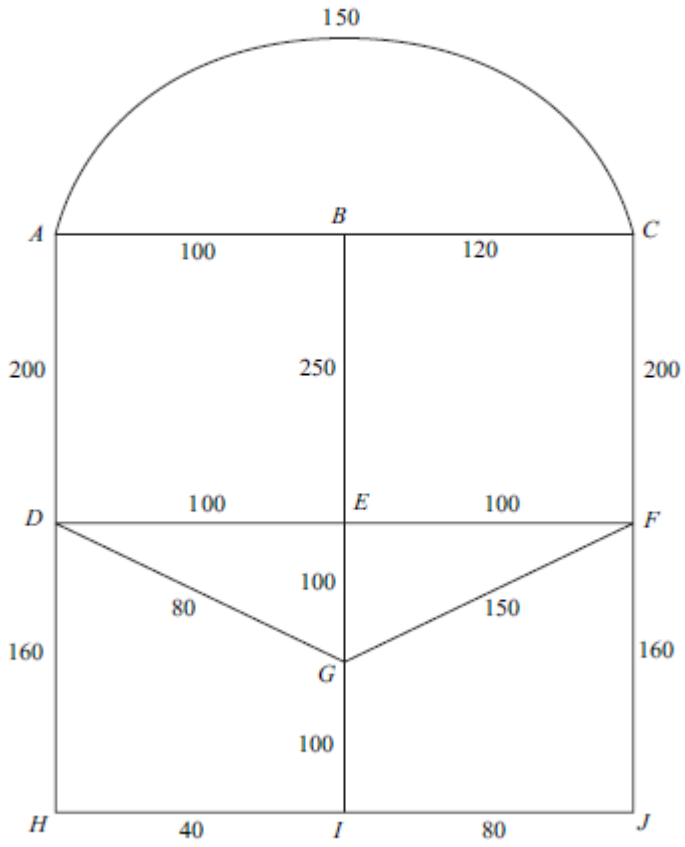
Decision 1 Route Inspection Questions

7 Stella is visiting Tijuana on a day trip. The diagram shows the lengths, in metres, of the roads near the bus station.



Total = 2090

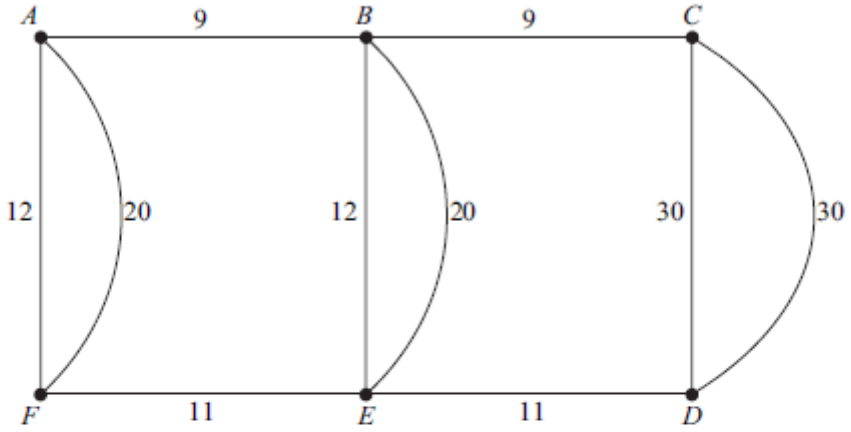
Stella leaves the bus station at A. She decides to walk along all of the roads at least once before returning to A.

(a) Explain why it is not possible to start from A, travel along each road only once and return to A. *(1 mark)*

(b) Find the length of an optimal 'Chinese postman' route around the network, starting and finishing at A. *(5 marks)*

(c) At each of the 9 places B, C, ..., J, there is a statue. Find the number of times that Stella will pass a statue if she follows her optimal route. *(2 marks)*

4 The diagram shows a network of roads connecting 6 villages. The number on each edge is the length, in miles, of the road.



Total length of the roads = 164 miles

(a) A police patrol car based at village *A* has to travel along each road at least once before returning to *A*. Find the length of an optimal 'Chinese postman' route for the police patrol car. *(6 marks)*

(b) A council worker starts from *A* and travels along each road at least once before finishing at *C*. Find the length of an optimal route for the council worker. *(2 marks)*

(c) A politician is to travel along all the roads at least once. He can start his journey at any village and can finish his journey at any village.

(i) Find the length of an optimal route for the politician. *(2 marks)*

(ii) State the vertices from which the politician could start in order to achieve this optimal route. *(1 mark)*

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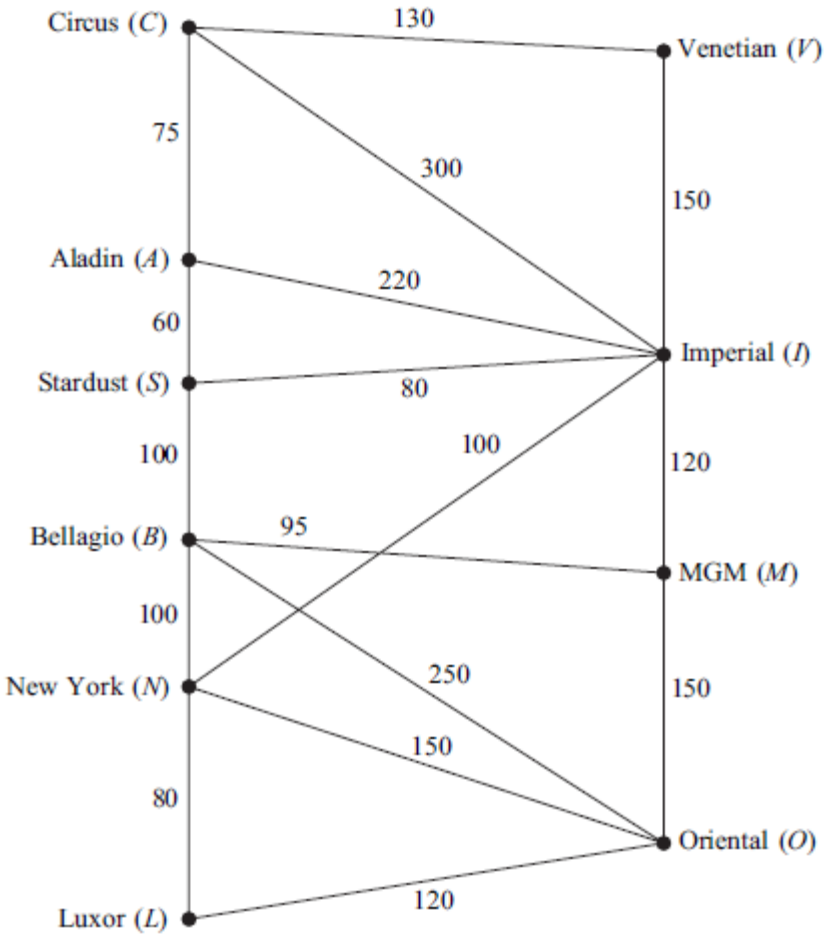
7 [**Figure 2**, printed on the insert, is provided for use in this question.]

The network shows the times, in seconds, taken by Craig to walk along walkways connecting ten hotels in Las Vegas.



The total of all the times in the diagram is 2280 seconds.

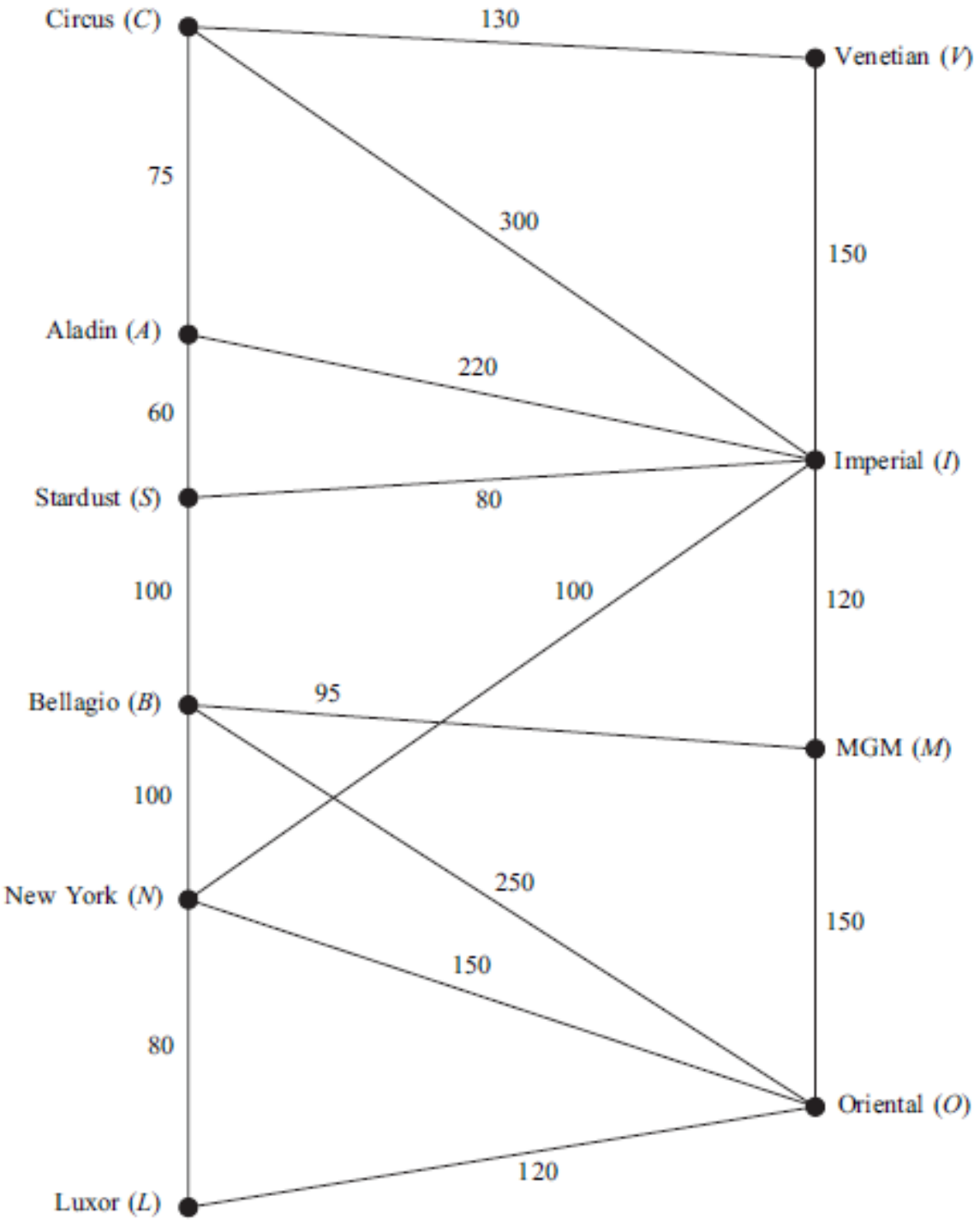
(a) (i) Craig is staying at the Circus (C) and has to visit the Oriental (O).

Use Dijkstra's algorithm on **Figure 2** to find the minimum time to walk from C to O. *(6 marks)*

(ii) Write down the corresponding route. *(1 mark)*

(b) (i) Find, by inspection, the shortest time to walk from A to M. *(1 mark)*

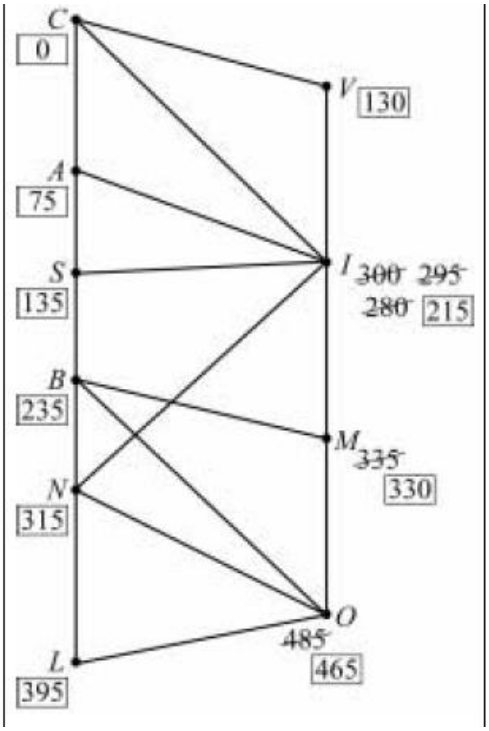
(ii) Craig intends to walk along all the walkways. Find the minimum time for Craig to walk along every walkway and return to his starting point. *(6 marks)*


Circus (C)
Venetian (V)
Aladin (A)
Imperial (I)
Stardust (S)
Bellagio (B)
MGM (M)
New York (N)
Oriental (O)
Luxor (L)
130
75
300
150
220
60
80
100
100
120
95
100
250
150
150
80
120

Decision 1 Route Inspection Answers

7(a)	Odd vertices (at *A, B, C, I*)	E1	1	
(b)	$AB + CI = 100 + 440 = 540$ $AC + BI = 150 + 450 = 600$ $AI + BC = 380 + 120 = 500$	M1 A2,1,0		
	Repeat $AI + BC$	E1		May be implied
	Distance $2090 + 500 = 2590$	B1	5	
(c)	Route with (3*A*), 2*B*, 2*C*, 3*D*, 2*E*, 2*F*, 3*G*, 1*H*, 2*I*, 1*J*	M1		$(16 \rightarrow 21)$
	= 18	A1	2	
	Total		**8**	

4(a)	A, C, D, F odd nodes	B1		May be implied
	AC + DF = 18 + 22 = 40	M1		
	AD + CF = 32 + 30 = 62	A2,1,0		
	AF + CD = 12 + 30 = 42			
	Repeat AC + DF	B1		May be implied
	Total 164 + 40 = 204	B1	6	
(b)	Start/finish A/C			
	∴ Repeat DF	B1		Or subtract AC
	Total 164 + 22 =186	B1	2	
(c)(i)	Shortest pair AF	B1		
	Distance = 164 +12 = 176	B1	2	
(ii)	Start/Finish at C/D	B1	1	May be listed in a route

7(a)(i)		M1 M1 M1 M1 A1 B1	6	SCA 4 values at I 2 values at M 2 values at O All correct 465 at O
(ii)	*CASINO*	B1	1	Or *ONISAC*
(b)(i)	$A \rightarrow M = 255$	B1	1	
(ii)	Odds (C, A, S, M)	M1		PI
	$CA + SM = 270$ $CS + AM = 390$ $CM + AS = 390$	A3		(–1 EE)
	Min 2280 + 270	M1		2280 + their best pairing
	= 2550	A1	6	SC 2/6 for answer 2550 with no working
	Total		**14**	