Course ID : BIT 114 **Course Name: Discrete Math**

Program: BIT Fall 2019

Semester:1Year/1semester

COLLEGE OF MANAGEMENT & INFORMATION TECHNOLOGY

BACHELOR IN INFORMATION TECHNOLOGY

ASSIGNMENT ON

ASSIGNMENT NUMBER:

Submitted by: sunil kumar goley tamang **Submitted to: Lincoln University college**

Year/ Semester: 1 Year/ I semester
LCID: LC00017000862

Date:06-03-2020

1. Define contradiction and tautology. Show that the compound proposition [p^(p->q)]->q is tautology.

➔ A compound proposition is said to be contradiction if its truth value is always false irrespective to the truth value of its constituent proposition.

For ex:

P	~P	P^~P
T	F	F
F	T	F

➔ A compound proposition is said to be tautology if its truth value is always true irrespective to the truth value of its constituent proposition.

For ex:

P	~P	Pv~P
T	F	T
F	T	T

➔ Solution:

P	q	p->q	P^(p->q)	[p^(p->q)]->q
T	T	T	T	T
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

Here, the above table shows that compound proposition [p^(p->q)]->q is tautology.

1. Without expanding show that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix} = (a-b)(b-c)(c-a)$$

➔ Solution:
Given,
Taking L.H.S

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ bc & ca & ab \end{vmatrix}$$

First step : $R_1 \text{->} R_1 - R_2$

$$\begin{vmatrix} 1-1 & 1 & 1 \\ a-b & b & c \\ bc-ca & ca & ab \end{vmatrix}$$

taking (a-b) common in first row R_1
second step: $R_2 \text{->} R_2 - R_1$

$$= (a-b) \begin{vmatrix} 0 & 1-1 & 1 \\ 1 & b-c & c \\ -c & ca-ab & ab \end{vmatrix}$$

Taking (b-c) common in second row R_2

$$= (a-b)(b-c) \begin{vmatrix} 0 & 0 & 1 \\ 1 & 1 & c \\ -c & -a & ab \end{vmatrix}$$

Then,

$$\text{Here} = 1 \begin{vmatrix} 1 & 1 \\ -c & -a \end{vmatrix}$$

= 1x-a-(-c)x1
= (c-a)
Hence, we have proved that (a-b)(b-c)(c-a)
L.H.S=R.H.S proved

2. Define homogeneous recurrence relation. Solve the recurrence relation.

$a_n=6a_{n-1}+8a_{n-2}$ for n_>2,$a_0=4,a_1=10$

- ➔ A homogeneous recurrence relation is said to be if the order of k of the form can be found as
  $a_n=c_1a_{n-1}+c_2a_{n-2}+\ldots+c_ka_{n-k}$

- ➔ Solution:
  Given recurrence relation is $a_n=6a_{n-1}+8a_{n-2}$……….(i)
  This is the recurrence relation of second order. Its character equation is ;
  Or, $r^2=6r^1-8r^0$
  Or, $r^2-6r+8=0$
  Or, r(r-4)-2(r-4)=0
  Or, (r-4)(r-2)=0
  Hence, $r_1=2,r_2=4$
  The solution of eqn(i) is ,
  $a_n= \alpha_1r_1^n+\alpha_2r_2^n$
  $a_n= \alpha_12^n+\alpha_24^n$……………………(ii)
  Put n=0 in eqn(ii), we get
  $a_0=\alpha_12^0+\alpha_24^0$
  Given $a_0=4$, then
  Or, $4=\alpha_1+ \alpha_2$
  Or, $\alpha_2=4-\alpha_1$
  again, put n=1
  Or, $a_1=\alpha_12^1+\alpha_24^1$
  Given $a_1=10$
  Or, $10= \alpha_12+(4-\alpha_1)4$
  Or, $5=\alpha_1+8-2\alpha_1$
  Or, $\alpha_1=3$, $\alpha_2=1$
  Here, the equation is found to be $a_n=3x2^n+1x4^n$

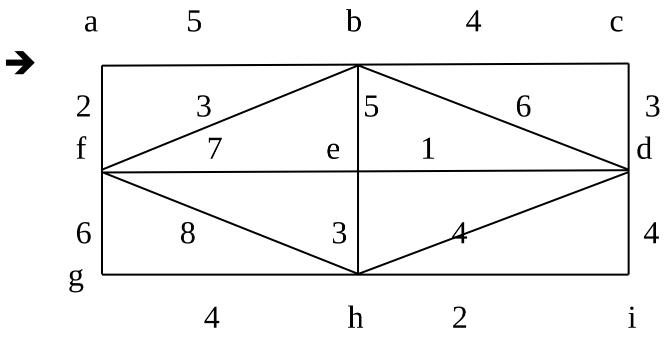
3. Define the term tree, minimum spanning tree, simple, multiple and pseudo graph. Write prim's and kruskal's algorithm to construct minimum spanning tree. Explain the process of generating spanning tree using kruskal's algorithm? Assume example of your own.
   - ➔ Tree: A connected undirected graph with no simple circuit is called tree .for a tree a graph must be simple graph.

- Minimum spanning tree: A spanning tree of n connected graph in which the sum of weight of it's edge in minimal is called minimum spanning tree.
- Simple graph:
- Multiple graph:
- Pseudo graph:

- Prim's algorithm:
  Procedure: G:weighted connected undirected graph with n vertices.
  T:= a minimum weight edge.
  For P:= 1 to n-2.
  Begin
  e:= an edge of minimum weight incident to a vertex inT and not forming a simple circuit in T if added to T.
  T:= T with e added.
  End{ T is a minimum spanning tree of G.}

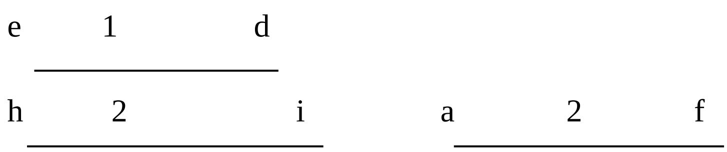
-

  Kruskal's algorithm:
  Procedure:
  Kruskal(G: a connected undirected weighted graph with n vertices.)
  T: = empty graph.
  For : i: 1 to n-1.
  Begin
  e:= any edge in G with smallest weight and forming a simple circuit if added to T.
  T:= tree with e added.
  End{T is minimum spanning tree of G.}

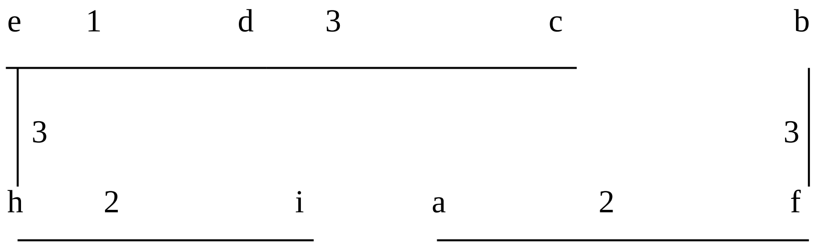


Solution:
First of all we list edges in ascending order.
(e,d)=1
(h,i)=2
(a,f)=2
(b,f)=3
(e,h)=3
(c,d)=3
(b,c)=4
(d,i)=4
(d,h)=4
(g,h)=4
(b,e)=5
(a,b)=5
(f,g)=6
(b,d)=6
(e,f)=7
(f,h)=8
Step1 : take an edge with minimum weight

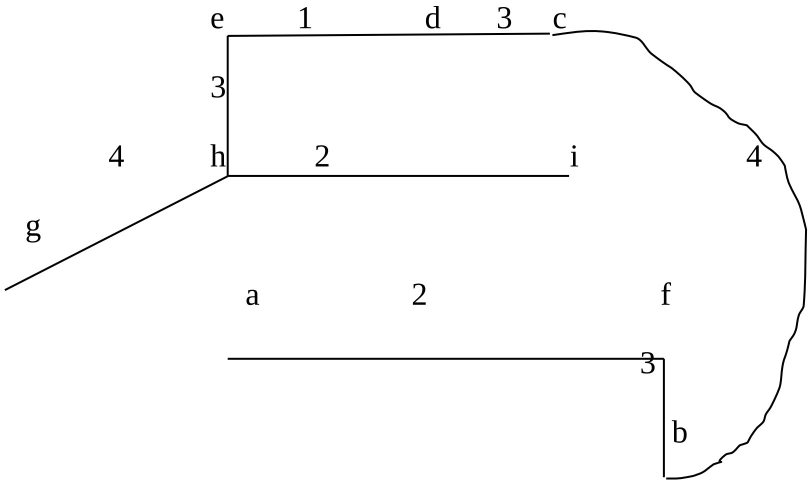
step 2: adding (h,i) and (a,f) having weight 2 on T.



step 3 : adding (b,f),(e,h),(c,d) having weight 3 on T.



step 4: adding (b,c),(d,i),(d,h),(g,h) having weight 4 on T.



here in step 4 the circuit is formed so they are excluded (d,h),(d,i)

step 5 : adding (b,e),(a,b) having weight 5 on T.

here (a,b),(b,e) is excluded because it makes circuit

(f,g),(b,d),(e,f),(f,h) are also excluded

Therefore, minimum spanning tree is found to be 22 having weighted.