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MS Computer Science
CSE 5400 Functional Programming

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Assignment

1.

Let P: It rains today Q: I will drive to work

Given: $P \rightarrow Q$

i. *Converse*: If I will drive to work, then it rains today [$Q \rightarrow P$]

ii. *Contrapositive*: If I will not drive to work, then it does not rain today [$\sim Q \rightarrow P$]

iii. *Inverse*: If it does not rain today, then I will not drive to work [$\sim P \rightarrow \sim Q$]

2.

Given X = { (000000), (100000), (110000), (111000), (111100), (111110),
(111111), (011111), (001111), (000111), (000011), (000001) }

The sequence follows as:

$(0)\ (2^5)\ (2^5+2^4)\ (2^5+2^4+2^3)\ (2^5+2^4+2^3+2^2)\ (2^5+2^4+2^3+2^2+2^1)$

$(2^6-1)\ (2^6-2^5-1)\ (2^6-2^5-2^4-1)\ (2^6-2^5-2^4-2^3-1)\ (2^6-2^5-2^4-2^3-2^2-1)$

$(2^6-2^5-2^4-2^3-2^2-2^1-1)$

The propositional formula is given by:

$[\ (A \rightarrow B) \wedge (B \rightarrow C) \wedge (C \rightarrow D) \wedge (D \rightarrow E)\ ]$

$\vee\ [\ (E \rightarrow D) \wedge (D \rightarrow C) \wedge (C \rightarrow B) \wedge (B \rightarrow A)\ ]$

Reference: *http://math.stackexchange.com/questions/1792438/propositional-formula-to-represent-set-of-binary-strings*

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3.

(i) $m < n$

M = {0, 1, 2, 3} N = {1, 3, 4}	**P(m, n) *P***	**M = {0, 1, 4} N = {0, 1, 2, 3}**	**P(m, n) *Q***	**P → Q**
(0,1)	T	(0,0)	F	F
(0,3)	T	(0,1)	T	T
(0,4)	T	(0,2)	T	T
(1,1)	F	(0,3)	T	T
(1,3)	T	(1,0)	F	F
(1,4)	T	(1,1)	F	F
(2,1)	F	(1,2)	T	T
(2,3)	T	(1,3)	T	T
(2,4)	T	(4,0)	F	F
(3,1)	F	(4,1)	F	T
(3,3)	F	(4,2)	F	T
(3,4)	T	(4,3)	F	F

(ii) $m \mid n$

M = {0, 1, 2, 3} N = {1, 3, 4}	**P(m, n) *P***	**M = {0, 1, 4} N = {0, 1, 2, 3}**	**P(m, n) *Q***	**P → Q**
(0,1)	T	(0,0)	T	T
(0,3)	T	(0,1)	T	T
(0,4)	T	(0,2)	T	T
(1,1)	T	(0,3)	T	T
(1,3)	F	(1,0)	F	T
(1,4)	F	(1,1)	T	T
(2,1)	T	(1,2)	F	F
(2,3)	F	(1,3)	F	T
(2,4)	F	(4,0)	F	T
(3,1)	T	(4,1)	T	T
(3,3)	T	(4,2)	T	T
(3,4)	F	(4,3)	F	T

4.

(a) Some freshmen are math majors. I, V, VI, VIII, X

(b) Every math major is a freshman. II, IV, V, VI, IX

(c) No math major is a freshman. I, II, III, VI, VIII, IX,

5.

The Logic Daemon responds...

Sequent attempted:

```
~S->~R,P,W,A,T|-W
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OK    1       (1)    ~S->~R          A
OK    2       (2)    P               A
OK    3       (3)    W               A
```

 Congratulations. Your proof is correct.

We found some superfluous lines in the submitted proof. You could have omitted lines 1, 2

[Restart] [Example] [Mail Proof]

LOGIC DAEMON

[Credits]