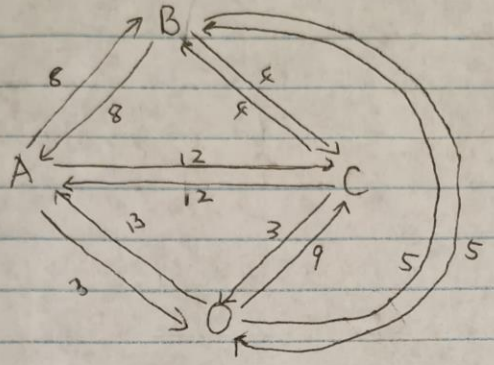
STMATH 381

H2

1. (a) Vertices: O, A, B, C



Kruskal's Algorithm

list of edges

edge	cost
AB	8
BA	8
AC	12
CA	12
AO	3
OA	13
BC	4
CB	4
BO	5
OB	5
CO	3
OC	9

(b) From O, visit A, B, C, and D and return O.

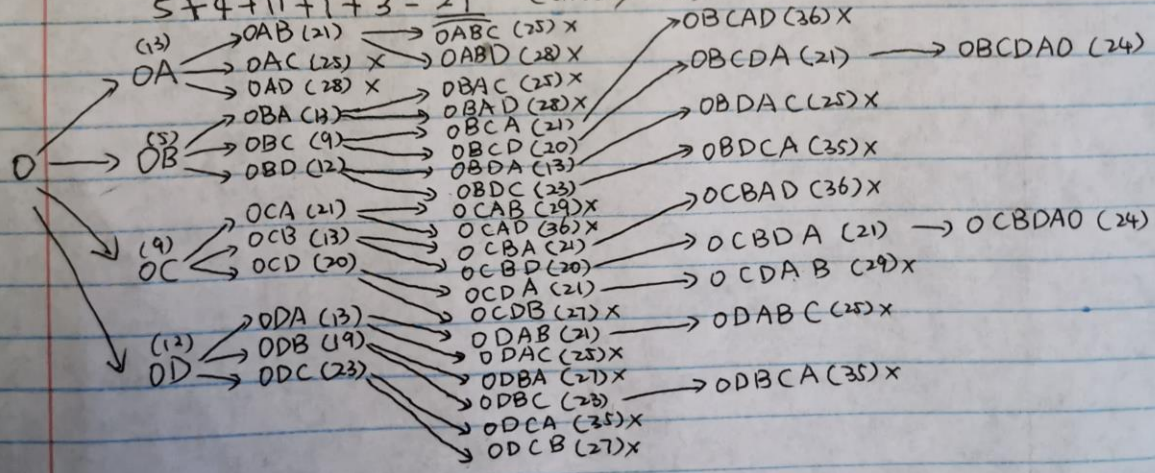
Greedy Path: From observing picture

~~O → B → D → A → C~~

O → B → C → B → D → A → O

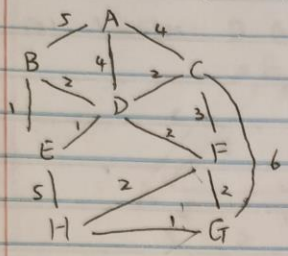
OBCDAO with cost of

5 + 4 + 11 + 1 + 3 = 24 (Greedy Cost)



The shortest routines are { OBCDAO, OCBDAO } with cost of 24

2. Dijkstra's algorithm : A to H

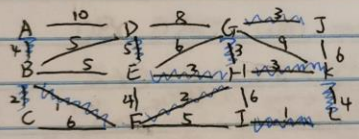


Node	Tentative distance from A				Visited	Predecessor
A	0				✓	n/a
B	∞	5			✓	A
C	∞	4			✓	A
D	∞	4			✓	A
E	∞	5			✓	D
F	∞	7	6		✓	~~E~~ D
G	∞	10	8			~~F~~ F
H	∞	10	8		✓	~~F~~ F

In reverse: HFDA

Final Answer: ADFH with cost 8

3. (a) Kruskal's



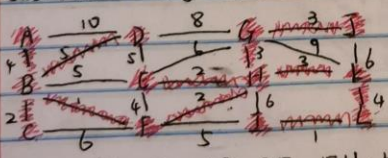
edge	cost
LI	1 ✓
BF	1 ✓
BC	2 ✓
EH	2 ✓
FH	2 ✓
GJ	3 ✓
HK	3 ✓
GH	3 ✓
AB	4 ✓
KL	4 ✓
EF	4 ×
IF	5 ×
BE	5 ×
DE	5 ✓
BD	5
JK	6
FC	6
HI	6
EG	6
DG	8
GK	9
AD	10

Total cost

= 4+2+3+4+1+2+3+5+3+1+2

= 30

(b) Prim's algorithm



Tree: AB, BC, BD, BF, FH, HE, HG, GJ, HK, KL, LI

Cost: 4+2+5+1+2+2+3+3+3+4+1

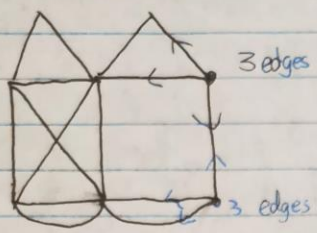
= 30

List of edges

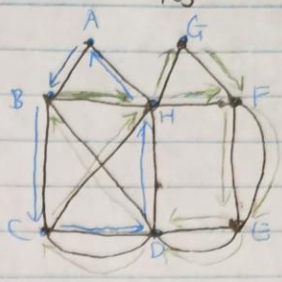
edge	cost	edge	cost
AB	4 ✓	BD	5
AD	10	BF	1 ✓
BC	2 ✓	EG	6
DG	8	FH	2 ✓
GJ	3 ✓	GK	9
JK	6		
KL	4 ✓		
LI	1 ✓		
IF	5 ×		
FC	6		
BE	5 ×		
EH	2 ✓		
HK	3 ✓		
DE	5 ✓		
EF	4 ×		
GH	3 ✓		
HI	6		

4.

No



Yes



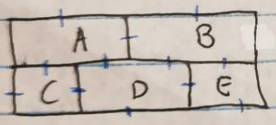
Left graph as labeled, two vertices only have 3 edges while for each vertices on right graph, it contains even number of edges. By the requirement of Eulerian circuits, for every vertices, it needs to have even valence.

A B C D H A

B H G F E D C H F E D B

A B H G F E D C H F E D B C D H A Eulerian Circuit

5.

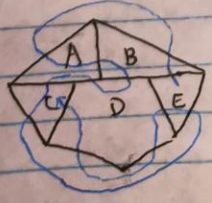


O

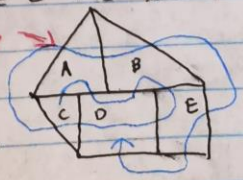
For A has 4 degrees
B has 4 degrees
C has 3 degrees
D has 5 degrees
E has 3 degrees
O has 5 degrees
} odd.

∴ Can not form a Eulerian Circuit
The form has no solution with one single Eulerian path

If we can construct a wall (door) on D to the outside or make the E has two walls



O



Use this one as the two straight line segments does not necessarily mean two edges.