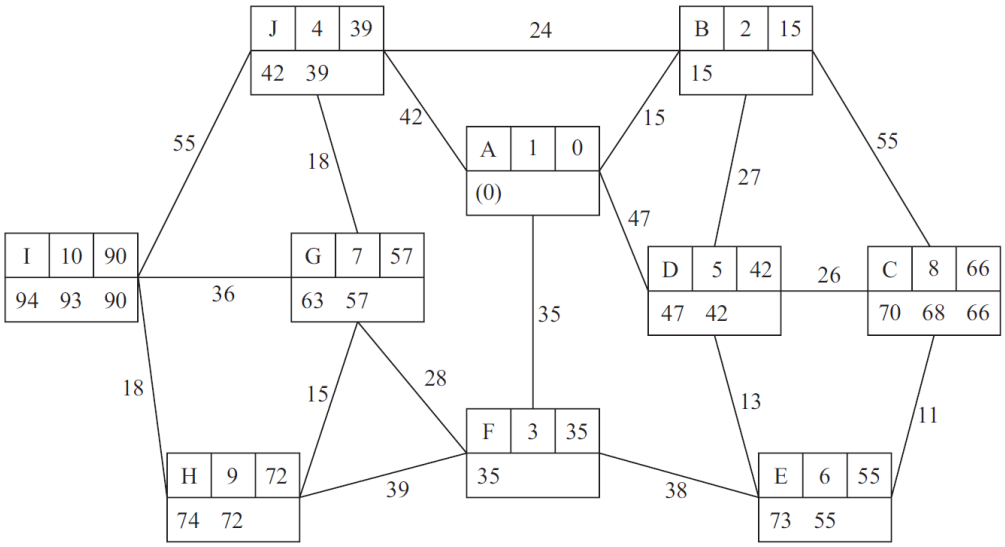
Question Number	Scheme	Marks
3.(a)	Totals in bins are 47, 50, 49 so $n \geqslant 50$ or considers bin 2 $n \geqslant 15 + 24 + 11 \quad \Rightarrow n \geqslant 50$ 13 placed in bin 3 instead of bin 2 so $n < 15 + 24 + 13 \quad \Rightarrow n < 52$ *n* can be 50 or 51	B1 M1 A1 **(3)**
(b)	Either considers *n* = 51 28 20 24 16 11 15 13 12 7 or considers *n* = 50 28 20 24 16 7 15 13 12 11 If considering *n* = 50 shows that 24 + 16 + 11 = 51 concludes that *n* = 50	M1 A1 **(2)**
		5 marks
	Notes for Question 3	
a1B1	Considers the total in each bin and states $n \geqslant 50$ which may be implied by sight of the three totals and then a statement that e.g. *n* = 50 or 51 or considers bin 2 and states $n \geqslant 50$	
a1M1	Considers the placement of 13 and deduces that this does not fit in bin 2 and therefore states a correct upper bound for *n* (accept statements e.g. 13 is not in bin 2 so *n* < 52 or 15 + 24 + 13 = 52 so *n* < 52 or 15 + 24 + 13 = 52 so *n* = 50 or 51) (Note: a statement of $n < 52$ with no working is M0)	
a1A1	CAO – accept inequalities $50 \leqslant n < 52$ o.e. (must have scored both B and M mark)	
b1M1	Either considers *n* = 51 and shows only 3 bins required or considers *n* = 50 and shows 4 bins required (bin packing must be correct – if both shown at least one must be correct)	
b1A1	If considering *n* = 51 sight of the correct bin packing plus conclusion that *n* = 50 is sufficient	

	If just considering $n = 50$ must also show that $n = 51$ uses 3 bins when using the algorithm e.g. by stating that 11 fits in bin 2 and 7 in bin 3 Concludes that $n = 50$ (there must not be any incorrect statements or working seen)	

Question Number	Scheme	Marks
4.(a)	Use Dijkstra to find the shortest route from A to C and from A to I and add these together	B2, 1 **(2)**
(b)		M1 A1 (ABFJ) A1 (DEG) A1ft (CHI)
	Quickest route is IHGJBABDEC	A1
	Length of quickest route is 90 + 66 = 156 (minutes)	A1ft **(6)**
		8 Marks