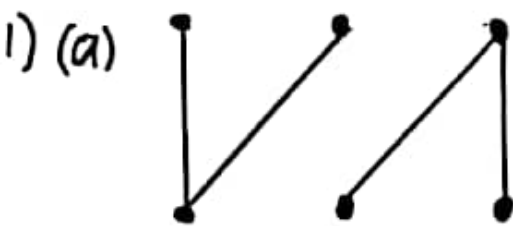# ASSIGNMENT 4
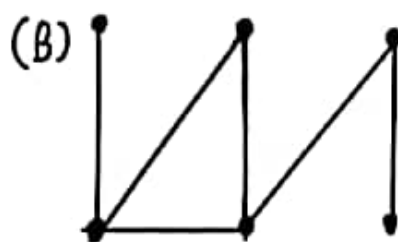
NUREEN FATINI BINTI ZULKEFLI
A24CS0169

DASNEEM BANU BINTI HAJA
A24CS0066
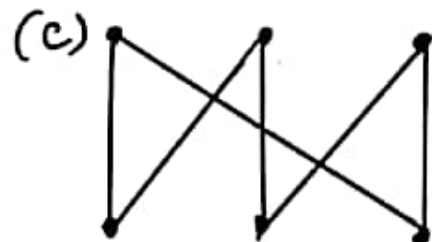
1) (a)

vertices = 6
edges = 4

(a) is not a tree because
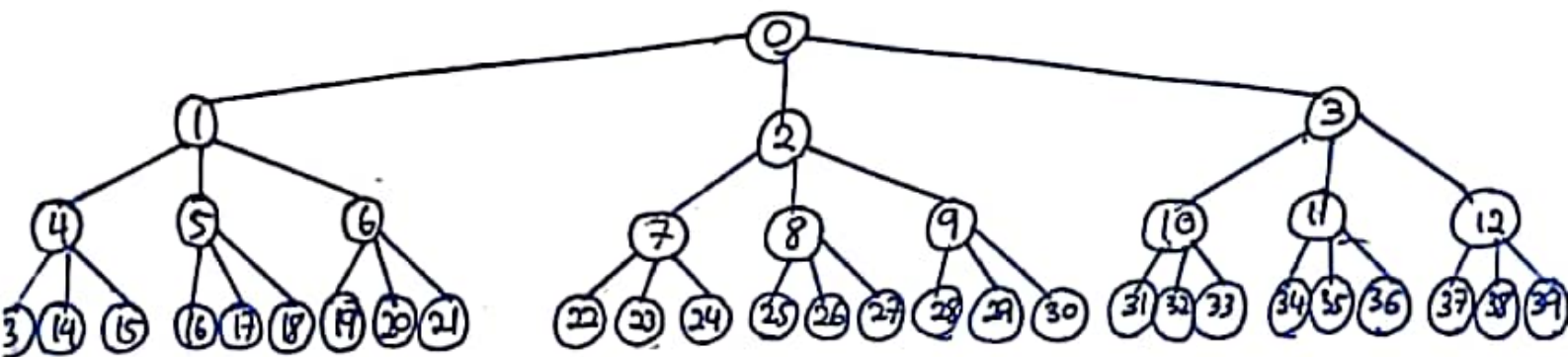edges $\neq$ n-1

(B)

vertices = 6
edges = 6
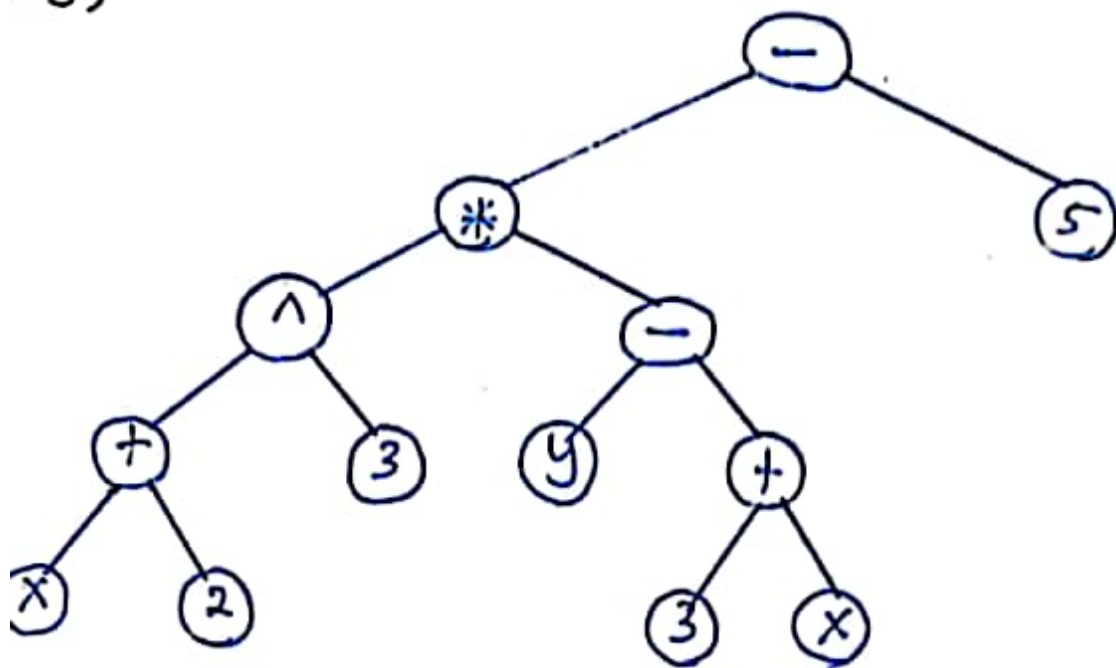
(b) is not a tree
because edges $\neq$ n-1

(c)

vertices = 6
edges = 6

(c) is not a tree
because edges $\neq$ n-1

2) Total nodes $= \dfrac{m^{h+1}-1}{m-1}$

$$= \dfrac{3^4-1}{3-1}$$

$$= 40$$

3)

Pre-order : $- * \wedge + x 2 3 - y + 3 x 5$

In-order : $(((x+2) \wedge 3) * (y - (3 + z))) - 5$

Post-order : $x 2 + 3 \wedge y 3 x + - x 5 -$

4) $5\ 2\ 1\ -\ -\ 1\ 4\ +\ +\ *$

$\quad\quad\quad\underset{\downarrow}{\underline{}}$

$\quad\quad 2 - 1 = 1$

$\quad\quad 5\ 1\ -\ 1\ 4\ +\ +\ *$

$\quad\quad\underset{\downarrow}{\underline{}}$

$\quad\quad 5 - 1 = 4$

$\quad\quad 4\quad 1\ 4\ +\ +\quad *$

$\quad\quad\quad\underset{\downarrow}{\underline{}}$

$\quad\quad\quad 1 + 4 = 5$

$1\quad 4\quad 5\quad +\quad *$

$\quad\underset{\downarrow}{\underline{}}$

$\quad\quad 4 + 5 = 9$

$\quad\quad 9 * 9 = 81$

$\quad\quad = 81$

5)

a) a

b) a, b, f, c, h, d, j, q, t

c) e, l, m, n, g, o, p, i, k, r, s, u

d) q, r

e) c

f) p

g) a, b, f

h) l, m, n, e, f

6) $i = \dfrac{n-1}{m}$

$100 = \dfrac{n-1}{5}$

$500 = n - 1$

$n = 501$
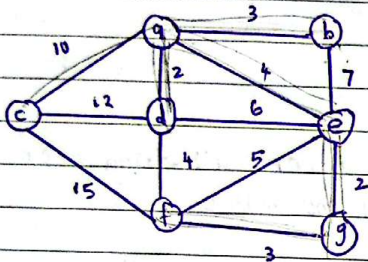
ASSIGNMENT 4

7. How many leaves does a full 4-ary tree with 1000 vertices have?

m n

$$i = (n-1)/m$$
$$= (1000-1)/4$$
$$= 999/4$$
$$= 249.75$$
$$= 250 \text{ internal vertices}$$

$$l = [(m-1)n+1]/m$$
$$= [(4-1)1000+1]/4$$
$$= [(3)1000+1]/4$$
$$= [3000+1]/4$$
$$= 750.25$$
$$= 750 \text{ leaves}$$

8.

Edge	Weight	Will adding edge make circuit?	Action taken	Cumulative weight of subgraph
$e_1 (a,d)$	2	NO	Added	2
$e_2 (e,g)$	2	NO	Added	4
$e_3 (a,b)$	3	NO	Added	7
$e_4 (f,g)$	3	NO	Added	10
$e_5 (a,e)$	4	NO	Added	14
$e_6 (d,f)$	4	Yes	Not Added	14
$e_7 (e,f)$	5	Yes	Not Added	14
$e_8 (d,e)$	6	Yes	Not Added	14
$e_9 (b,e)$	7	Yes	Not Added	14
$e_{10} (a,c)$	10	NO	Added	24
$e_{11} (c,d)$	12	Yes	Not Added	24
$e_{12} (c,f)$	15	Yes	Not Added	24

The minimum spanning tree is drawn below
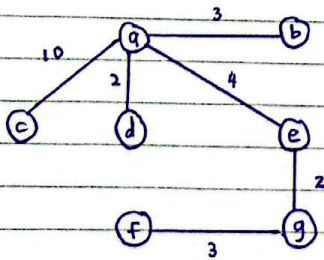

The minimum spanning tree has a total weight of 24.

9.
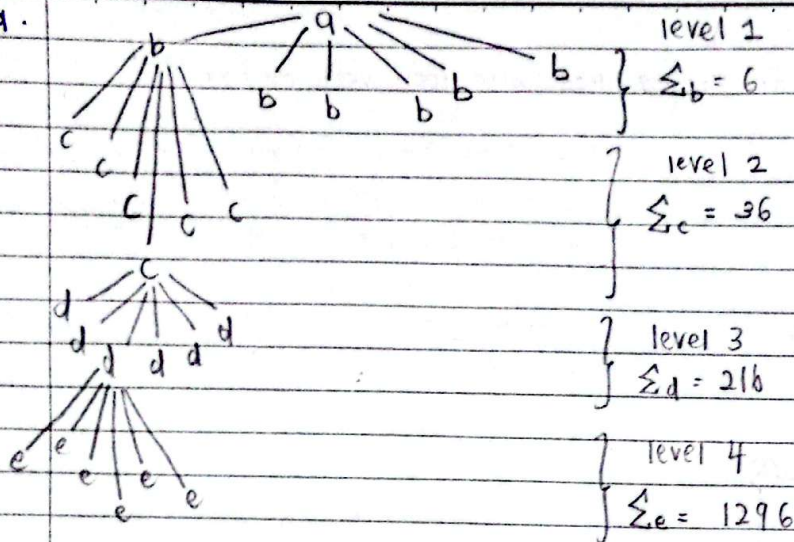
level 1 $\sum_b = 6$	• The chain form a full 6-ary tree with 4 levels.
level 2 $\sum_c = 36$	• This diagram shows that the first person will receive 1296 dollars
level 3 $\sum_d = 216$	• As each tree have same number of leaves as the (a), each person will be receiving 1296 dollars which is same as first person.
level 4 $\sum_e = 1296$	

10 Construct a state transition diagram of a DFA that accepts all string over $\{a, b, c\}$ that begin with a, contain exactly two b's and end with c.

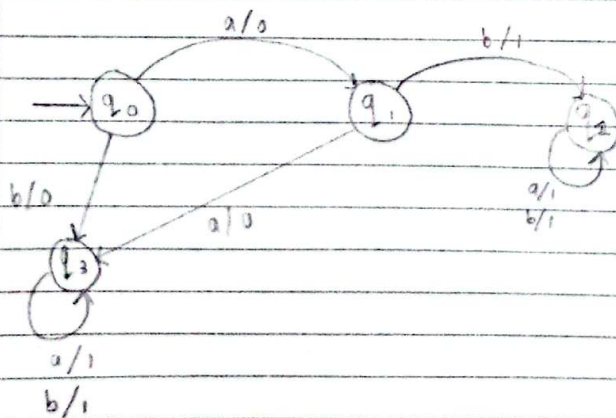$$S = \{q_0, q_1, q_2, q_3, q_4\} \qquad I = \{a, b, c\}$$
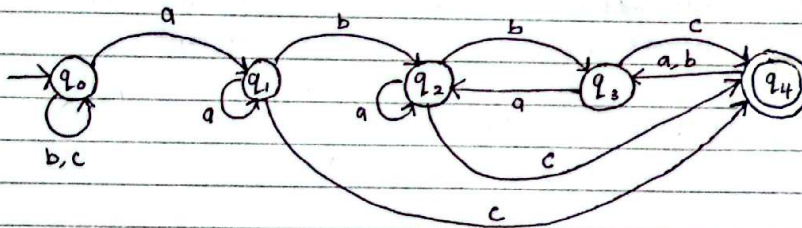
11 Construct a state transition diagram of a FSM that accepts the given set of strings over $\{a, b\}$:
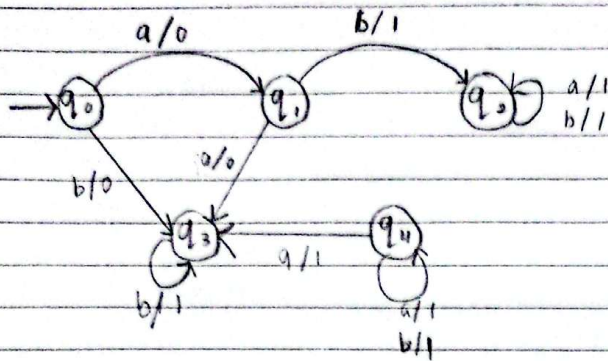
a) contain exactly two b's

$$S = \{q_0, q_1, q_2, q_3\}$$
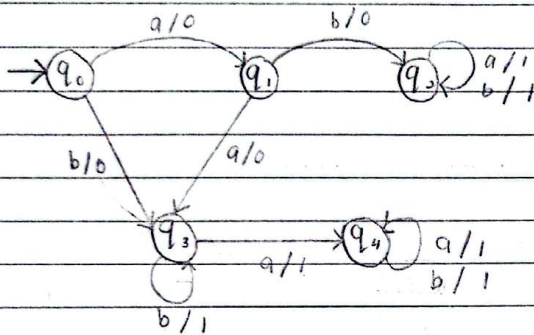$$I = \{a, b\}$$
$$O = \{0, 1\}$$

11 b) at least one b.

$$S: \{q_0, q_1, q_2, q_3, q_4\}$$
$$I: \{a, b\}$$
$$O: \{0, 1\}$$

11 c) odd number of a's.

$$S = \{q_0, q_1, q_2, q_3, q_4\}$$
$$I: \{a, b, c\}$$
$$O: \{0, 1\}$$

12 a)

	f_s					f_o				
	i_1	i_2	i_3	i_4	i_5	i_1	i_2	i_3	i_4	i_5
q_0	q_1	—	—	—	—	0	—	—	—	—
q_1	—	q_0	—	—	q_2	—	0	—	—	0
q_2	—	q_0	—	—	q_3	—	0	—	—	1
q_3	—	—	q_4	—	—	—	—	2	—	—
q_4	—	—	—	q_0	—	—	—	—	3	—

12 b) state diagram