

# Discrete Structure.

## Assignment #1

Q1(a)

1. There are exactly four red books.

Ans:-  $\exists a \exists b \exists c \exists d \text{ red}(a) \wedge \text{book}(a) \wedge \text{red}(b) \wedge \text{book}(b) \wedge \text{red}(c) \wedge \text{book}(c) \wedge \text{red}(d) \wedge \text{book}(d)$   
 $\wedge \neg a=b \wedge \neg a=c \wedge \neg a=d \wedge \neg b=c \wedge \neg b=d \wedge \neg c=d \wedge \forall z (\text{red}(z) \wedge \text{book}(z)) \rightarrow (a=z \vee b=z \vee c=z \vee d=z)$

2. There are at least four red books.

Ans:-  $\exists a \exists b \exists c \exists d \text{ red}(a) \wedge \text{book}(a) \wedge \text{red}(b) \wedge \text{book}(b) \wedge \text{red}(c) \wedge \text{book}(c) \wedge \text{red}(d) \wedge \text{book}(d) \wedge \neg a=b \wedge \neg a=c \wedge \neg a=d \wedge \neg b=c \wedge \neg b=d \wedge \neg c=d$

3. There are at most four red books.

$\exists a \exists b \exists c \exists d \text{ red}(a) \wedge \text{book}(a) \wedge \text{red}(b) \wedge \text{book}(b) \wedge \text{red}(c) \wedge \text{book}(c) \wedge \text{red}(d) \wedge \text{book}(d) \wedge \forall z \text{ red}(z) \wedge \text{book}(z) \rightarrow a=z \vee b=z \vee c=z \vee d=z$

## Question 1(b)

$$(1) - (A \wedge B) \vee D \Rightarrow C$$

$$C = ?$$

$$(2) - B \wedge K$$

$$(3) - A \vee N$$

$$(4) - \neg N$$

Applying And Elimination on eq (2) B is true in — eq (5) K is true in — eq — (6)

Applying Unit Resolution on (3) and (4)

A is true — eq (7)

Applying Modus on eq (5), (7) and (1)  
C is true Ans

$$(1) - (A \vee B) \wedge (C \vee D) \Rightarrow F$$

$$F = ?$$

$$(2) - A \wedge K$$

$$(3) - \neg K$$

$$(4) - C \wedge T$$

Sol:-

From eq (2) and eq (3) we cannot say whether A is true or not. So, we cannot conclude whether F is true or not because, System is incomplete or not we can't define.



## Question No #2

a) Show steps of bubble sort to sort this array.  
2, 3, 1, 6, 0.

Sol:-

2	3	1	6	0
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2  $\nless$  3 No swap } step 1

2	3	1	6	0
---	---	---	---	---

2  $>$  1 Swap } step 2

2	1	3	6	0
---	---	---	---	---

3  $\nless$  6 No swap

2	1	3	6	0
---	---	---	---	---

6  $>$  0 Swap

2	1	3	0	6
---	---	---	---	---

2  $>$  1 Swap

1	2	3	0	6
---	---	---	---	---

2  $\nless$  3 No swap

1	2	3	0	6
---	---	---	---	---

3  $>$  0 Swap

1	2	0	3	6
---	---	---	---	---

3  $\nless$  6 No swap

1	2	0	3	6
---	---	---	---	---

1 ~~3~~ No swap

1	2	0	3	6
---	---	---	---	---

2 > 0 Swap

1	0	2	3	6
---	---	---	---	---

2 ~~3~~ No swap

1	0	2	3	6
---	---	---	---	---

2 ~~6~~ No swap

1	0	2	3	6
---	---	---	---	---

1 > 0 Swap

0	1	2	3	6
---	---	---	---	---

1 ~~2~~ No swap

2 ~~3~~ No swap

3 ~~6~~ No swap

0	1	2	3	6
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