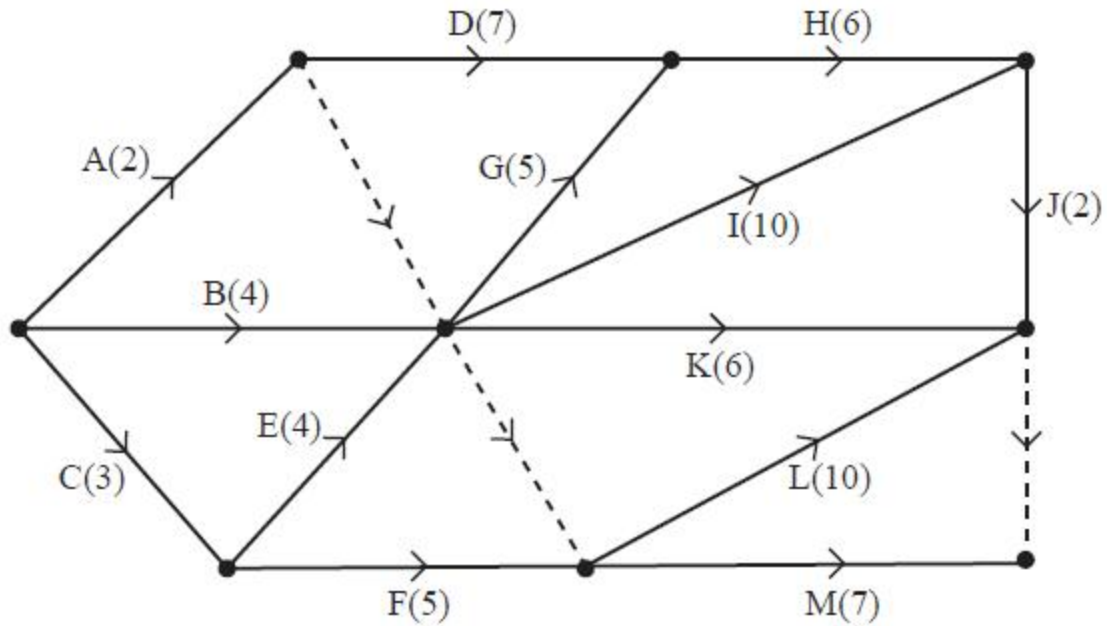


**Questions**

Q1.



**Figure 3**

A project is modelled by the activity network shown in Figure 3. The activities are represented by the arcs. The number in brackets on each arc gives the time, in hours, to complete the corresponding activity. The project is to be completed in the shortest possible time.

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

(a)

Activity	Immediately preceding activities
A	
B	
C	
D	
E	
F	

Activity	Immediately preceding activities
G	
H	
I	
J	
K	
L	
M	

**Table 1**

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

Key:

Early event time
Late event time

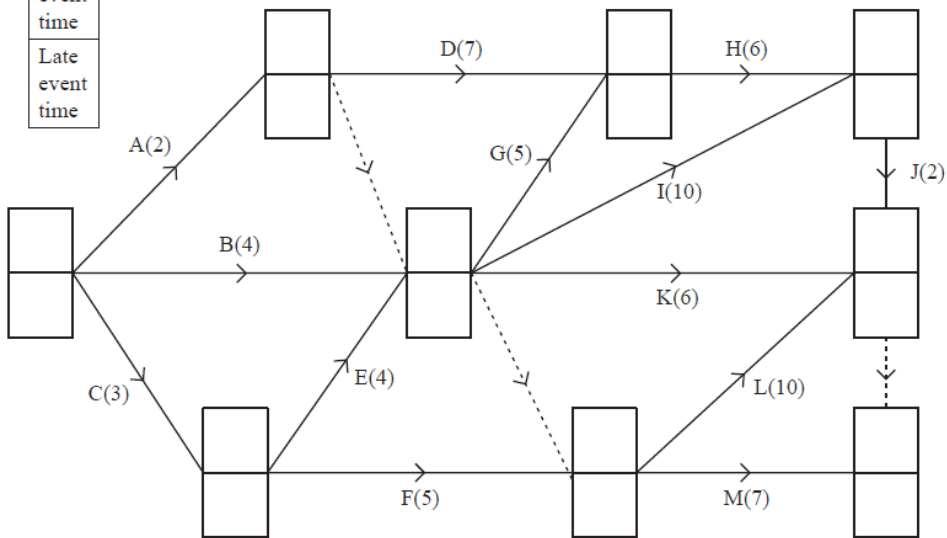
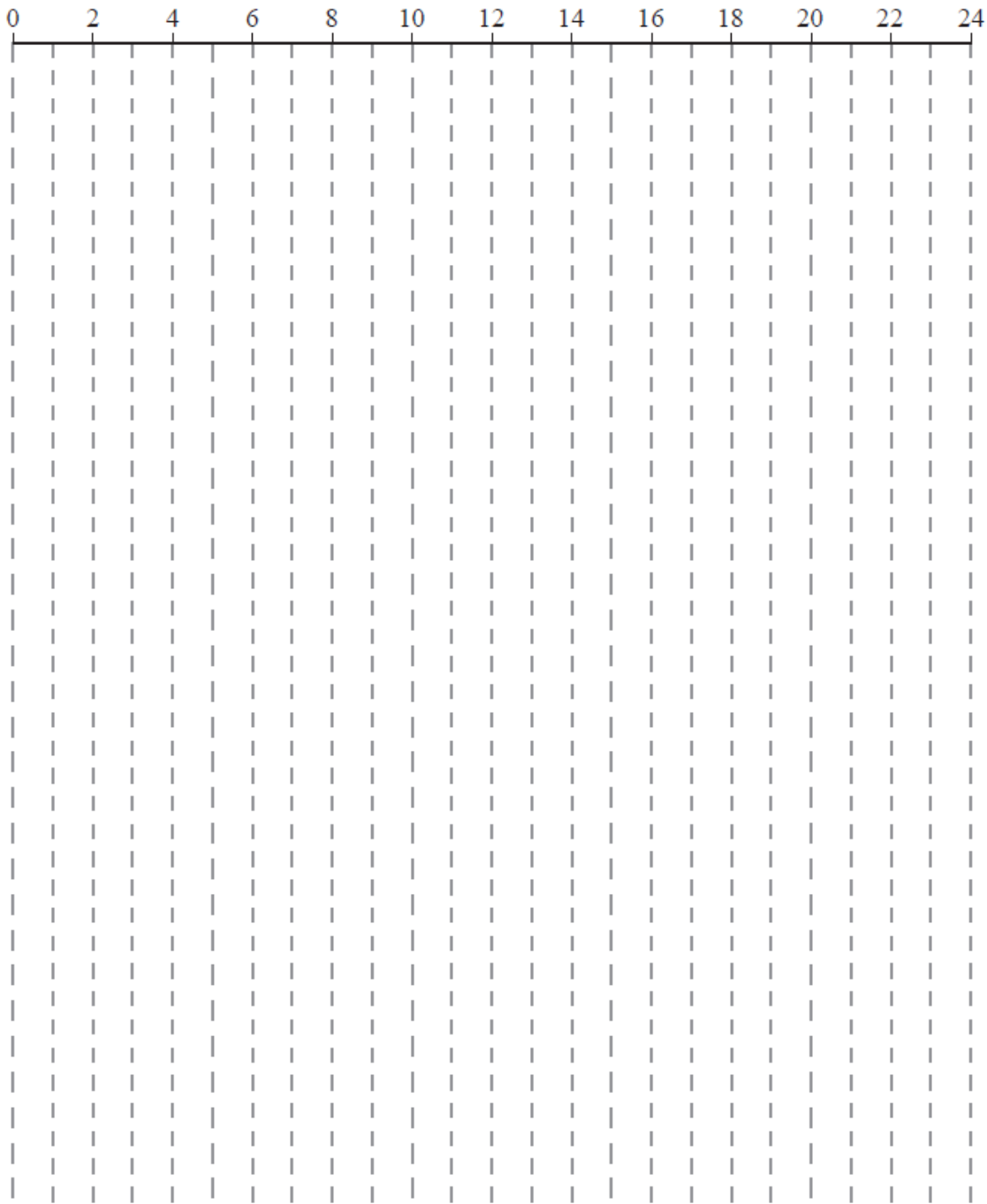


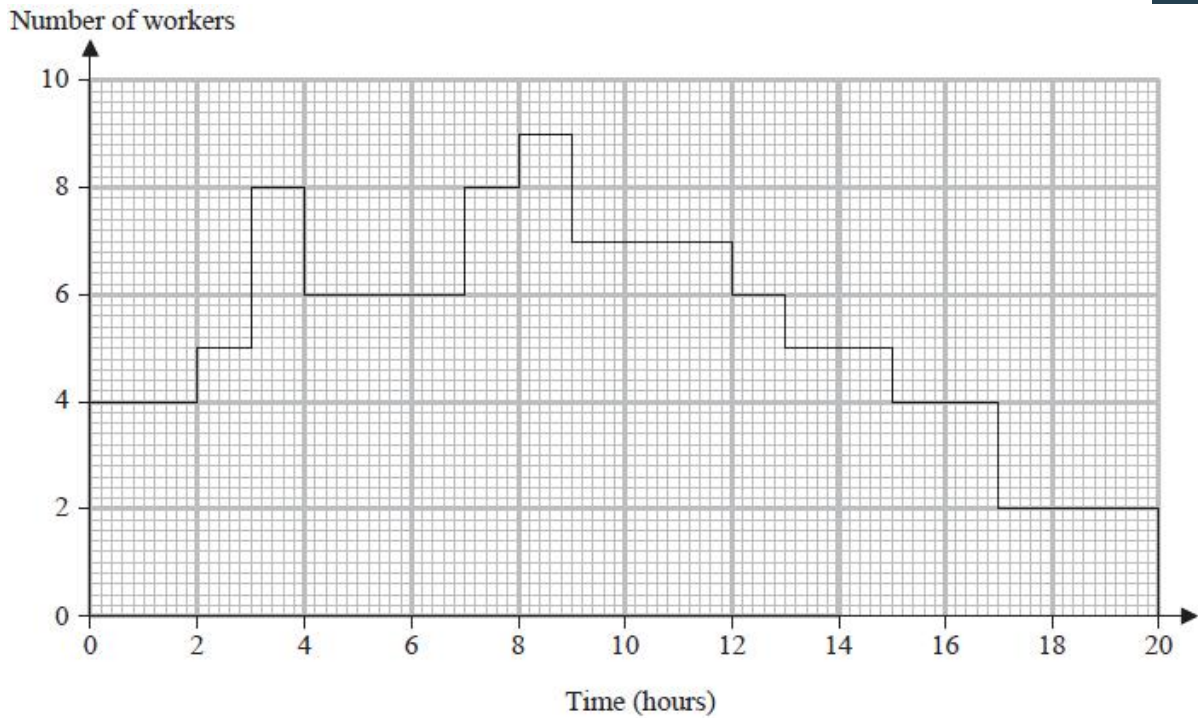
Diagram 1

(4)

(c) Draw a Gantt chart for this project on Grid 1 in the answer book.



**Grid 1**



**Figure 4**

The resource histogram in Figure 4 shows the number of workers required when each activity starts at its earliest possible time. When an activity is started it must be completed without interruption. Each activity requires at least one worker.

(d) By considering which activities are happening each hour, and by working backwards from the minimum project completion time, complete Table 2 in the answer book to show the number of workers needed for each activity.

(3)

**(Total for question = 13 marks)**

**(Q06 9FM0/03D, June 2025)**

Q2.

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

(a) Explain how you can deduce from the precedence table that at least one dummy will be needed when drawing the activity network. Your explanation should refer to specific activities.

(1)

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

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

Each activity in the precedence table takes 3 hours to complete.

(c) State the minimum completion time.

(1)

One of the activities now needs to be chosen to be extended by an hour. When the change is made the minimum completion time must not be affected.

(d) List the activities that could be chosen.

(1)

**(Total for question = 8 marks)**

**(Q02 8FM0/27, June 2025)**

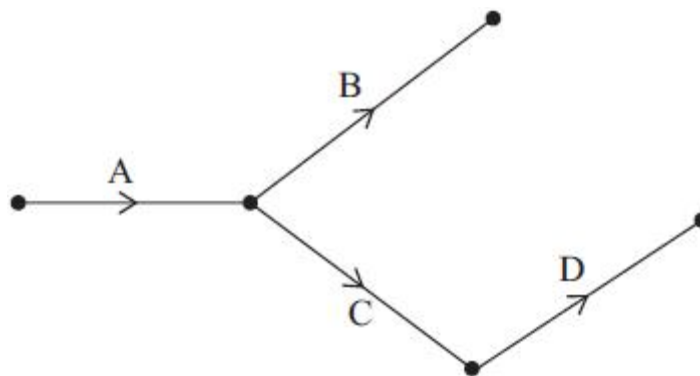
**Q3.**

A company manages an awards evening.

The table below lists the activities required to set up the room for the evening, and their immediately preceding activities. Each activity requires exactly one person.

Activity	Immediately preceding activities
A	-
B	A
C	A
D	C
E	C
F	B, D, E
G	E
H	B
J	H, F, G

Figure 1 shows a partially completed activity network used to model the project. Each activity is represented by an arc.



**Figure 1**

(a) Add the remaining five activities to Diagram 1 in the answer book to complete the activity network, using exactly two dummies.

In addition to setting up the room, the company must prepare the meals for the guests. Figure 2 shows the activity network for preparing the main courses. The numbers in brackets represent the time, in minutes, to complete each task.

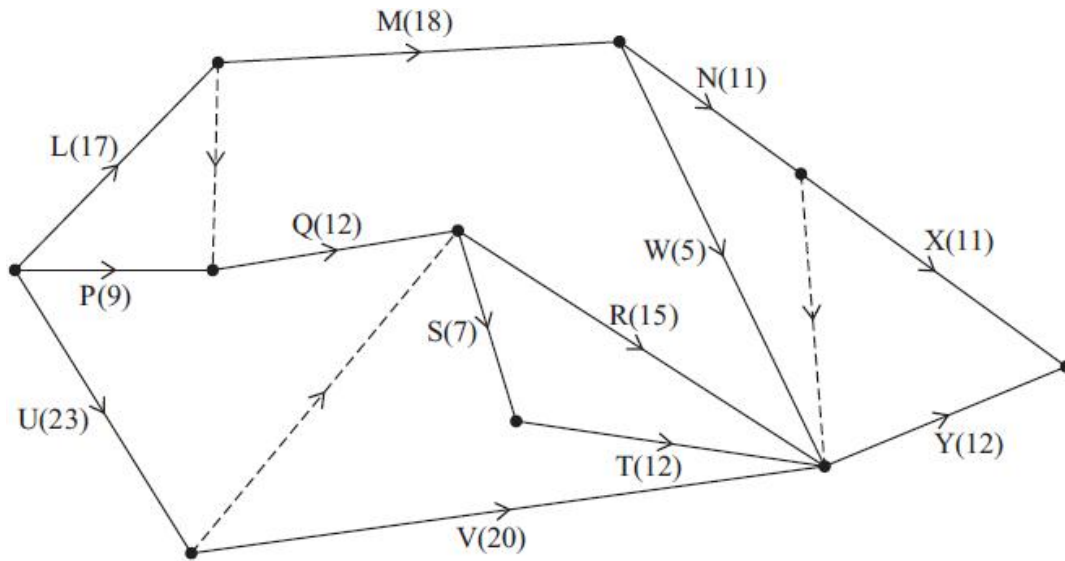


Figure 2

(b) Complete Diagram 2 in the answer book to show the early event times and the late event times for the activity network shown in Figure 2.

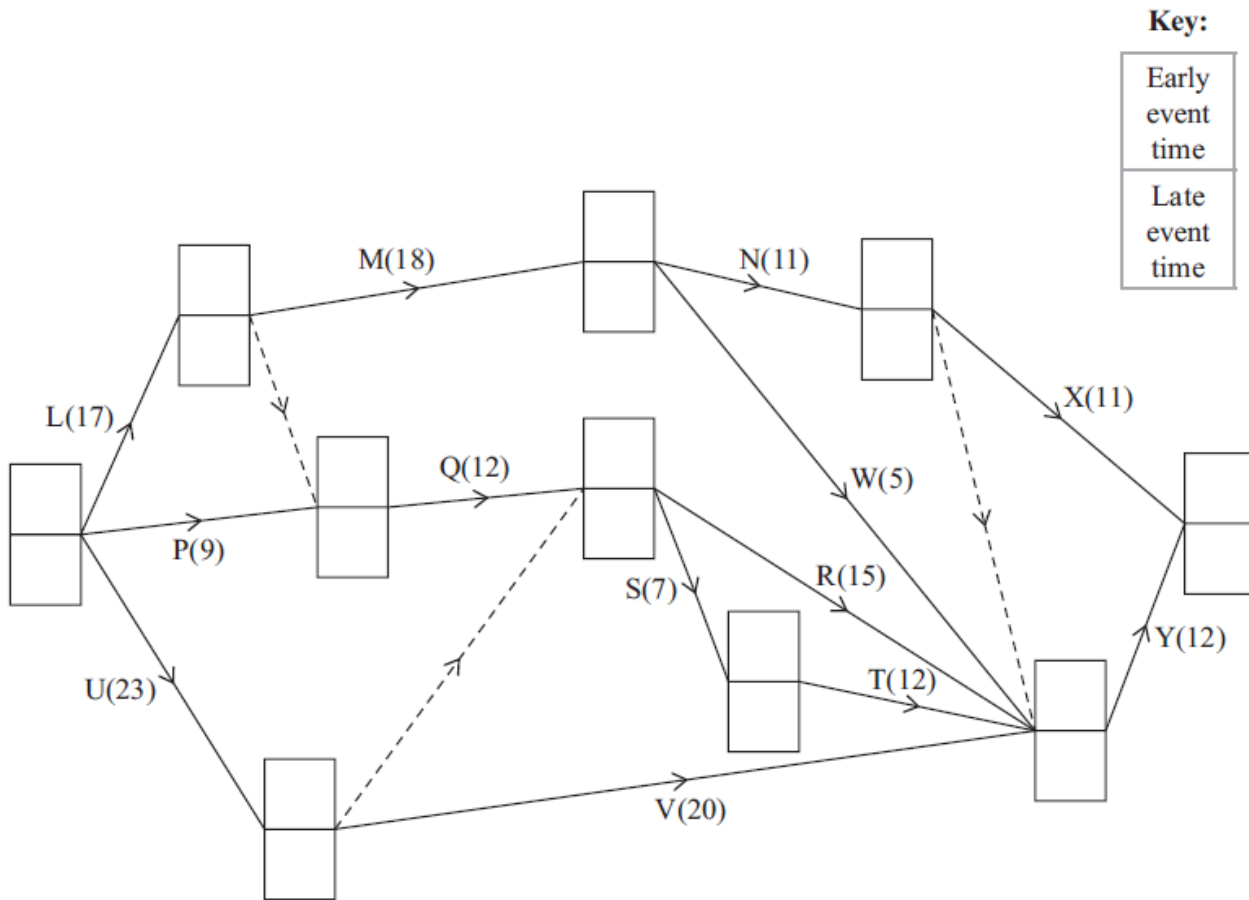


Diagram 2

(c) State the critical activities.

(1)

(d) Given that the main courses need to be ready to be served (with all activities completed) at 8 pm, state the latest time that activity R can start.

(1)

**(Total for question = 8 marks)**

**(Q02 8FM0/27, June 2024)**

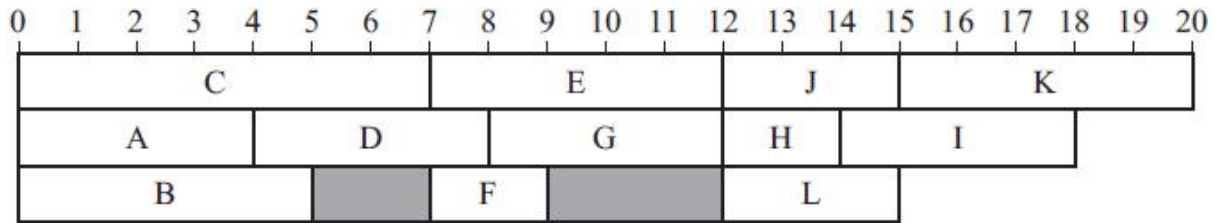
**Q4.**

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.

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.

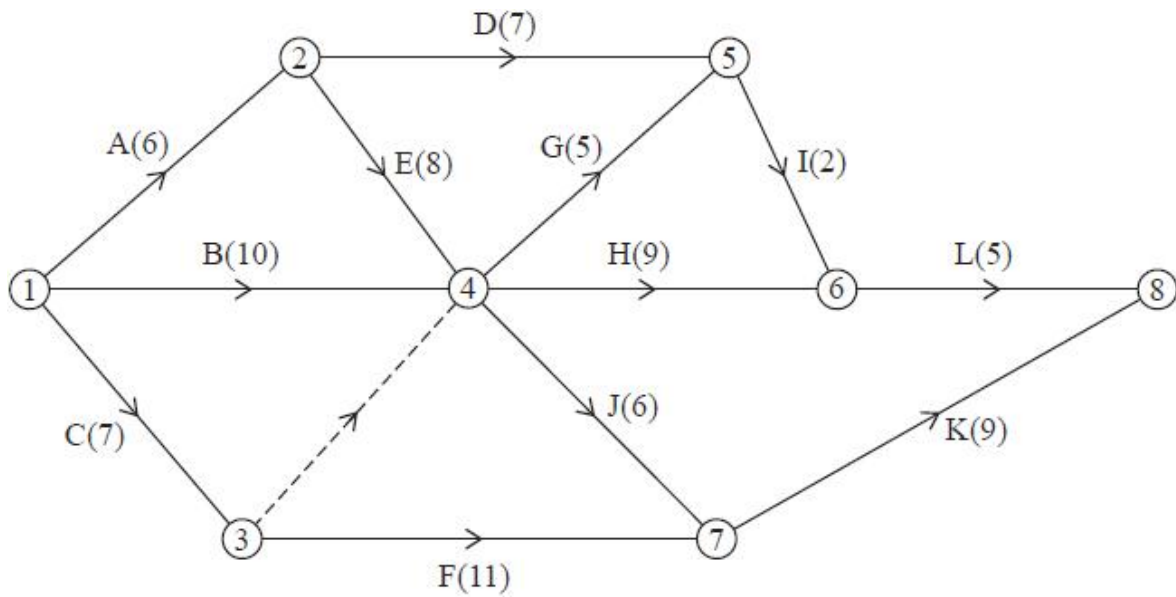
- (c) Determine whether the project can still be completed in the minimum completion time using only three workers when the duration of activity I is 8 hours.

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

(2)

**(Total for question = 11 marks)**

Q5.



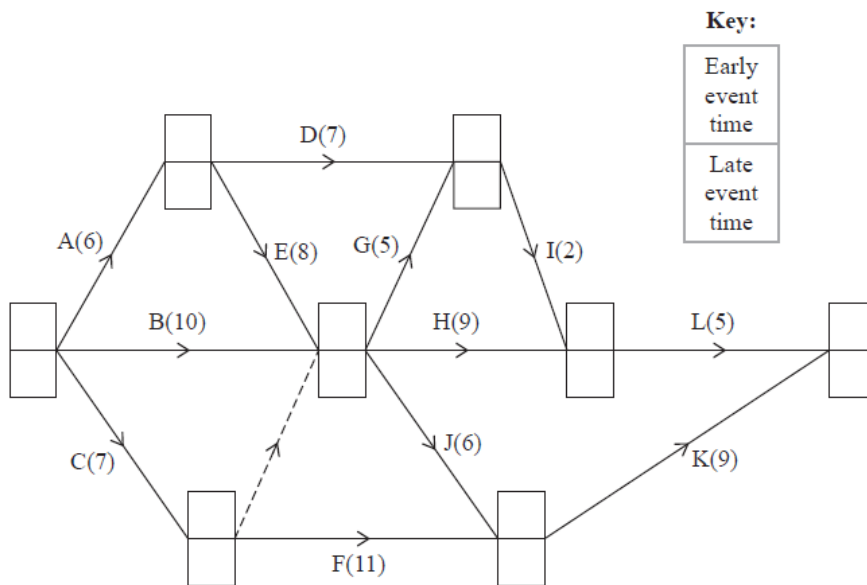
**Figure 1**

A project is modelled by the activity network shown in Figure 1. The activities are represented by the arcs. The number in brackets on each arc gives the time required, in hours, to complete the corresponding activity. The numbers in circles are the event numbers. Each activity requires one worker, and the project is to be completed in the shortest possible time.

(a) Explain the significance of the dummy activity from event 3 to event 4

(1)

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



**Diagram 1**

(3)

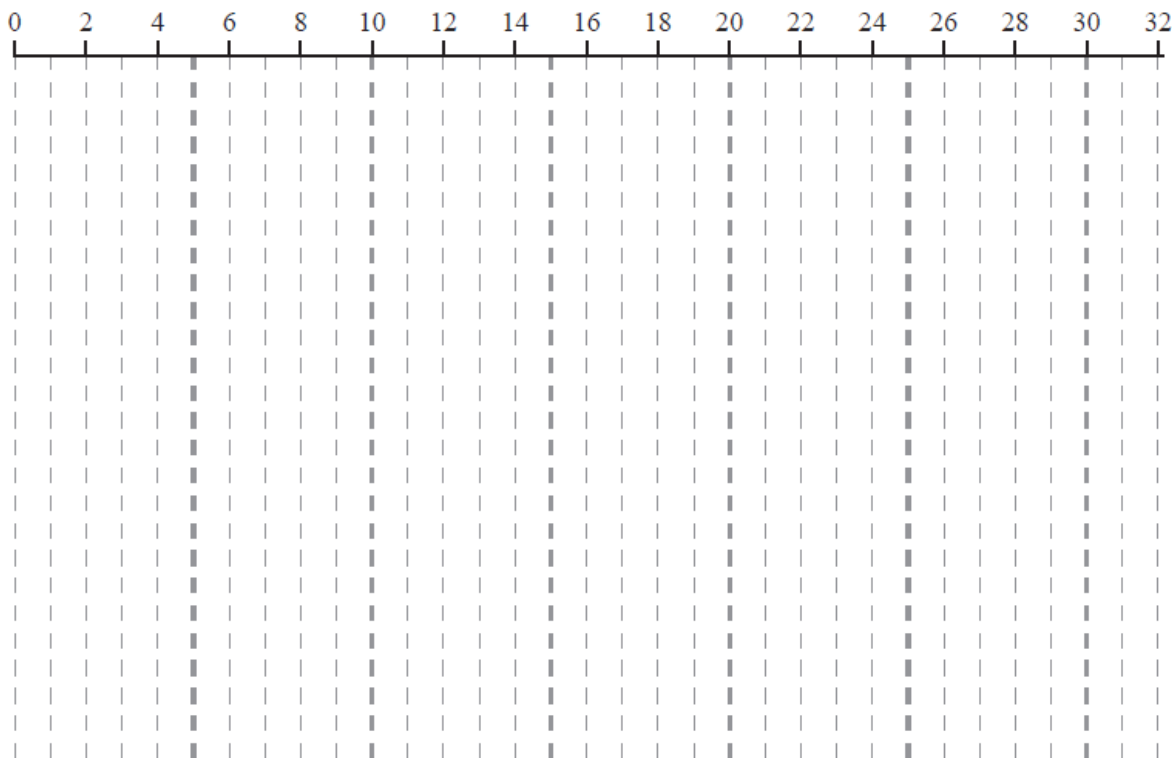
(c) State the critical activities.

(1)

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

(1)

(e) Draw a Gantt chart for this project on Grid 1 in the answer book.



Grid 1

(4)

**(Total for question = 10 marks)**

**(Q02 8FM0/27, June 2023)**

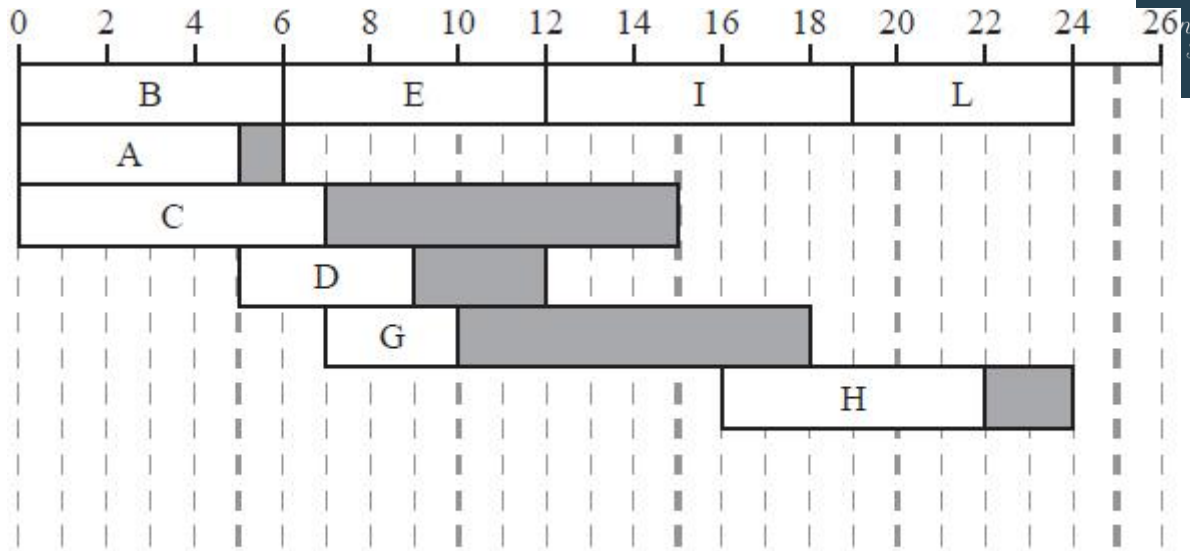
**Q6.**

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

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

(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)



**Figure 6**

Figure 6 shows a partially completed cascade chart for the project. The non-critical activities F, J and K are **not** shown in Figure 6.

The time taken to complete each activity is given in hours and the project is to be completed in the minimum possible time.

(b) State the critical activities.

(1)

Given that the total float of activity F is 2 hours,

(c) state the duration of activity F.

(1)

The duration of activity J is  $x$  hours, and the duration of activity K is  $y$  hours, where  $x > 0$  and  $y > 0$

(d) (i) State, in terms of  $y$ , the maximum possible total float for activity K.

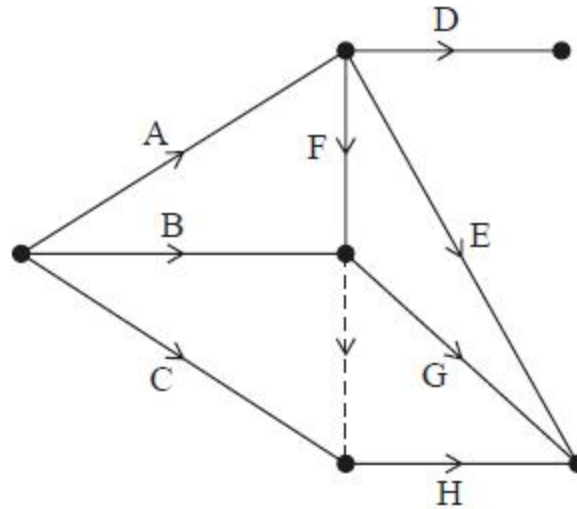
(ii) State, in terms of  $x$  and  $y$ , the total float for activity J.

(2)

**(Total for question = 9 marks)**

**(Q06 9FM0/03D, June 2023)**

Q7.



**Figure 5**

Figure 5 shows a partially completed activity network for a project that consists of 14 activities.

(a) Complete the precedence table in the answer book for the 8 activities in Figure 5.

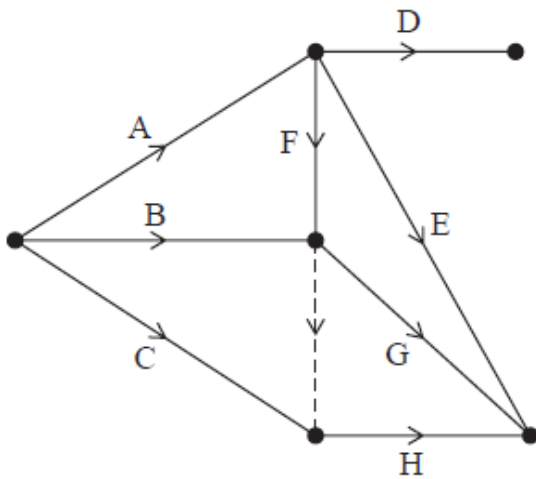
Activity	Immediately preceding activities	Activity	Immediately preceding activities
A		E	
B		F	
C		G	
D		H	

(2)

The precedence table for the remaining 6 activities is given below.

Activity	Immediately preceding activities
I	D, E, G, H
J	D, E, G, H
K	E, G, H
L	I, J, K
M	J, K
N	J, K

(b) Complete the activity network in the answer book for the project. Your completed activity network must contain only the minimum number of dummies.



(4)

Given that all 14 activities have the same duration,

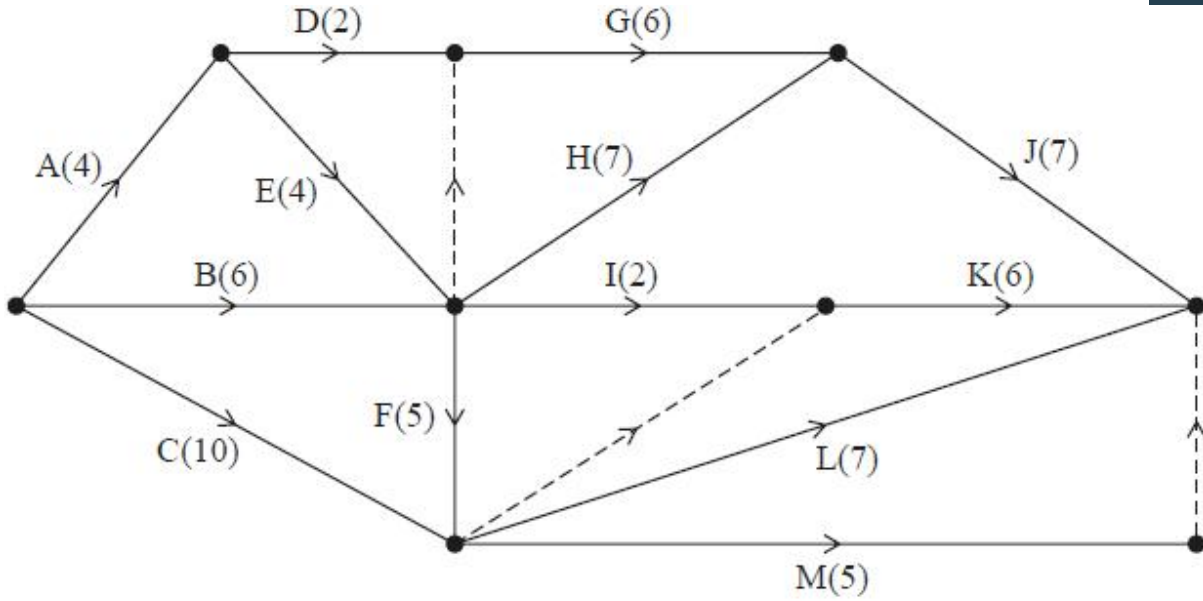
(c) explain why activity D cannot be critical.

(2)

**(Total for question = 8 marks)**

**(Q07 9FM0/03D, Oct 2021)**

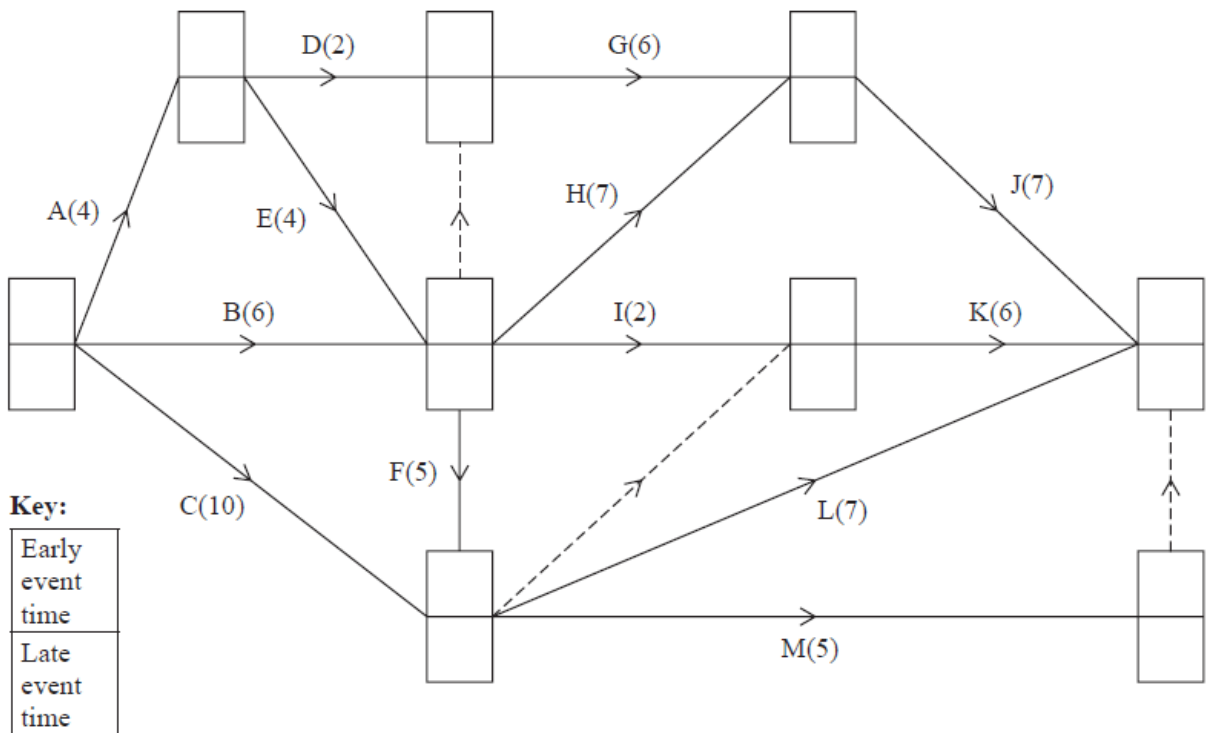
Q8.



**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.



**Diagram 1**

(4)

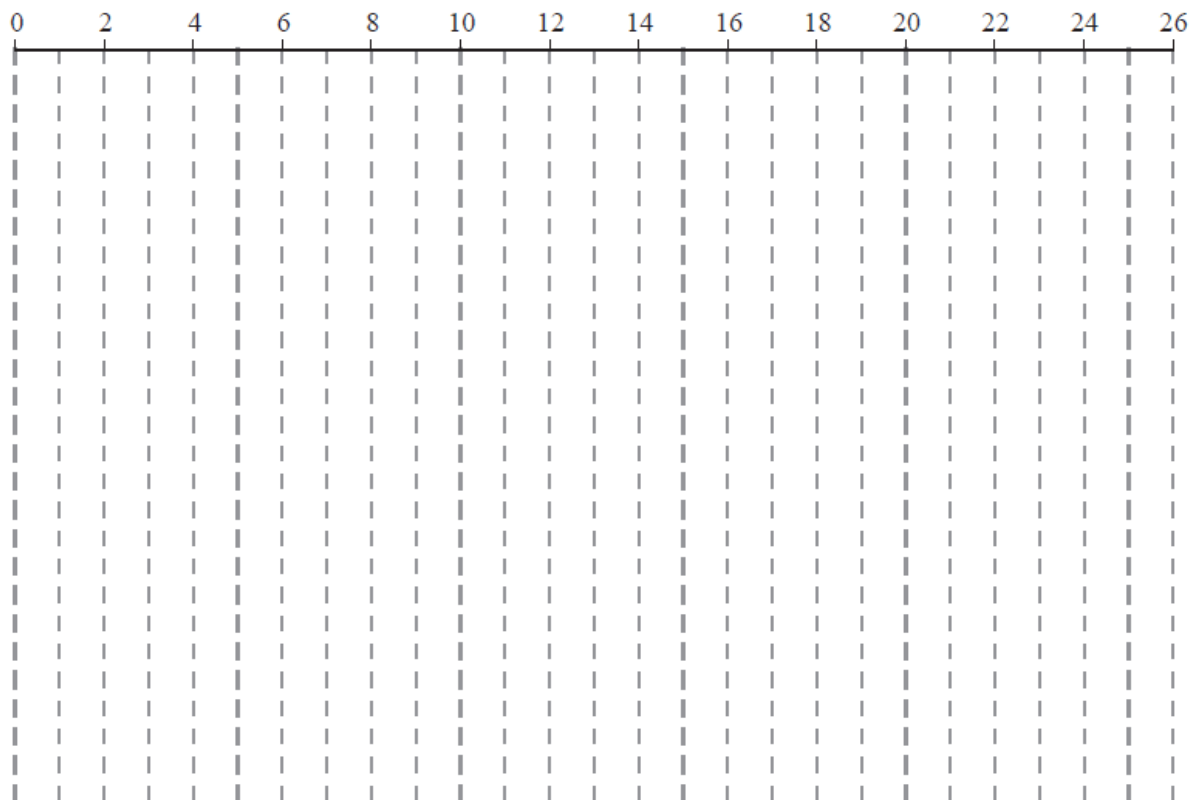


Each activity requires one worker and the project must be completed in the shortest possible time using as few workers as possible.

(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.



Grid 1

(3)

**(Total for question = 9 marks)**

**(Q02 9FM0/03D, Oct 2021)**