

## Discrete Structures Tutorial 3 – Solution

Q1.  $R = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$

$S = \{\{a\}, \{b\}, \{c\}\}$

$T = \{\{a,b\}, \{a,c\}, \{b,c\}\}$

$U = \{\{a,b,c\}\}$

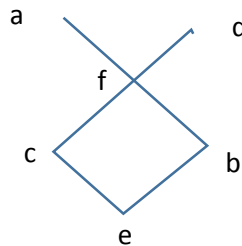
- i) **Chains** → 1)  $\{\{x, \emptyset\} \mid x \in R\}$  Example –  $\{\emptyset, \{a\}\}$   
 2)  $\{\{x, y\} \mid x \in S, y \in U\}$  Example –  $\{\{a\}, \{a,b,c\}\}$   
 3)  $\{\{x, y\} \mid x \in T, y \in U\}$  Example –  $\{\{a,b\}, \{a,b,c\}\}$   
 4)  $\{x, y\} \mid x \in S, y \in T \text{ \& } x \subset y\}$  Example –  $\{\{a\}, \{a,b\}\}$   
 5)  $\{\{x, y, z\} \mid x \in S, z \in U, y \in T \text{ \& } x \subset y\}$  Example –  $\{\{a\}, \{a,b\}, \{a,b,c\}\}$

- Antichains** → 1)  $\{\{x, y\} \mid x, y \in S \text{ \& } x \neq y\}$  Example –  $\{\{a\}, \{b\}\}$   
 2)  $\{\{x, y\} \mid x, y \in T \text{ \& } x \neq y\}$  Example –  $\{\{a,b\}, \{b,c\}\}$   
 3)  $\{\{x, y\} \mid x \in S, y \in T \text{ \& } x \not\subset y\}$  Example –  $\{\{a\}, \{b,c\}\}$

- ii) **Chains** →  $\{d, a\}, \{d, b\}, \{d, c\}, \{e, a\}, \{e, b\}, \{e, c\}, \{f, a\}, \{f, b\}, \{f, c\}, \{g, a\}, \{g, b\}, \{g, c\}, \{h, a\}, \{h, b\}, \{h, c\}, \{g, h, a\}, \{g, h, b\}, \{g, h, c\}, \{d, g, h, a\}, \{d, g, h, b\}, \{d, g, h, c\}, \{e, g, h, a\}, \{e, g, h, b\}, \{e, g, h, c\}, \{f, g, h, a\}, \{f, g, h, b\}, \{f, g, h, c\}, \{d, h, a\}, \{d, h, b\}, \{d, h, c\}, \{g, d, a\}, \{g, d, b\}, \{g, d, c\}, \{e, h, a\}, \{e, h, b\}, \{e, h, c\}, \{g, e, a\}, \{g, e, b\}, \{g, e, c\}, \{f, h, a\}, \{f, h, b\}, \{f, h, c\}, \{g, f, a\}, \{g, f, b\}, \{g, f, c\}$

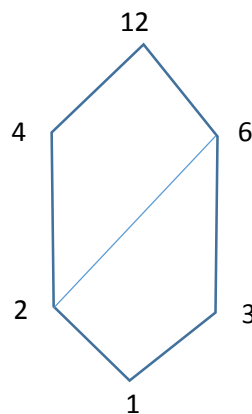
**Antichains** –  $\{d, e\}, \{d, f\}, \{e, f\}, \{a, b\}, \{b, c\}, \{a, c\}$

Q2.



- a) Minimal =  $\{e\}$   
 Maximal =  $\{a, b\}$   
 b) Maximum =  $\{\}$   
 Minimum =  $\{e\}$   
 c) Uncomparable =  $\{a, d\}, \{c, b\}$

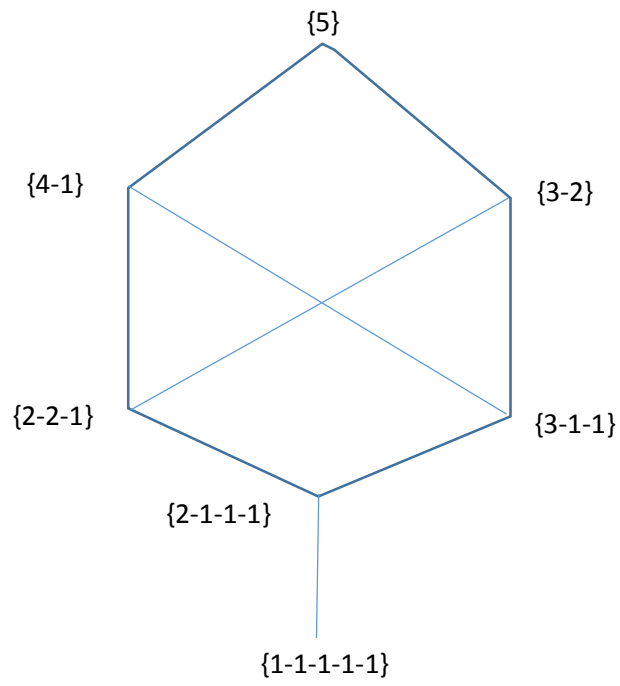
Q3.



**Covering Relation** =  $\{(1,2), (1,3), (2,4), (2,6), (3,6), (4,12), (6,12)\}$

Q4.

$m = 5$



Continue...

