

**Question 1:**

a)  $F = \{A \rightarrow B, B \rightarrow C, B \rightarrow D, C \rightarrow A\}$

Given  $A \rightarrow B, B \rightarrow C$

$A \rightarrow B \ \& \ B \rightarrow C$

$A \rightarrow C$  (transitive)

Given  $A \rightarrow B, B \rightarrow D$

$A \rightarrow B \ \& \ B \rightarrow D$

$A \rightarrow D$  (transitive)

Given  $B \rightarrow C, C \rightarrow A$

$B \rightarrow C \ \& \ C \rightarrow A$

$B \rightarrow A$  (transitive)

Given  $C \rightarrow A, A \rightarrow B$

$C \rightarrow A \ \& \ A \rightarrow B$

$C \rightarrow B$  (transitive)

b)  $G = \{A \rightarrow B, A \rightarrow D, BD \rightarrow C\}$

Given  $A \rightarrow B, A \rightarrow D$

$A \rightarrow AB, AB \rightarrow BD$  (augmentation)

$A \rightarrow BD$  (transitivity)

$A \rightarrow C$  (transitivity)