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20P-0070

BSCS (B)

(DISCRETE STRUCTURES)

ASSIGNMENT # 01

Q1

- (a) A say "C is the knave", B say "A is the knight", C says "I am spy".
- (b) A say "I am knight", B say "I am the knave", and C say "B is knight".
- (c) A says "I am the knight", B says "I am the knave", and C say "I am the knave".
- (d) A say "I am the knight", B says "A is ~~the~~ telling the truth", and C says "I am the spy".

Solution know The solution is:-

A = "C is the knave."

B = "A is the knight."

C = "I am spy."



Lets:-

$P_1 = A$  is a knight.

$P_2 = A$  is a knave.

$P_3 = A$  is a spy.

$q_1 = B$  is a knight.

$q_2 = B$  is a ~~spy~~ knave.

$q_3 = B$  is a ~~knave~~ spy.

$r_1 = C$  is a knight

$r_2 = C$  is a knave

$r_3 = C$  is a spy.

# Equations

P=03

$$A = \gamma_2$$

$$B = P_1$$

$$C = \gamma_3$$

Cases :-

- 1- knight, knight, 1 knight.
- 2- knight, knight, knave. ✓
- 3- knight, knight, spy.
- 4- knight, knave, knight. ✓

5- ~~knave~~, ~~knave~~

6- knight, spy, spy.

7- knave, knight, knight. ✓

Not possible They are two knight and  
One knave.

8- spy, spy, spy.



## Case #02 :-

$\begin{matrix} F & F & T \\ \text{knight} & , & \text{knight} & , & \text{knave} \\ A & B & C \end{matrix}$

$$1) \gamma_2 = F$$

$$P_1 = T$$

$$q_1 = T, \gamma_1 = F$$

$$2) P_1 = F$$

$$P_2 = F$$

$$q_2 = F, \gamma_2 = T$$

$$P_3 = F$$

$$q_3 = F, \gamma_3 = F$$

$$3) \gamma_3 = T$$

$$T \neq F$$

$$T \neq F$$

$$F \neq F$$

The case 2 was does not hold.

## Case #04 :-

$\begin{matrix} A & B & C \\ \text{knight} & , & \text{knave} & , & \text{knight} \end{matrix}$

$$\gamma_2 = F$$

$$P_1 = T$$

$$q_1 = F$$

$$\gamma_1 = T$$

$$P_1 = T$$

$$P_2 = F$$

$$q_2 = T$$

$$\gamma_2 = F$$

$$\gamma_3 = F$$

$$P_3 = F$$

$$q_3 = F$$

$$\gamma_3 = F$$

$$F = F$$

$$T = T$$

$$F = F$$

know case is hold. So:-

A is knight, B is a knave and C is knight.

## Case #10

P = 05

A                      B                      C  
knave , knight , knight

$x_2 = T$	$F \neq T$	$P_1 = F$	$q_1 = T$	$x_1 = T$
$P_1 = F$	$F = F$	$P_2 = T$	$q_2 = F$	$x_2 = F$
$x_3 = F$	$F = F$	$P_3 = F$	$q_3 = F$	$x_3 = F$

So The case was done, not hold.

B:- A say "I am The knight", B say "I am The knave", and C say "B is knight".

know:-

A = I am The knight.

B = I am The knave.

C = B is The knight.

$P_1 = A$  is The knight.

$P_2 = A$  is The knave.

$P_3 = A$  is The spy.

$q_1 = B$  is The knight.

$q_2 = B$  is The knave.

$q_3 = B$  is The spy.

$x_1 = C$  is The knight.

$x_2 = C$  is The knave.

$x_3 = C$  is The spy.



Know Equations:-

P# = 06

$$A = P_1$$

$$B = Q_2$$

$$C = Q_1$$

Case 02 :-

A B C  
knight, knight, knave.

$$P_1 = F$$

$$Q_2 = F$$

$$Q_1 = T$$

$$A = T$$

$$B = F$$

$$C = F$$

$$Q_1 = T$$

$$Q_2 = F$$

$$Q_3 = F$$

$$P_1 = F$$

$$P_2 = T$$

$$P_3 = F$$

$$T \neq F$$

$$F = F$$

$$T = T$$

The case was does not hold.

Case 04 :-

knight, knave, knight.

$$P_1 = F$$

$$Q_2 = T$$

$$Q_1 = F$$

$$P_1 = T$$

$$P_2 = F$$

$$P_3 = T$$

$$Q_1 = F$$

$$Q_2 = T$$

$$Q_3 = F$$

$$P_1 = T$$

$$P_2 = F$$

$$P_3 = F$$

$$T \neq F$$

$$T = T$$

$$F = F$$

Case 10 :-

knave, knight, knight

$$P_1 = T$$

$$Q_2 = F$$

$$Q_1 = F$$

$$P_1 = F$$

$$P_2 = T$$

$$P_3 = F$$

$$Q_1 = T$$

$$Q_2 = F$$

$$Q_3 = F$$

$$P_1 = T$$

$$P_2 = F$$

$$P_3 = F$$

$$F \neq T$$

$$F = F$$

$$F \neq F$$

The case was does not hold.

C

P#07

A say "I am The knave", B say "I am The knave",  
and C say "I am The knave".

A = I am The knave.

B = I am The knave.

$P_1 = A$  is a knight.

$P_2 = A$  is a knave.

$P_3 = A$  is a spy.

$Q_1 = B$  is a knight.

$Q_2 = B$  is a knave.

$Q_3 = B$  is a spy.

$r_1 = C$  is a knight.

$r_2 = C$  is a knave.

$r_3 = C$  is a spy.

Known Equations:-

$$A = P_2$$

$$B = Q_2$$

$$C = r_2$$



Case 02:

P = 08

knight, knight, knave

$$P_2 = F$$

$$P_1 = T$$

$$Q_1 = T$$

$$Y_1 = F$$

$$Q_2 = F$$

$$P_2 = F$$

$$Q_2 = F$$

$$Y_2 = T$$

$$Y_2 = T$$

$$P_3 = F$$

$$Q_3 = F$$

$$Y_3 = F$$

The case was hold.

Case 04 :-

$$P_2 = F$$

knight, knave, knight

$$Q_2 = T$$

$$Y_2 = F$$

$$P_1 = T$$

$$Q_1 = F$$

$$Y_1 = T$$

$$P_2 = F$$

$$Q_2 = T$$

$$Y_2 = F$$

$$P_3 = F$$

$$Q_3 = F$$

$$Y_3 = F$$

$$F = F$$

$$T = T$$

$$F = F$$

The case was hold.

Case 10 :-

knave, knight, knight

$$P_2 = T$$

$$Q_2 = F$$

$$Y_2 = F$$

$$T = T$$

$$F = F$$

The case was hold.

$$P_1 = F$$

$$Q_1 = T$$

$$Y_1 = T$$

$$P_2 = T$$

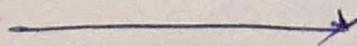
$$Q_2 = F$$

$$Y_2 = F$$

$$P_3 = F$$

$$Q_3 = F$$

$$Y_3 = F$$



## CONCLUSION:

P = 09

So in all cases hold there is contradiction  
~~we~~ we can not say exactly whether  
who is knight and who is knave.

D:

A say "I am the knight", B say "A is telling  
the truth". and C says "I am the  
spy".

A = I am the knight.

B = A is telling truth (knave).

C = I am the spy.

$P_1$  = A is a knight.

$P_2$  = A is a knave.

$P_3$  = A is a spy.

$q_1$  = B is a knight.

$q_2$  = B is a knave.

$q_3$  = B is a spy.

$r_1$  = C is a knight.

$r_2$  = C is a knave.

$r_3$  = C is a spy.



Case 02 :-

knight, knight, knave

P=10

$$P_1 = F$$

$$P_2 = F$$

$$P_3 = T$$

$$P_1 = T$$

$$P_2 = F$$

$$P_3 = F$$

$$Q_1 = T$$

$$Q_2 = F$$

$$Q_3 = F$$

$$r_1 = F$$

$$r_2 = T$$

$$r_3 = F$$

$$T \neq F$$

$$F = F$$

$F = T$  The Case was does not hold

Case 02

Knave, knight, knight  
 $\swarrow$  T F F

$$P_1 = F$$

$$P_2 = T$$

$$r_3 = F$$

$$P_1 = T$$

$$P_2 = F$$

$$P_3 = F$$

$$Q_1 = F$$

$$Q_2 = T$$

$$Q_3 = F$$

$$r_1 = T$$

$$r_2 = F$$

$$r_3 = F$$

$$T \neq F$$

$$F \neq T$$

$$F = F$$

The Case was does not hold.

Case 10 :-

knave, knight, knight.

$$P_1 = T$$

$$P_2 = F$$

$$r_3 = F$$

$$P_1 = F$$

$$P_2 = T$$

$$P_3 = F$$

$$Q_1 = T$$

$$Q_2 = F$$

$$Q_3 = F$$

$$r_1 = T$$

$$r_2 = F$$

$$r_3 = F$$

$$F \neq T$$

$$T = F$$

$$F = F$$

The case does not hold.