D2 Critical path analysis Challenge

Challenge 1

A building company is going to lay a new block-paved driveway. The table below shows the activities involved.

	Activity	Immediate Predecessor	Duration (days)
A	Remove tarmac top drive	—	7
B	Remove tarmac bottom drive	—	6
C	Concrete edging top	A	3
D	Concrete edging bottom	B	3
E	Lay hardcore	C, D	2
F	Lay sand	E	2
G	Lay blocks	F	5
H	Brush sand	G	1

(a) Construct an activity network for the project. *(3 marks)*

(b) Find the minimum completion time for the whole project. *(2 marks)*

(c) Given that each activity starts as early as possible, draw a cascade (Gantt) chart for the project. *(4 marks)*
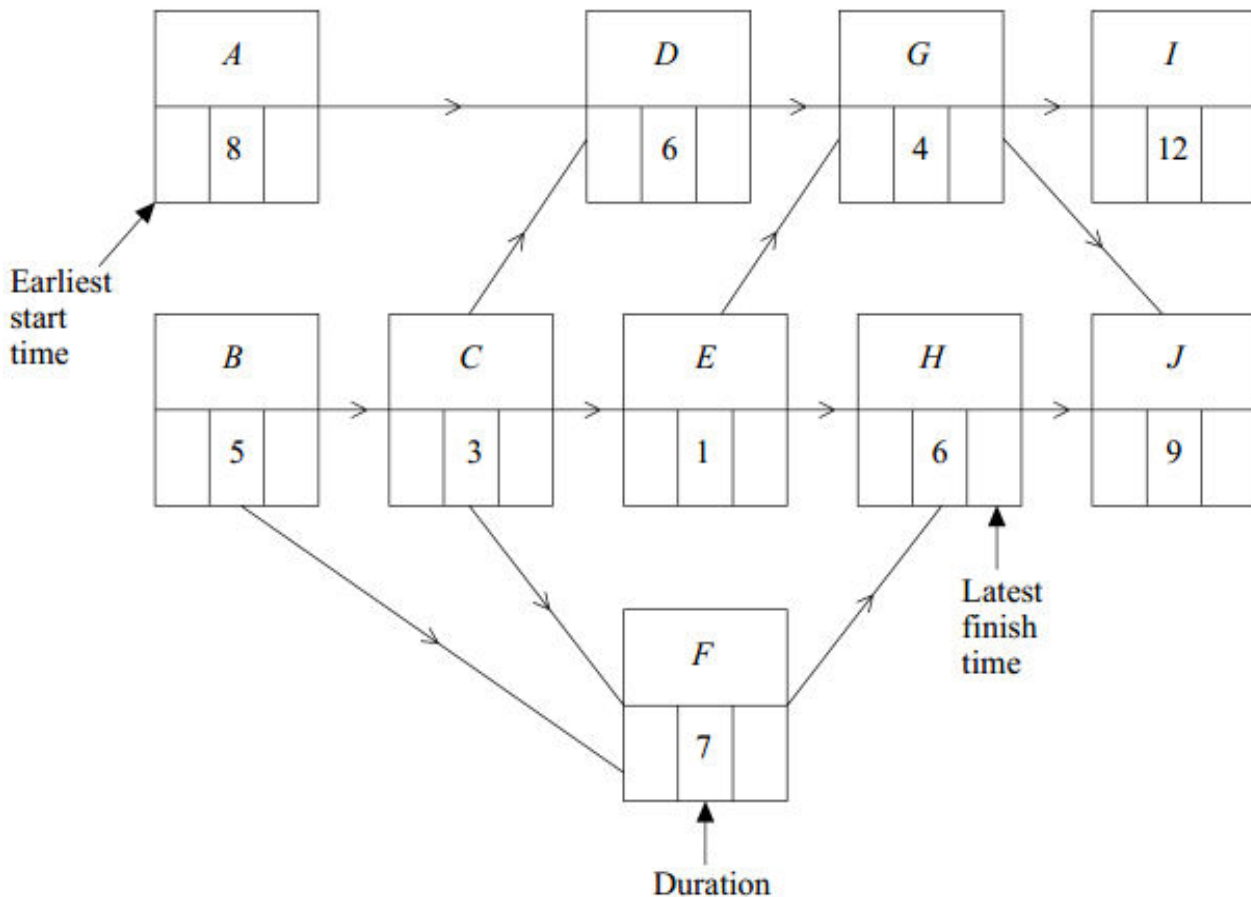
2 [**Table 1** and **Figure 1**, printed on the insert, are provided for use in answering this question.]

The following diagram shows an activity network for a project. The time required for each activity is given in hours.

(a) On **Table 1**, complete the precedence table. *(2 marks)*

(b) On **Figure 1**, complete the earliest start and latest finish times for each activity. *(4 marks)*

(c) List the critical activities. *(1 mark)*

(d) Draw a Gantt diagram, given that the project is to be completed in the minimum possible time and all the activities are to start as late as possible. *(4 marks)*

(e) There are only two workers available. They are both capable of completing each activity on their own in the stated time.
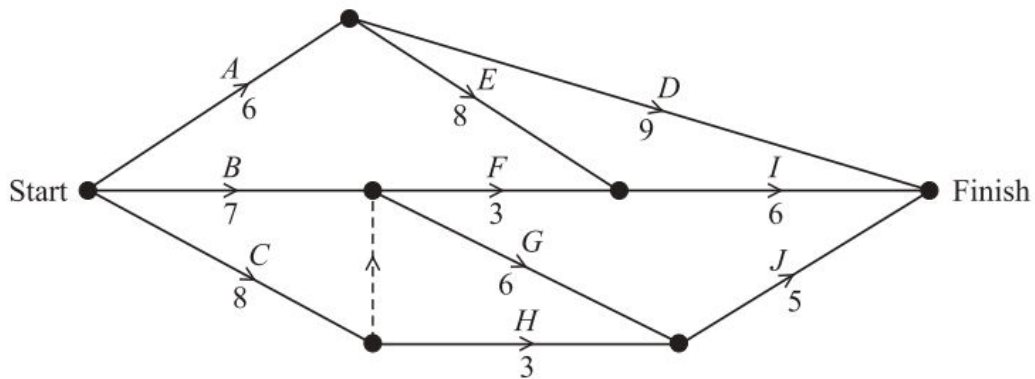
Find the minimum overrun time for the whole project. *(2 marks)*

Final Challenge

[**Figure 3**, printed on the insert, is provided for use in answering part (a) of this question.]

The following activity network of a complex project involves activities $A - J$ whose durations are given in hours.

(a) Perform a forward and backward pass in order to calculate all the early and late event times.
(5 marks)

(b) Find the critical path and the minimum completion time of the project.
(2 marks)

(c) Each activity requires one worker. By scheduling each activity to start at its earliest start time, confirm that the project can be completed in the minimum time and find the minimum number of workers needed for this schedule.
(4 marks)

(d) Show that by rescheduling just one activity the project can be completed in the minimum time with four workers.
(2 marks)

(e) Show that the project cannot be completed in the minimum time with only three workers.
(2 marks)

Critical path analysis

Inserts

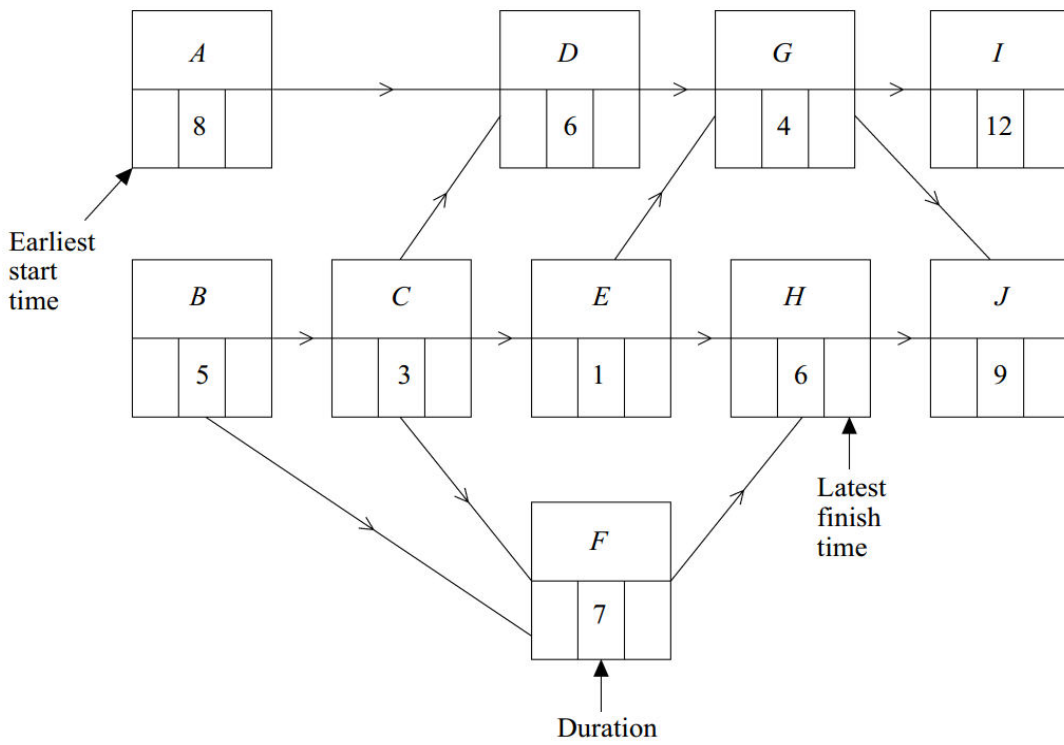| Activity	Immediate Predecessor
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	

Table 1 (for Question 2(a))

Figure 1 (for Question 2(b))