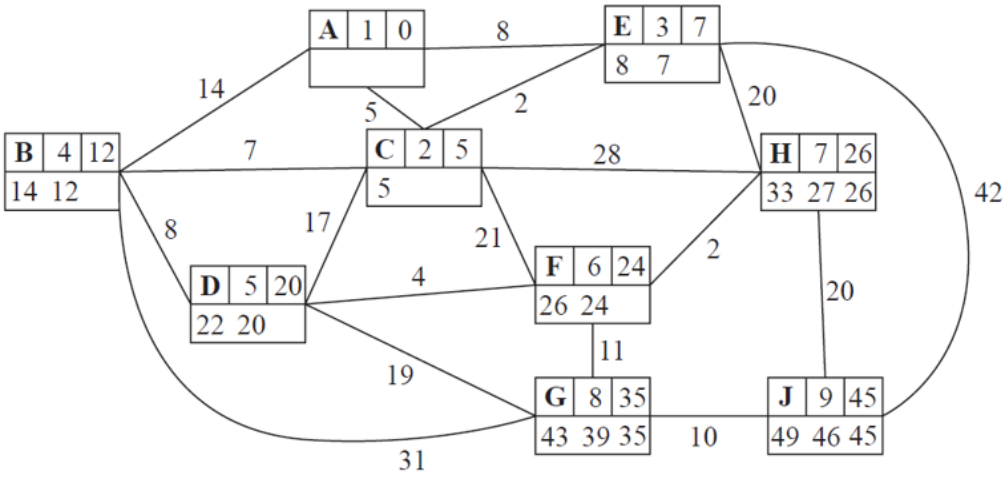
Question Number	Scheme	Marks
6. (a)	 Shortest time: 45 (minutes) Quickest route: A C B D F G J	M1 A1 (CEBD) A1 (FH) A1ft (GJ) A1ft A1 **(6)**
(b)	A(CB)D + HJ = 20 + 20 = 40 A(CBDF)H + D(FG)J = 26 + 25 = 51 A(CBDFG)J + D(F)H = 45 + 6 = 51 Repeated arcs: AC, BC, BD, HJ	M1 A1 A1 A1 A1 **(5)**
(c)(i) **(ii)**	Vertex C: 4 times Vertex D: 3 times	B1 B1 **(2)**
(d)	H to H requires the consideration of the shortest path from A to J only (as these are the only two odd nodes) 314 > 309 or 45 > 40 so quicker to start at H and finish at D	B1 B1 **(2)**
		15 marks

Notes for Question 6

In (a) it is important that all values at each node are checked very carefully – the order of the working values must be correct for the corresponding A mark to be awarded e.g. at J the working values must be 49 46 45 in that order (so 49 45 46 is incorrect)

It is also important that the order of labelling is checked carefully. The order of labelling must be a strictly increasing sequence – so 1, 2, 3, 3, 4, … will be penalised once (see notes below) but 1, 2, 3, 5, 6, … is fine. Errors in the final values and working values are penalised before errors in the order of labelling

a1M1: A larger value replaced by a smaller value in at least two of the working value boxes at any node except A or C

a1A1: All values at C, E, B and D correct and the working values in the correct order (including order of labelling)

a2A1: All values at F and H correct and the working values in the correct order. Penalise order of labelling only once per question (F and H must be labelled in that order and F must be labelled after C, E, B and D)

a3A1ft: All values in G and J correct on the follow through and the working values in the correct order. Penalise order of labelling only once per question. To follow through G check that the working value at G follows from the candidate's final values from their feeds into G (which will mostly likely come from nodes B, D and F (in the order in which the candidate has labelled them)) and that the final value, and order of labelling, follows through correctly. Repeat this process for J (which will possibly have working values from E, H and G with the order of these values determined by the candidate's order of labelling at E, H and G)

Question Number	Scheme	Marks

a4A1ft: Follow through on their final value at J **only** (condone lack of units) - so if 45 given as the answer and the final value at J is not 45 then A0
a5A1: CAO - correct route (from either A to J or J to A) – ACBDFGJ or JGFDBCA

b1M1: Correct three distinct pairings of the correct four odd nodes A, D, H and J
b1A1: **Any** row correct including pairing **and** total
b2A1: **Any** two rows correct including pairings **and** totals
b3A1: **All** three rows correct including pairings **and** totals
b4A1: CAO correct edges clearly stated and not just in their working as AC, BC, BD, HJ. Must be these arcs and not AD, ACBD or AD via B and C

ciB1: CAO (Vertex C: 4)
ciiB1: CAO (Vertex D: 3)

d1B1: Correct reasoning (that to travel from H to H) only the shortest path between A and J needs traversing twice – as a minimum must mention either 'A to J only' or refer to A and J being the only odd nodes (e.g. odd nodes: A and J is fine but not 'A and J are odd nodes')
d2B1: Either 'it will be slower' or 'it will be quicker from H to D' (if saying 'quicker' then it must be clear that they are talking about H to D) + correct numerical argument (not just stating the values 314 and 309 (or 45 and 40) and saying 'slower' - there must be some comparison of these two values)