Name :

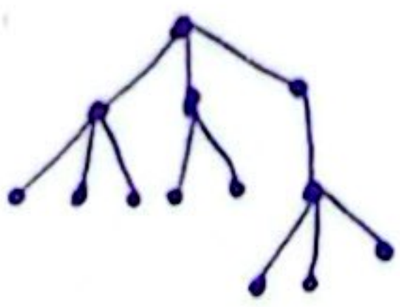
① Gwee Zi Ni A24CS0078

② Lee Jia Yee A24CS0260

③ Evelyn Ang A24CS0068

④ Leong Jia Ling A24CS0104

1) a)

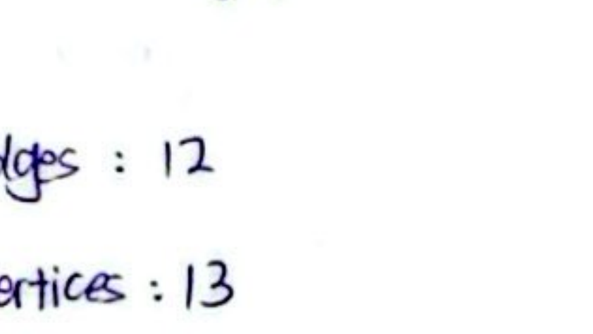


b) Edges : 12

Vertices : 13

c) Not a full 3-ary tree because not every internal node has exactly 3 children. However, it is a 3-ary tree.

d)



∴ The tree is balanced. All leaves are at levels 3 or 2.

2) a) Children of vertex d = h, i

b) Sibling of vertex f = g

c) Height of this root tree is 4

d) Address of vertex j is 1-2-1

e) Preorder traversal : a, b, d, h, n, o, i, e, j, k, c, f, l, m, g

In order traversal : n, h, o, d, i, b, j, e, k, a, l, f, m, c, g

Postorder traversal : n, o, h, i, d, j, k, e, b, l, m, f, g, c, a

3) In order traversal : 2, +, 2, *, 3, +, 4, /, 2

Expresson obtained fiom in order traversal = 2 + 2*3 + 4/2

= 2+ (2*3) + (4/2)

= 2+6+2

= 10 ✗

4) Each member can either recruit 4 other members or chose not to recruit any members

⇒ 4 - any

⇒ m = 4

2000 members are actively doing the recruitments before the maximum level of recruitment is reached

⇒ 2000 members have children

⇒ 2000 members are internal nodes

⇒ i = 2000

Members have been recruited ⇒ total number of vertices - 1

⇒ total number of vertices = n

n = mi + 1

= (4)(2000) + 1

n = 8001

Membeas have been recruited

= 8001 - 1

= 8000

∴ The total number of vertices is 8001 which are people include in multi-level marketing. The first people is not recruited, the members have been recruited is 8000.

Members who did not do any recruitment ⇒ There are no children

⇒ ℓ

ℓ = (m-1)i + 1

= (4-1)(2000) + 1

ℓ = 6001 ✗

∴ Members who did not do any recruitment, ℓ = 6001.

5) a) A simple circuit or cycle, FEDCH exists in Figure 3. However, a simple circuit or a cycle cannot be formed in Kruskal's algorithm.

b) Edges in order of size:

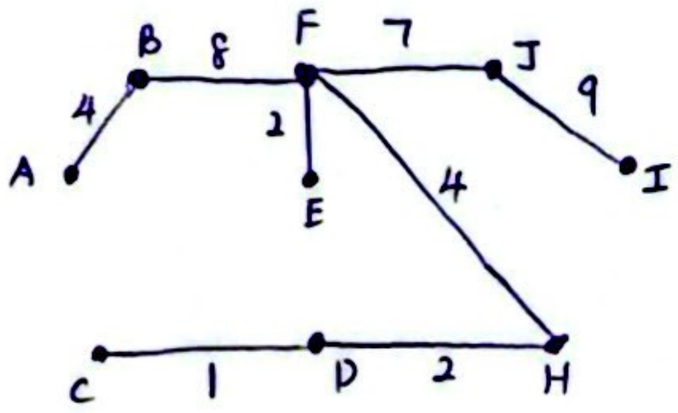
Edges	Weight	Cycle	Select
CD	1	No	Yes
DH	2	No	Yes
EF	2	No	Yes
AB	4	No	Yes
HF	4	No	Yes

Edges	Weight	Cycle	Select
DE	6	Yes	No
CE	7	Yes	No
FJ	7	No	Yes
AC	8	Yes	No
BF	8	No	Yes

Edges	Weight	Cycle	Select
IJ	9	No	Yes
HI	10	Yes	No
BC	11	Yes	No
JH	14	Yes	No

Selected edges with least weight which will not create a circuit :

CD , DH, EF , AB, HF , FJ , BF, IJ



∴ length of selected edges

= 1+2+2+4+4+7+8+9

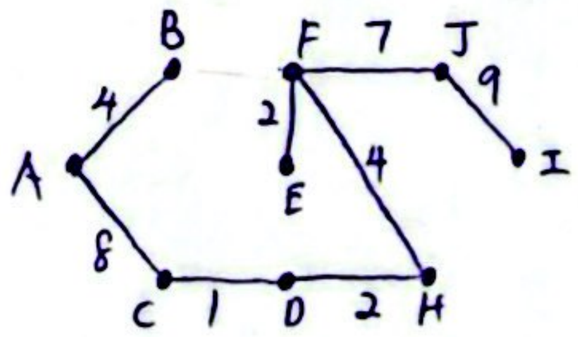
= 37 meters ✱

Cost per meter is RM100,

37 meters × 100 = 3700.

Total cost is RM 3700

c) Yes, it is possible. There is different edges with same length in Figure 3.

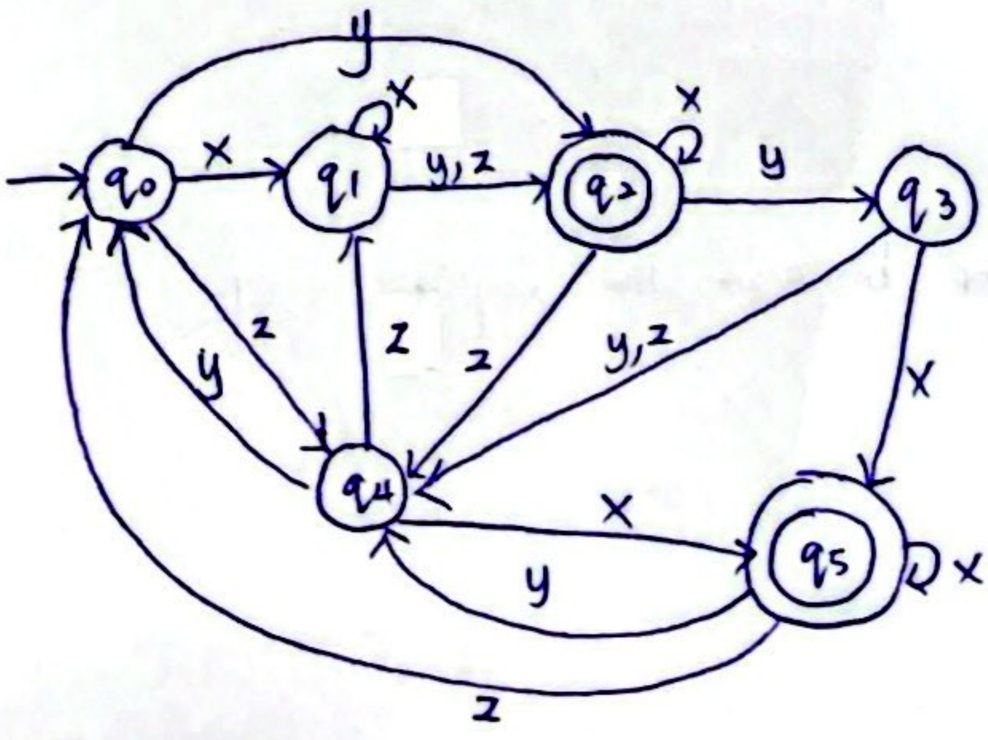


Length of selected edges

= 1+2+2+4+4+7+8+9

= 37 meters

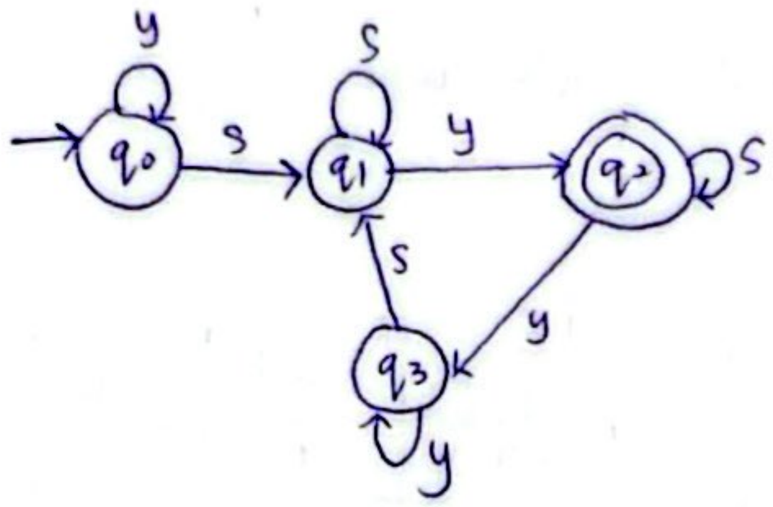
6-(i)



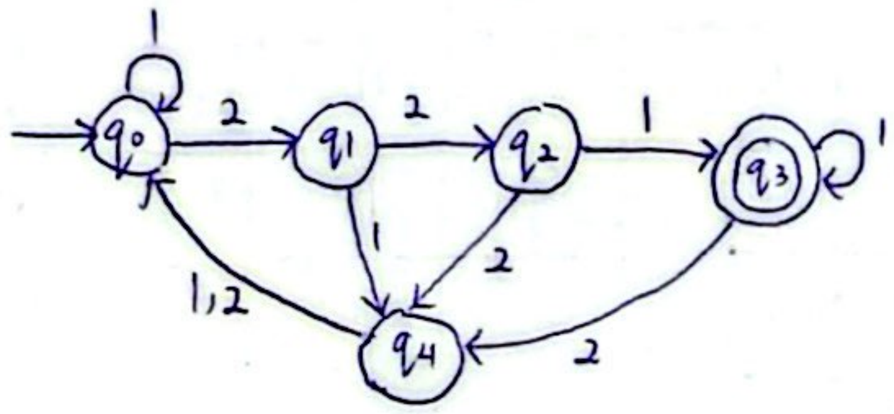
(ii) Minimum length of strings that is accepted by the machine, M is 1.

(iii) $q_0 \xrightarrow{y} q_2$

7) i)



ii)



8) a) $S = \{q_0, q_1, q_2, q_3\}$

$I = \{a, b\}$

$O = \{0, 1\}$

$q_0 = q_0$ = Initial state

	f_S		f_O	
	q	b	a	b
q_0	q_1	q_3	1	0
q_1	q_1	q_2	0	1
q_2	q_1	q_2	0	1
q_3	q_3	q_3	1	0

b) $q_0 \xrightarrow[1]{a} q_1 \xrightarrow[0]{a} q_1 \xrightarrow[0]{a} q_1 \xrightarrow[1]{b} q_2 \xrightarrow[1]{b} q_2 \xrightarrow[1]{b} q_2$

Output string : 100111

Output : 1

∴ Input string aaabbb is accepted by the machine because the output is 1.

4) State :

S0 : Green light with barrier at the top position

S1 : Flashing yellow light with lowering barriers

S2 : Red light, barrier at bottom which indicate that train is leaving from left sensor zone

S3 : Red light, barrier at bottom which indicate that train is entering into right sensor zone

S4 : Red light, barrier is raising

Inputs :

A : First signal from left, train entered left sensor zone

B : Second signal from left, train exited from left sensor zone

C : First signal from right, train entered right sensor zone

D : Second signal from right, train exited from right sensor zone

E : After leaving Right sensor zone

outputs :

1 : Green light with barrier at the top position

2 : Flashing yellow light with lowering barriers

3 : Red light with barrier at the bottom position

4 : Red light with raising barrier

State	fs					f0				
	A	B	C	D	E	A	B	C	D	E
S_0	S_1					2				
S_1		S_2					3			
S_2			S_3					3		
S_3				S_4					4	
S_4					S_0					1