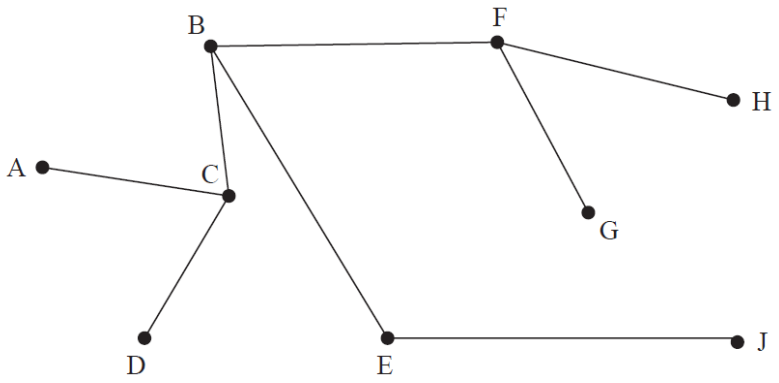
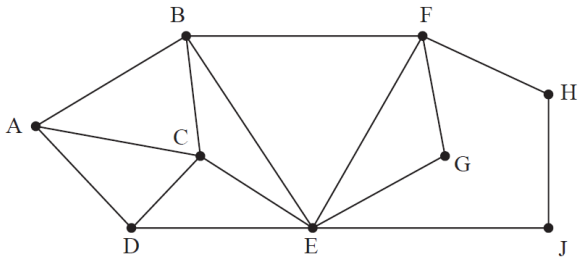
Question Number	Scheme	Marks
(c)	Kruskal: AC(9), BE(11), BF(12), not EF(14), FG(15), FH(17), not EG(18), EJ(20), $\left\{\begin{matrix}\text{not HJ (21)}\\ \text{BC (21)}\end{matrix}\right\}$, not CE(23), not AB(24), CD(25) (not DE, AD)	M1 A1 A1 **(3)**
(d)		B1 **(1)**
(e)	130 (km)	B1 **(1)**
		7 marks

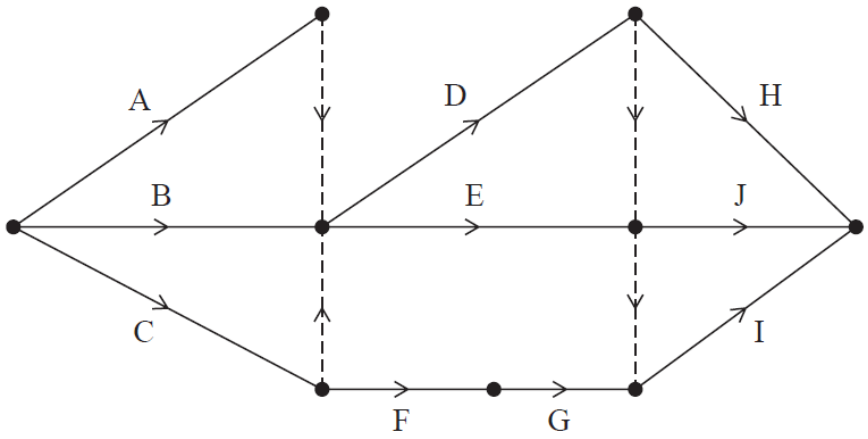
Notes for Question 2

a1B1: Any correct example of a path (so no vertex appearing more than once) from A to J
b1B1: No with a correct reason i.e. must mention that a tour must begin and start at the same vertex, e.g. the route given does not finish at A scores B1
c1M1: Kruskal's algorithm - first four arcs (AC, BE, BF, FG) correctly chosen **and** at least one rejection seen at some point (the rejection need not be correct or at the correct time)
c1A1: All arcs in tree selected correctly in the correct order (AC, BE, BF, FG, FH, EJ, BC, CD) with no additional arcs included in MST
c2A1: cso - including all rejections correct and at the correct time (do not need to see DE and/or AD rejected but if they are rejected then must be after CD has been selected). Note that BC can be included before HJ rejected
d1B1: cao
e1B1: cao (130) – no units required/ignore units even if incorrect

For reference:



3.	e.g.	M1 A1

Question Number	Scheme	Marks
	 **Note that this solution is not unique e.g. A and B could be interchanged**	A1 A1 A1 **(5)**
		5 marks

Notes for Question 3

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, e.g. 'D dealt with correctly' requires the correct immediate precedences for this activity, i.e. A, B and C labelled correctly and leading into the same node and D starting from that node but do not consider the end event for D. **Activity on node is M0**

If one arc is not labelled, for example if the arc for activity F is not labelled (but the arc is present) then this will lose the first A mark and the final (CSO) A mark – they can still earn the second A mark on the bod.

If two or more arcs are not labelled then mark strictly according to the scheme below and therefore no bod as mentioned above. Assume that a solid line is an activity which has not been labelled rather than a dummy (even if in the correct place for where a dummy should be)

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

a1M1: Seven activities (labelled on arc), one start and at least two dummies placed
a1A1: Activities A, B, C, 1st two dummies (including correct arrows on these two dummies) and F dealt with correctly. The first two dummies are those at the end of activities A (or possibly B if A and B are interchanged in their network) and C
a2A1: D, E, G and H dealt with correctly – this mark can be scored on the bod if the arrows are missing off the first two dummies provided the dummies are in the correct place
a3A1: I and J dealt with correctly – so this requires the third and fourth dummies (including correct arrows)
a4A1: cso – all arrows correctly placed for each activity with one finish and at most four dummies (so must have scored the first four marks)
Please check all arcs carefully for arrows – if no dummy has an arrow 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

For reference in checking immediately preceding activities (for 'dealt with correctly')

A	B	C	D	E	F	G	H	I	J
-	-	-	A, B, C	A, B, C	C	F	D	D, E, G	D, E

4. (a)	Float on F is twice float on D $\Rightarrow 22-8-y=2(8-3-x)$ (oe)	B1
	BFDM is 10 less than critical path	B1