E	A, B, C
F	A, B, C
G	C
H	D, E
I	D, E
J	D, E
K	F, G, J
L	F, G

(a) Draw the activity network described in the precedence table, using activity on arc.

Your activity network must contain the minimum number of dummies only.

(5)

Each of the activities shown in the precedence table requires one worker. The project is to be completed in the minimum possible time.

Figure 3

Figure 3 shows a schedule for the project using three workers.

(b) (i) State the critical path for the network.

(ii) State the minimum completion time for the project.
(iii) Calculate the total float on activity B.
(iv) Calculate the total float on activity G.

(4)

Immediately after the start of the project, it is found that the duration of activity I, as shown in Figure 3, is incorrect. In fact, activity I will take 8 hours.

The durations of all the other activities remain as shown in Figure 3.

(c) Determine whether the project can still be completed in the minimum completion time using only three workers when the duration of activity I is 8 hours.

Your answer must make specific reference to workers, times and activities.

(2)

(Total for question = 11 marks)

(Q06 9FM0/03D, June 2024)

Q2.

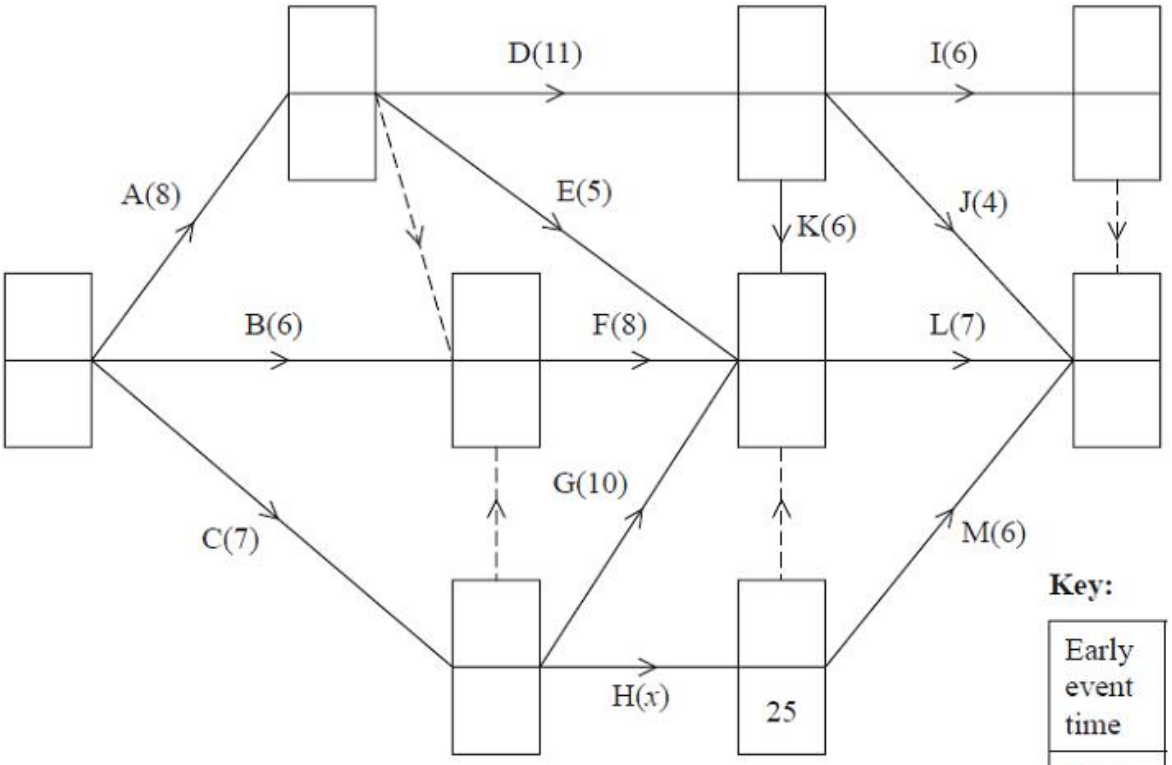


Figure 3

The network in Figure 3 shows the activities that need to be undertaken to complete a project. Each activity is represented by an arc and the duration of the activity, in days, is shown in brackets. The early event times and late event times are to be shown at each vertex and one late event time has been completed for you.

The total float of activity H is 7 days.

(a) Explain, with detailed reasoning, why $x = 11$

(2)

(b) Determine the missing early event times and late event times, and hence complete Diagram 1 in your answer book.

(3)

Each activity requires one worker and the project must be completed in the shortest possible time using as few workers as possible.

(c) Calculate a lower bound for the number of workers needed to complete the project in the shortest possible time.

(1)

(d) Schedule the activities using Grid 1 in the answer book.

(3)

(Total for question = 9 marks)

(Q04 9FM0/03D, June 2019)

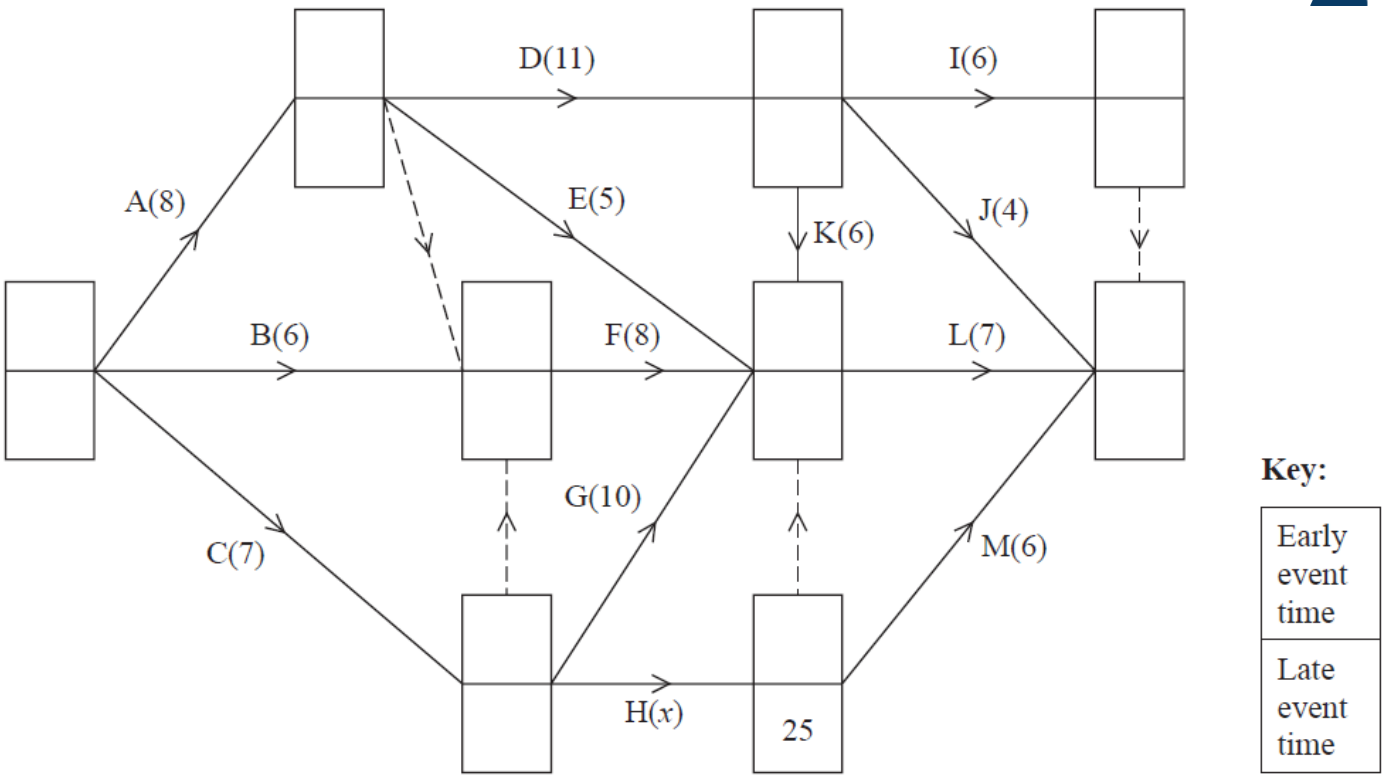
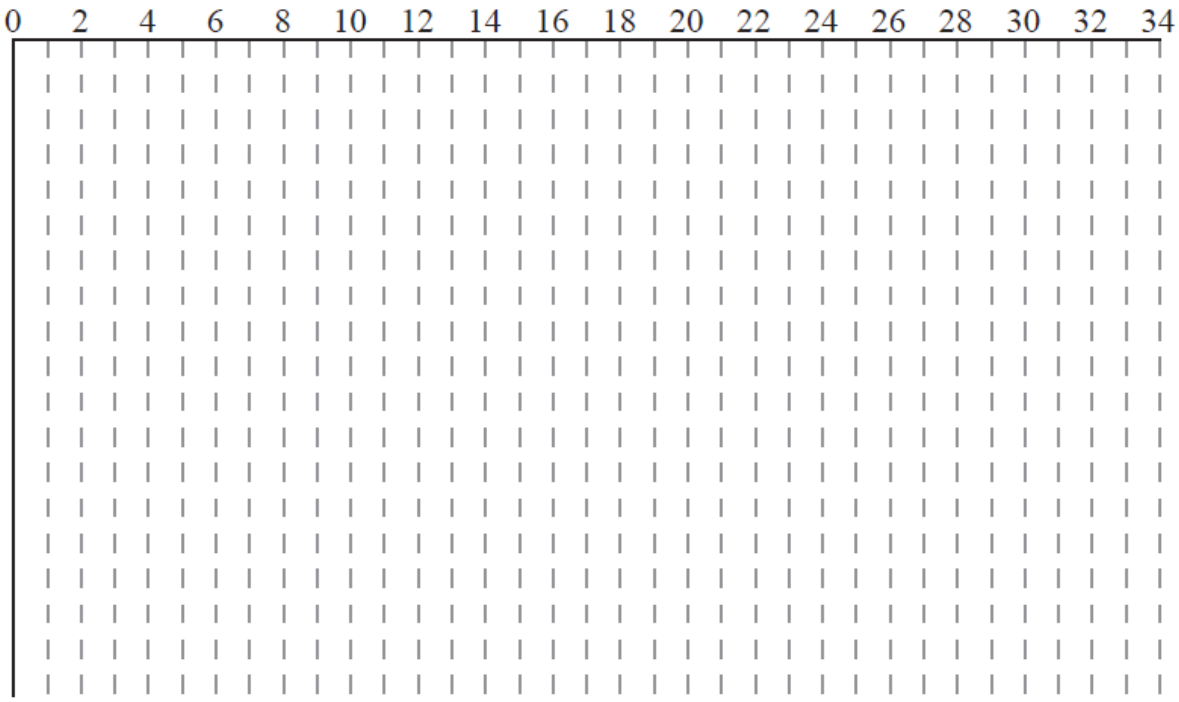


Diagram 1



Grid 1

Q3.

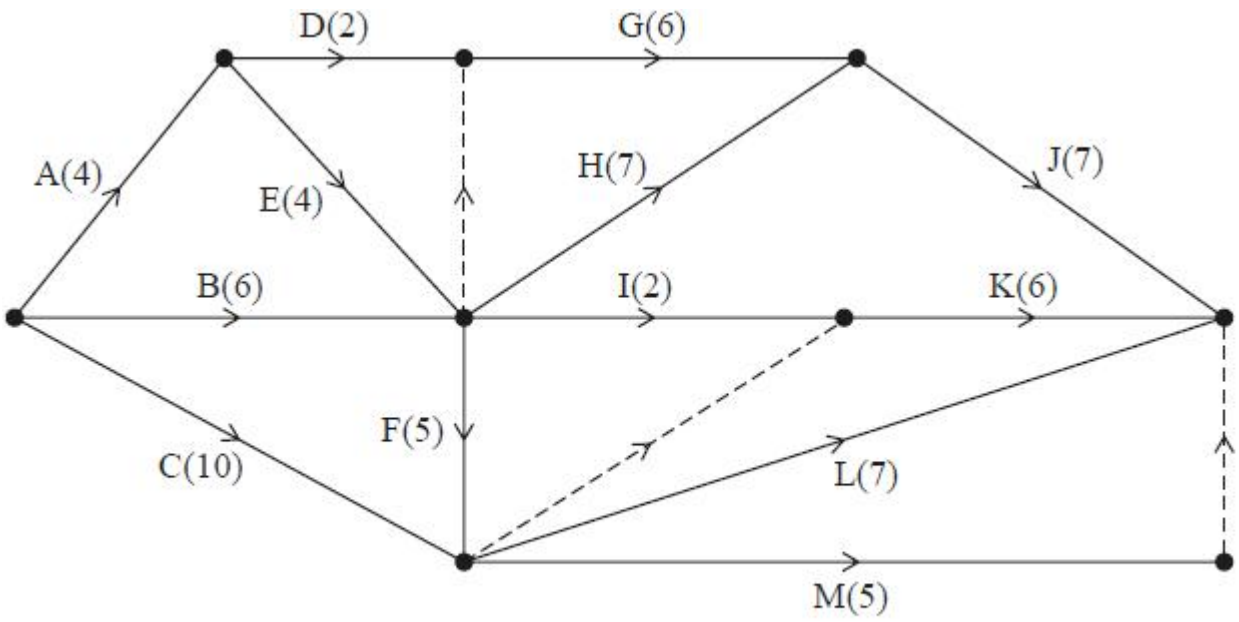


Figure 2

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 hours, to complete the corresponding activity.

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

(4)

Each activity requires one worker and the project must be completed in the shortest possible time using as few workers as possible.

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

(2)

(c) Schedule the activities using Grid 1 in the answer book.

(3)

(Total for question = 9 marks)

(Q02 9FM0/03D, Oct 2021)

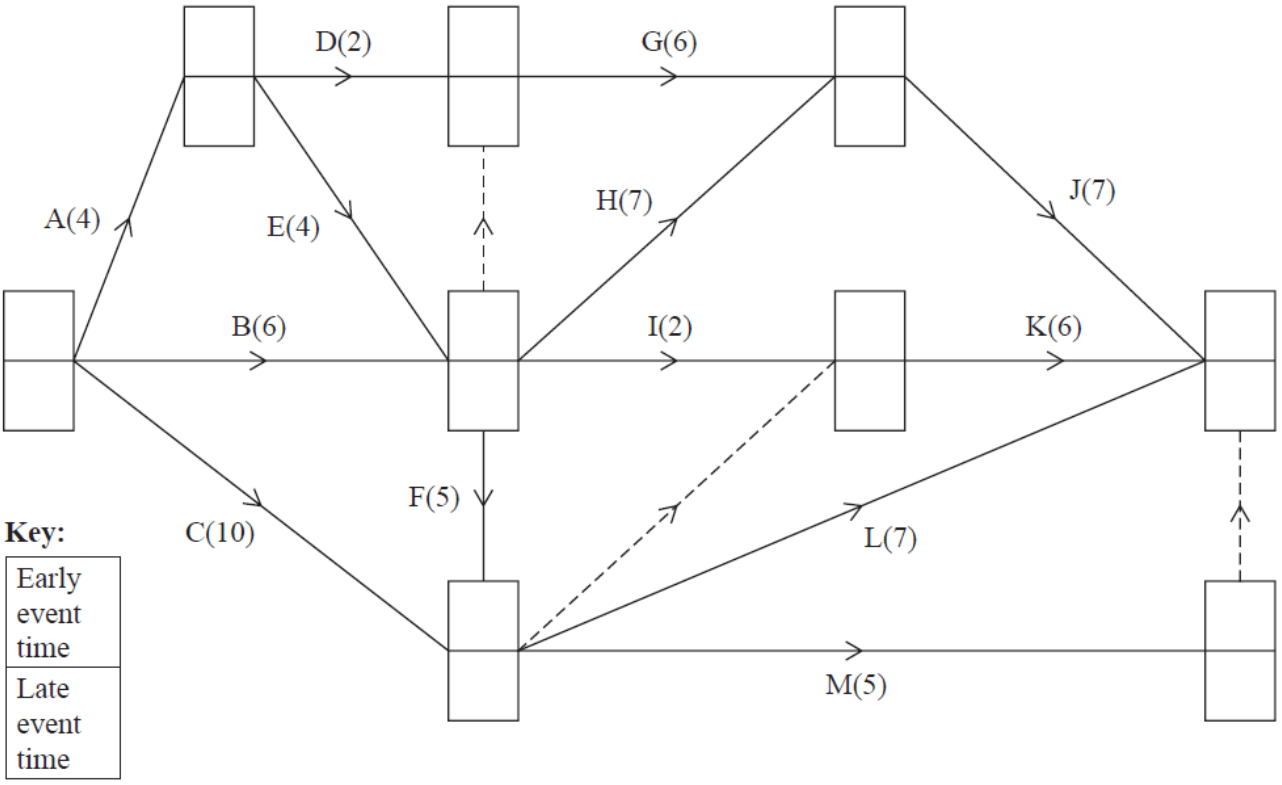
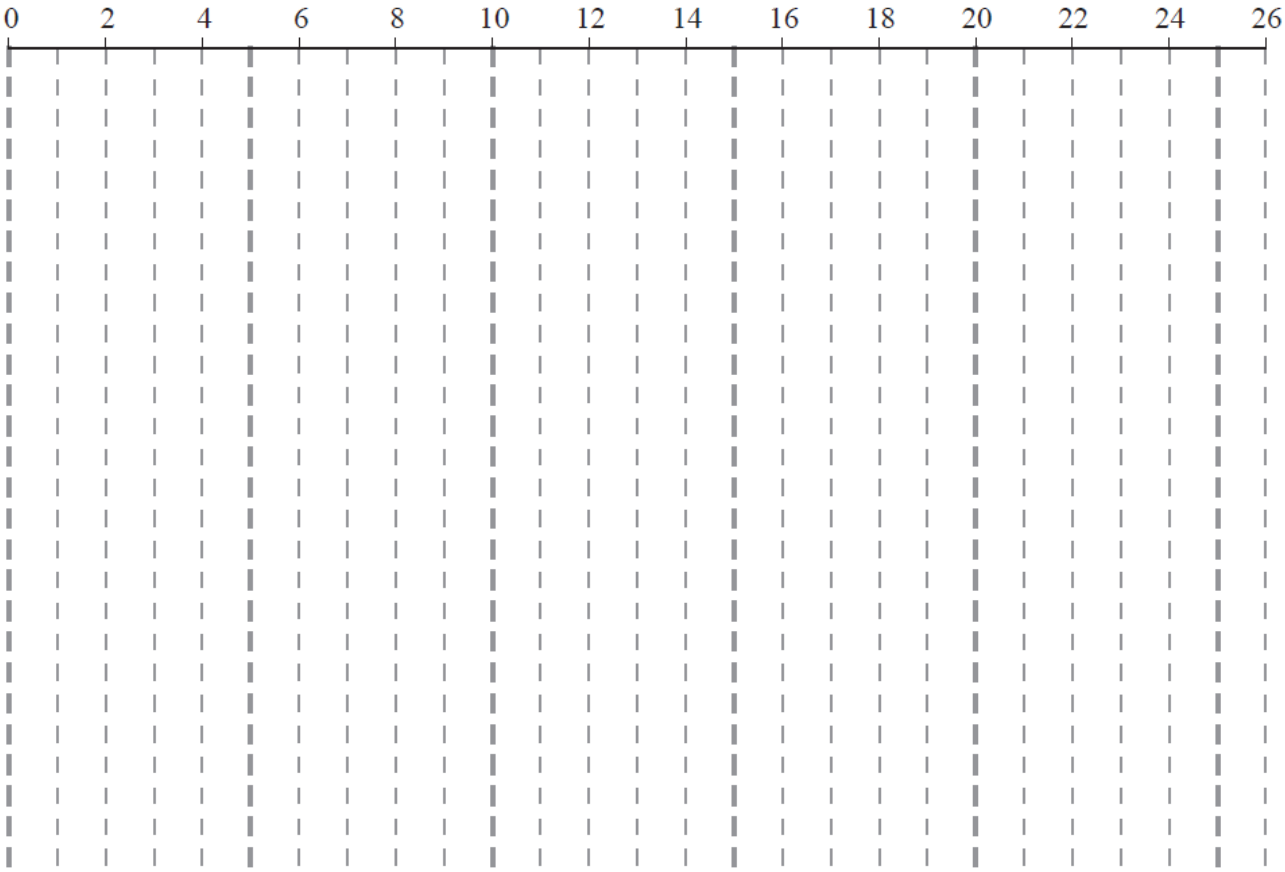


Diagram 1



Grid 1

Q4.

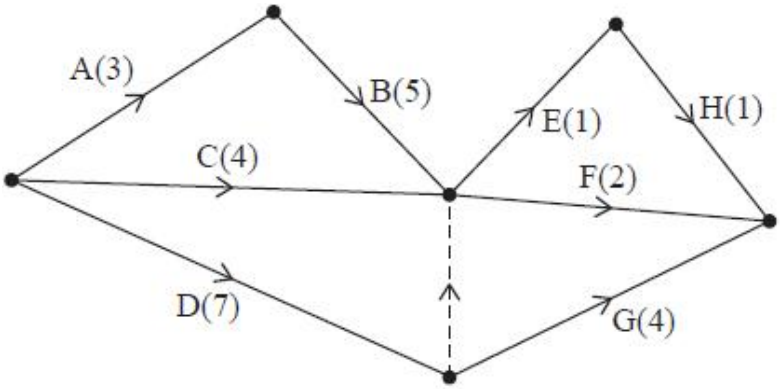


Figure 3

The network in Figure 3 shows the activities that need to be undertaken to complete a project. Each activity is represented by an arc and the duration, in hours, of the corresponding activity is shown in brackets.

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

(ii) State the minimum completion time of the project.

(3)

The table below lists the number of workers required for each activity in the project.

Activity	Number of workers
A	2
B	1
C	2
D	2
E	3
F	2
G	1
H	3

Each worker is able to do any of the activities. Once an activity is started it must be completed without interruption. It is given that each activity begins at its earliest possible start time.

(b) (i) On Grid 1 in the answer book, draw a resource histogram to show the number of workers required at each time.

(ii) Hence state the time interval(s) when six workers are required.

(4)

(Total for question = 7 marks)

(Q02 9FM0/03D, June 2023)

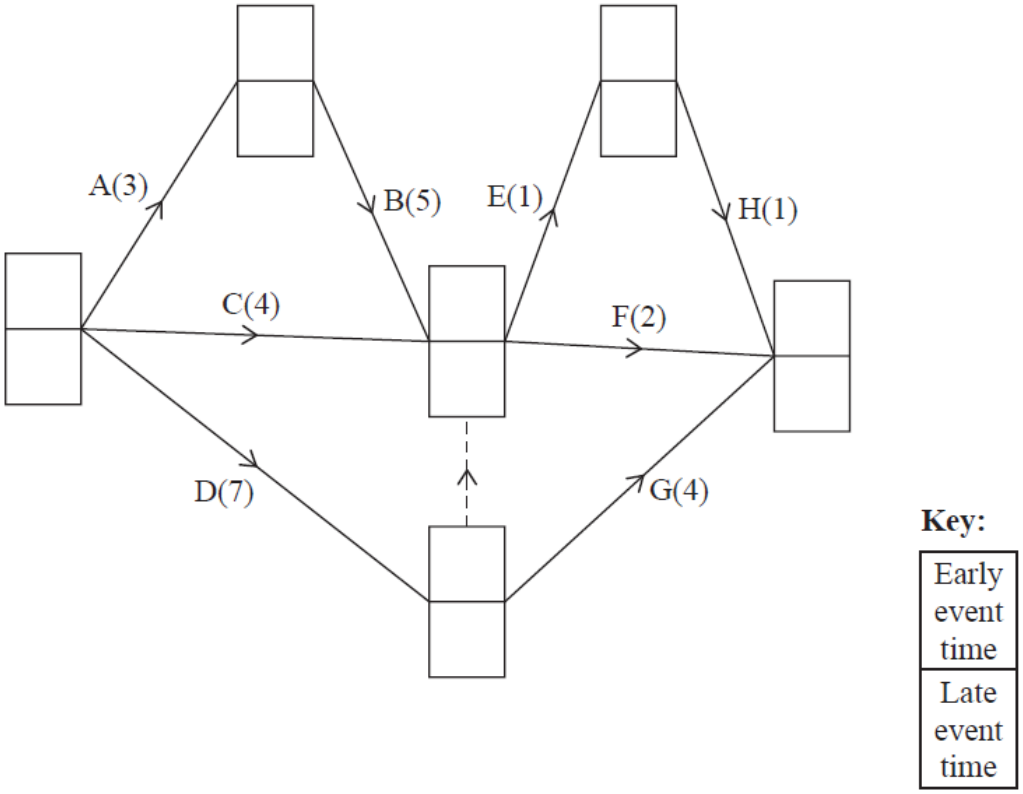
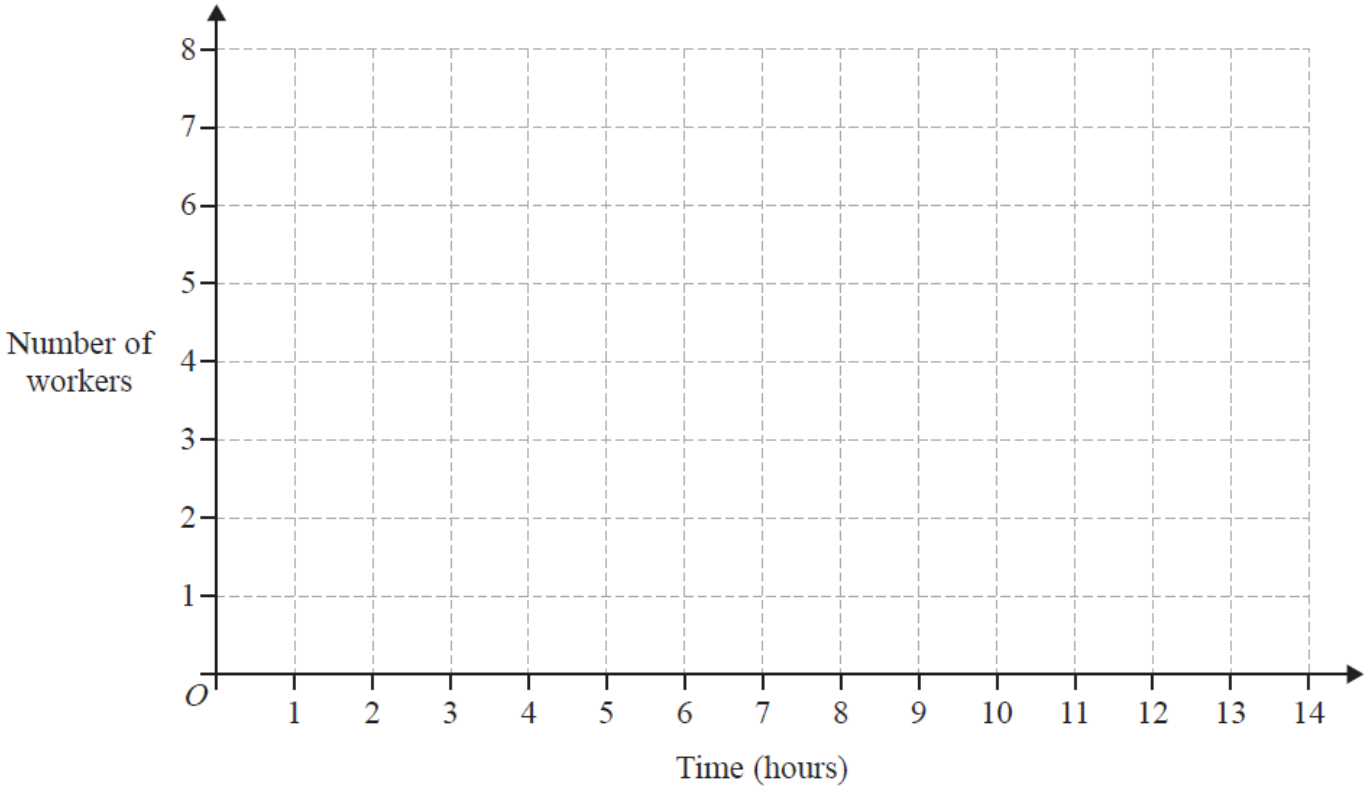


Diagram 1



Grid 1

Q5.

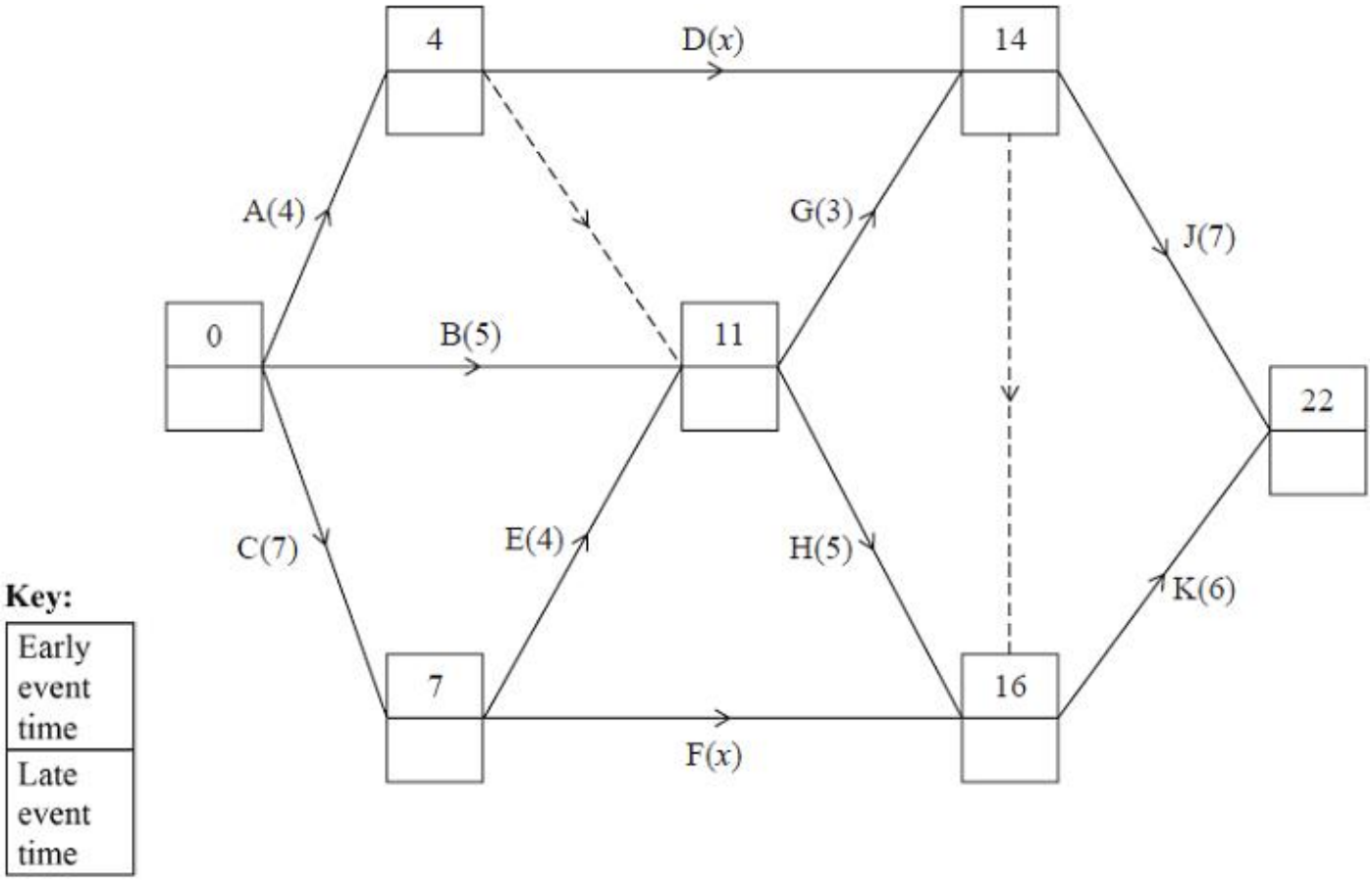


Figure 2

The network in Figure 2 shows the activities that need to be completed for a project. Each activity is represented by an arc and the duration of the activity, in days, is shown in brackets. The early event times are shown in Figure 2.

(a) Complete Table 1 in the answer book to show the immediately preceding activities for each activity.

(2)

It is given that $4 < x \leq m$

(b) State the largest possible integer value of m.

(1)

(c) (i) Complete Diagram 1 in the answer book to show the late event times.

(ii) State the activities that must be critical.

(3)

(d) Calculate the total float for activity G.

(1)

The resource histogram in Figure 3 shows the number of workers required when each activity starts at its earliest possible time. The histogram also shows which activities happen at each time.

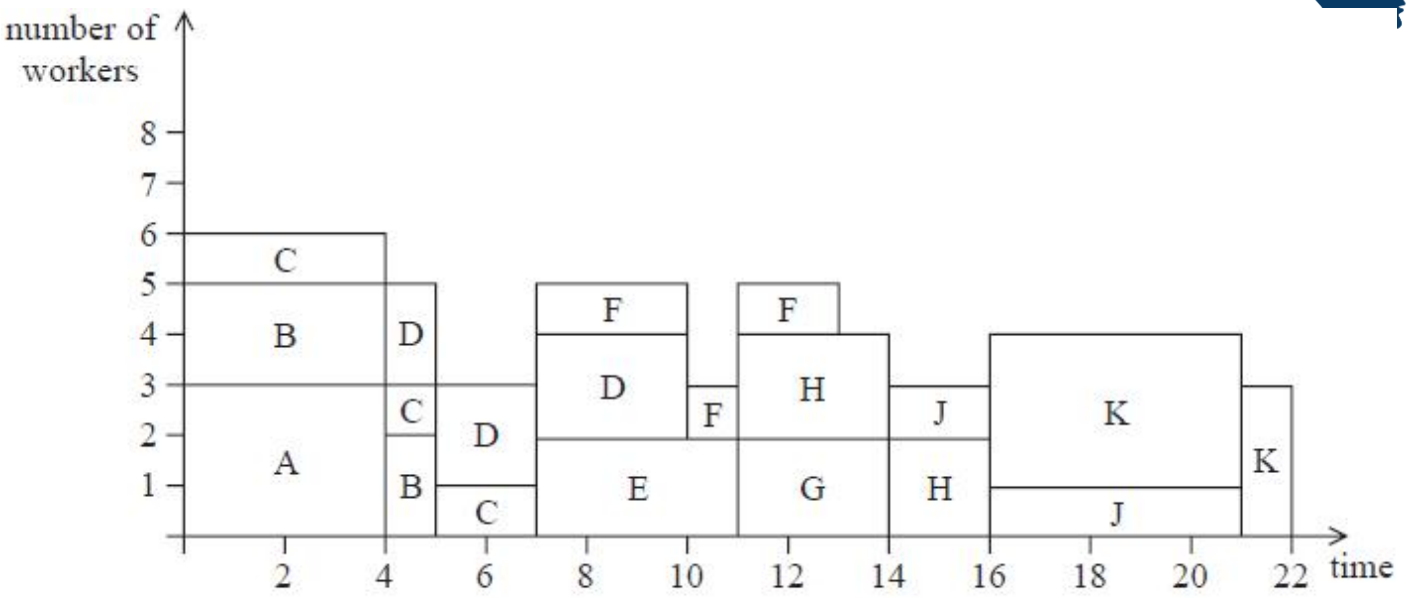


Figure 3

(e) Complete Table 2 in the answer book to show the number of workers required for each activity of the project.

(2)

(f) Draw a Gantt chart on Grid 1 in the answer book to represent the activity network.

(5)

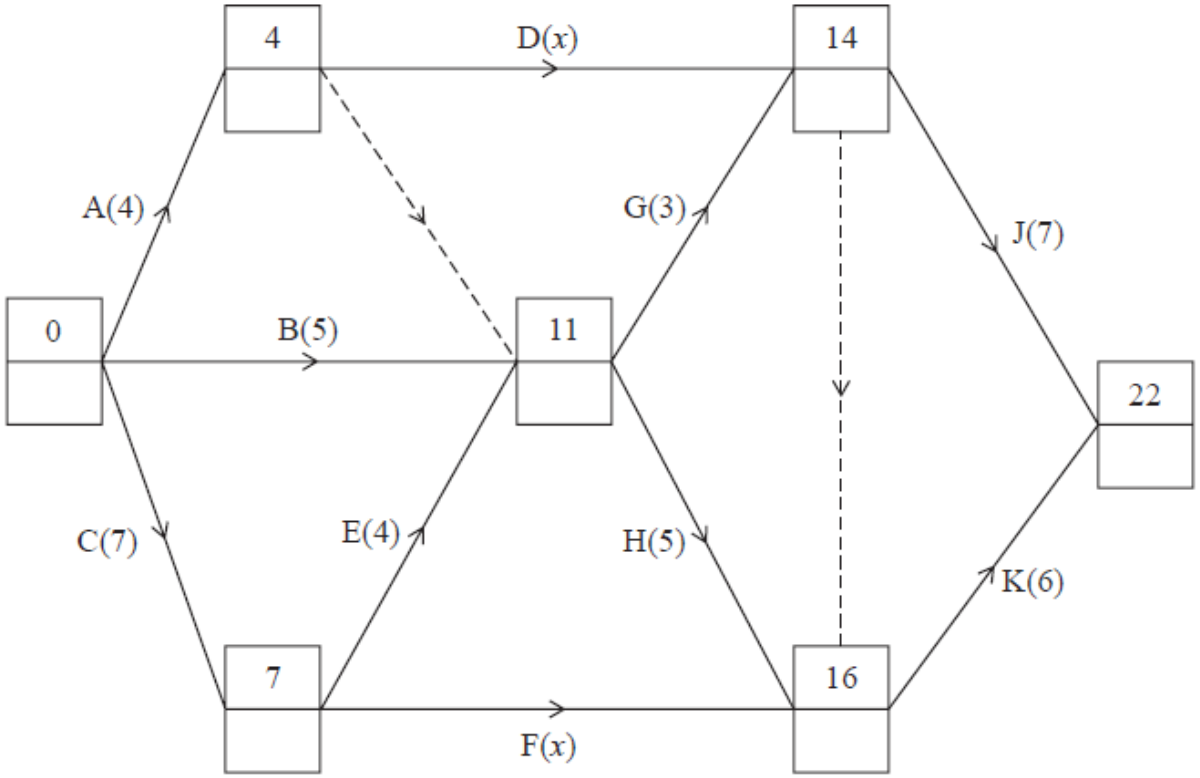
(Total for question = 14 marks)

(Q05 9FM0/03D, June 2022)

Activity	Immediately preceding activity
A	
B	
C	
D	
E	

Activity	Immediately preceding activity
F	
G	
H	
J	
K	

(c)(i)



Key:

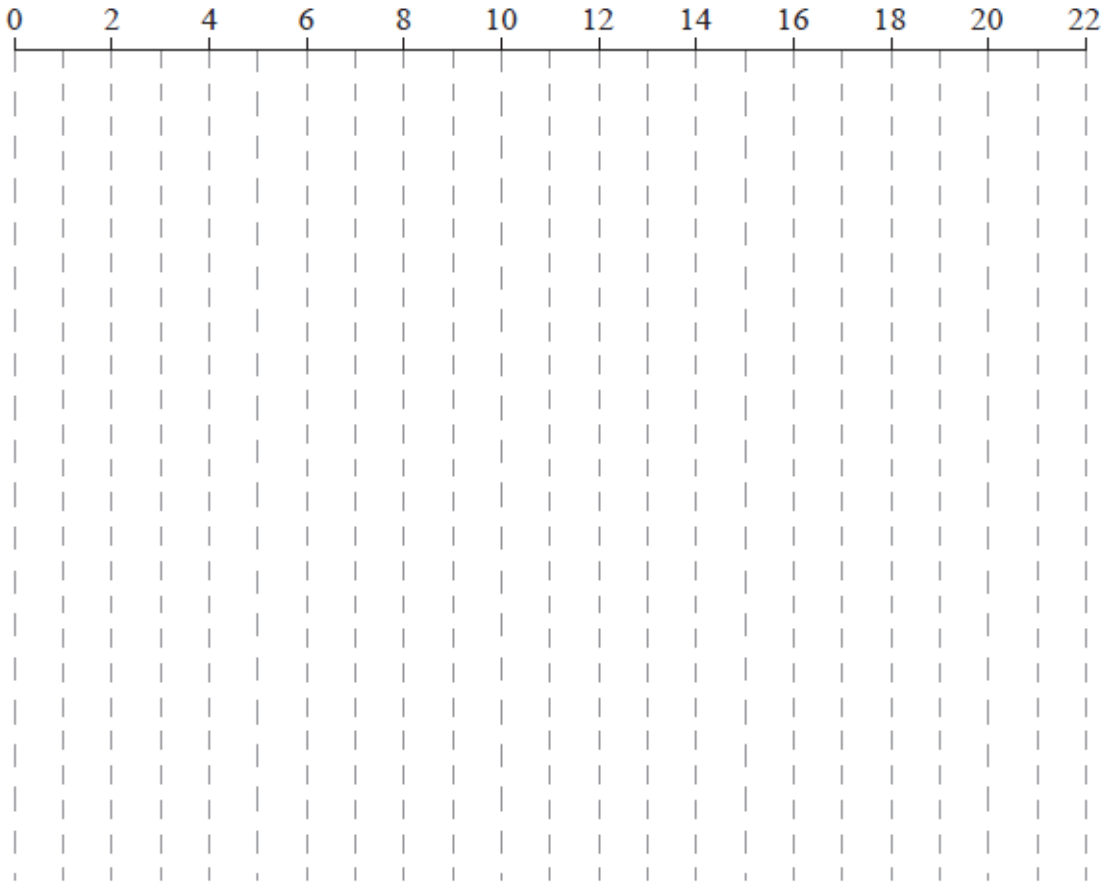
Early event time
Late event time

(e)

Activity	Number of workers
A	
B	
C	
D	
E	

Activity	Number of workers
F	
G	
H	
J	
K	

Table 2



Grid 1

Q6.

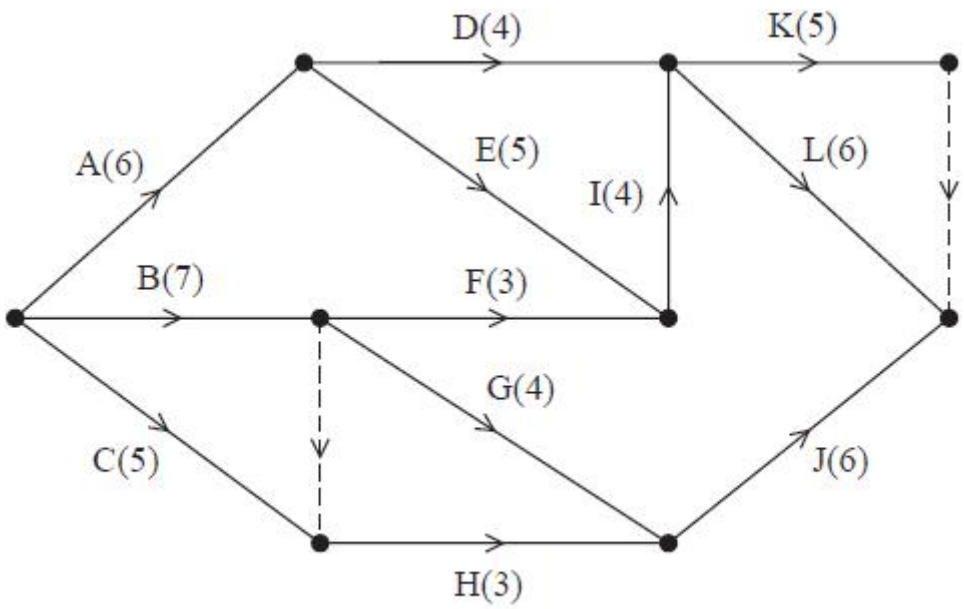


Figure 1

The network in Figure 1 shows the activities that need to be undertaken to complete a project. Each activity is represented by an arc and the duration, in hours, of the corresponding activity is shown in brackets.

(a) Explain why each of the dummy activities is required.

(2)

(b) Complete the table in the answer book to show the immediately preceding activities for each activity.

(2)

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

(ii) State the minimum completion time for the project.

(iii) State the critical activities.

(6)

Each activity requires one worker. Each worker is able to do any of the activities. Once an activity is started it must be completed without interruption.

(d) On Grid 1 in the answer book, draw a resource histogram to show the number of workers required at each time when each activity begins at its earliest possible start time.

(3)

(e) Determine whether or not the project can be completed in the minimum possible time using fewer workers than the number indicated by the resource histogram in (d). You must justify your answer with reference to the resource histogram and the completed Diagram 1.

(2)

(Total for question = 15 marks)

(Q02 9FM0/03D, Oct 2020)

Activity	Immediately preceding activities
A	
B	
C	
D	

Activity	Immediately preceding activities
E	
F	
G	
H	

Activity	Immediately preceding activities
I	
J	
K	
L	

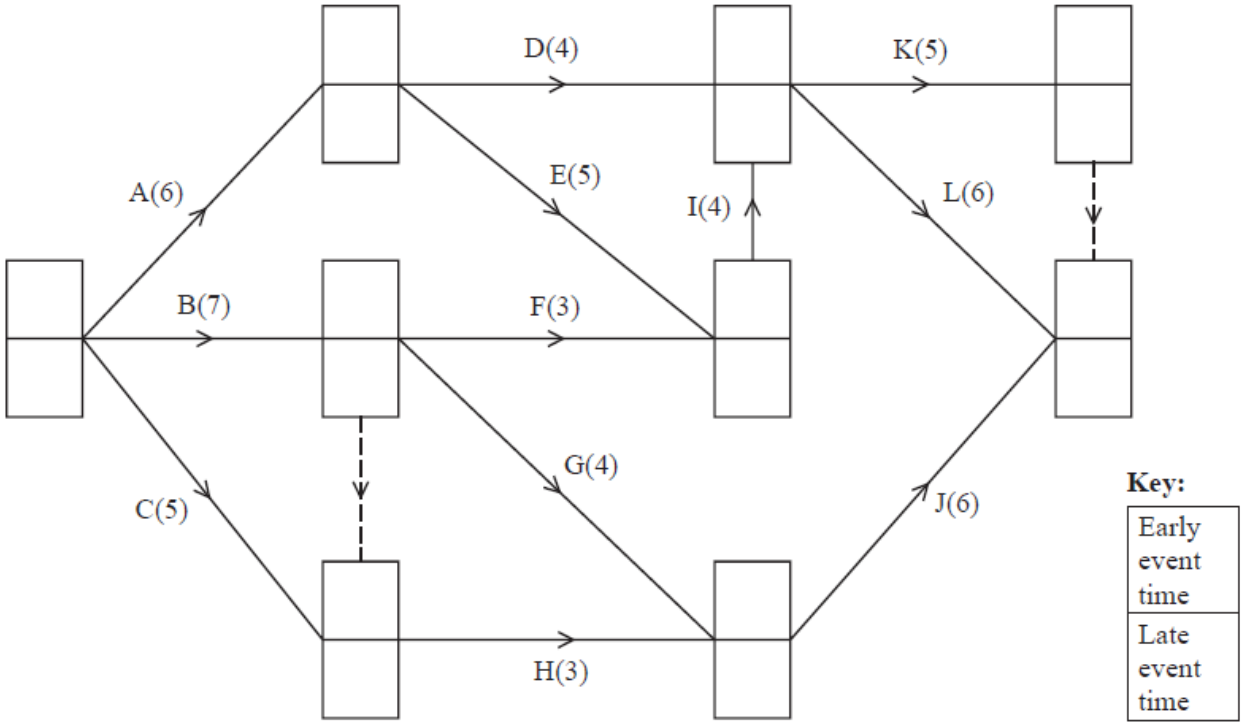
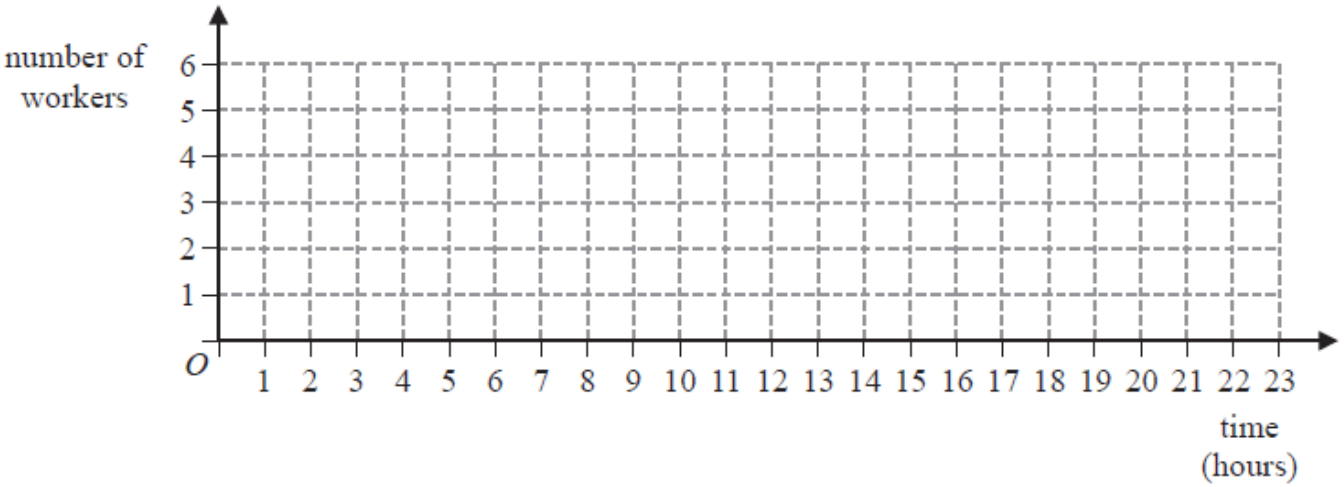


Diagram 1



Grid 1