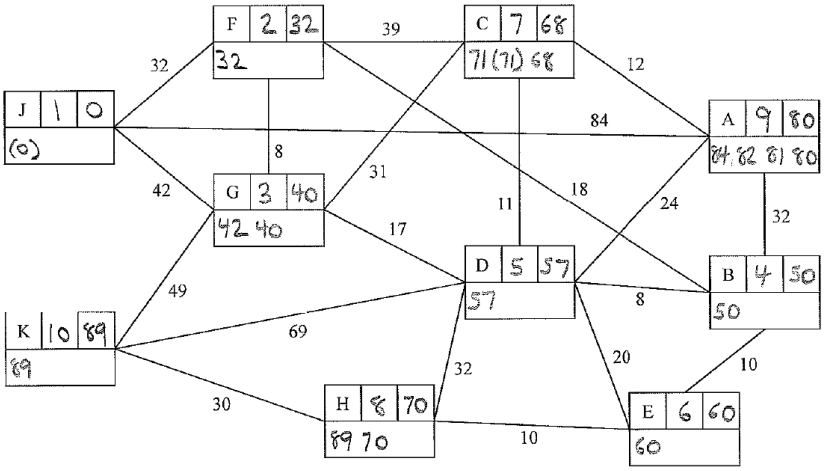
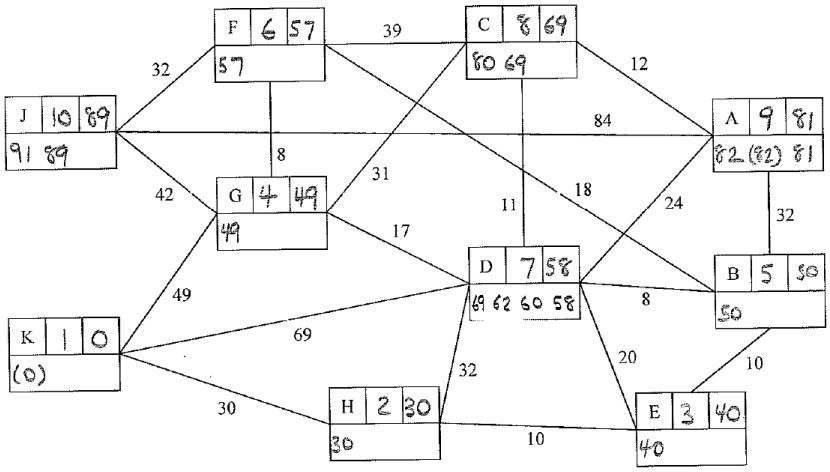
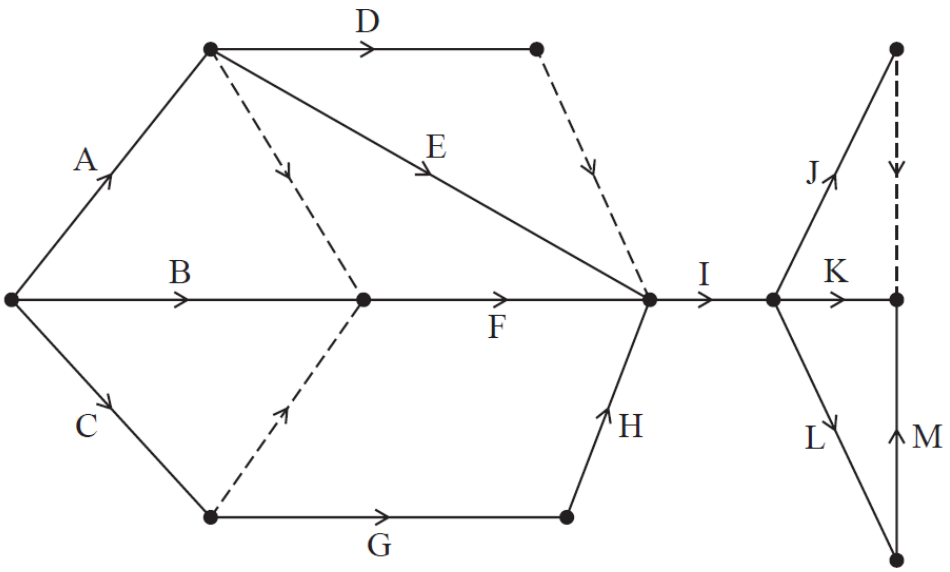


If starting at K: M1 (as above), A1 (for correct values at K, H, E, G, B), A0, A0, A1 (for route KHEBDCA), A1 (for length 81), A0 so 4 out of 7 max.



Question Number	Scheme	Marks
6.(a)	e.g.  	M1 A1 A1 A1 A1 **(5)**

(b)	Activity I is guaranteed to be critical…	M1	
	…because all paths (from source to sink) contain activity I	A1	**(2)**
(c)	Minimum project completion time is 12 (hours)	B1	
	Critical path is C G H I L M	B1	**(2)**
		9 marks	

Notes for Question 6

In **(a)** condone lack of, or incorrect, numbered events throughout. 'Dealt with correctly' means that the activity starts from the correct event but need not necessarily finish at the correct event. For example, 'I dealt with correctly' requires the correct precedences for this activity, i.e. D, E, F and H labelled correctly **and** that they lead directly into the same node (possibly with the aid of a dummy activity). Activity I then starts from that node but ignore the end event for I. The table below is useful in checking this. **Activity on node is M0**

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

If an arc is not labelled, for example, if the arc for activity E is not labelled (but the arc is present) then this will lose the first A mark and the final (correct solution only) A mark – they can still earn the second A mark on the bod (benefit of doubt). If two or more arcs are not labelled then mark according to the scheme. Assume that a solid line which has not been labelled is an activity rather than a dummy (even if in the correct place for where a dummy should be)

Ignore incorrect or lack of arrows on the activities for the first four marks only

a1M1: Eight activities (labelled on arc), one start and at least two dummies placed
a1A1: Activities A, B, C, 1st two dummies, D, E and G dealt with correctly. The first two dummies are those at the end of activities A and C. Both dummies must have arrows pointing in the correct direction
a2A1: Activities F, H and 3rd dummy dealt with correctly. The 3rd dummy is the one at the end of D. The dummy must have an arrow pointing in the correct direction
a3A1: Activities I, J, K, L and M dealt with correctly
a4A1: CSO – all arrows correctly placed for each activity with one finish and a 4th dummy (with a correct arrow) at the end of activity J. **Please check all arcs carefully for arrows – if there are no arrows on any dummies then M1 only. Note that additional (but unnecessary) 'correct' dummies that still maintain precedence for the network should only be penalised with the final A mark, if earned, in (a)**

Note additional valid solutions:

- Activities D and E interchanged **or** J and K interchanged (or both)
- The dummy at the end of D could appear before activity D, similarly for the dummy at the end of J
- A combination of both these points, e.g. D and E interchanged and the corresponding dummy appearing before the activities
- The arrow on the 'final' dummy (the one at the end of J) could be reversed

b1M1: CAO **(**Activity I **only**) – if more than one activity stated as being critical then M0
b1A1: Correct reasoning – mention that every/all paths/routes (in the network) contain activity I e.g. 'there is no route that doesn't contain I' scores M1A1. Must mention 'path', 'route' etc. so e.g. 'everything passes through I' would score M1A0 (but 'every route passes through I' is fine for both marks)

c1B1: Correct answer only (12)
c2B1: Correct answer only (C G H I L M)

Question Number	Scheme	Marks
7.(a)	If CD is not in the tree then AD must be as these are the only two arcs incident to D or the weight of CD is greater than the weight of AD	M1
	$2y + x > 3y - 7 \Rightarrow y < x + 7$ *	A1 **(2)**
(b)	$4x + 1 < 2y + 1 \Rightarrow y > 2x$ *	B1
	$4x + 1 < 8x - 3 \Rightarrow x > 1$	B1
	$4x + 1 < 3y - 7 \Rightarrow 3y > 4x + 8$	B1 **(3)**
(c)		B1 B1 B1 B1 **(4)**