\documentclass[10pt]{article}

% math fonts

\usepackage{amsmath,amsfonts,amsthm,amssymb}

% to insert graphics

\usepackage{graphicx}

% to change margins of the pages

\usepackage[margin=0.9in]{geometry}

% Makes equations flush left

\usepackage{fleqn}

% This generates a page header with your name in it.

\usepackage{fancyhdr}

\pagestyle{fancy}

\fancyhf{}

\lhead{FOCS Fall 2018}

\rhead{HW01 solution by Sriyuth Sagi}

\rfoot{Page \thepage}

\begin{document}

{\bf Rosen 1.1, Exercise 8(d,f):} \\

\framebox{

8(d) answer: I bought a lottery ticket this week and I won the million dollar jackpot.

}

\framebox{

8(f) answer: If I had not bought a lottery ticket this week, then I would not have won the million dollar jackpot.

}

\vspace\*{1cm}

\noindent

Student's work goes here\\

\\

p : I bought a lottery ticket this week.\\

q : I won the million dollar jackpot.\\

8(d): p $\wedge$ q\\

I bought a lottery ticket this week $\wedge$ I won the million dollar jackpot\\

$\wedge$ = and\\

I bought a lottery ticket this week and I won the million dollar jackpot.\\

\\

8(f): $\lnot p \rightarrow \lnot q$\\

$\lnot$ I bought a lottery ticket this week $\rightarrow \lnot$ I won the million dollar jackpot\\

I did not buy a lottery ticket this week $\rightarrow$ I did not win the million dollar jackpot\\

If I had not bought a lottery ticket this week, then I would not have won the million dollar jackpot.\\

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\noindent

{\bf Rosen 1.1, Exercise 22(e):} \\

\framebox{

If you can access the website, then you pay a subscription fee.

}

\vspace\*{1cm}

\noindent

Student's work goes here\\

\\

p: You can access the website\\

q: you pay a subscription fee\\

\\

You can access the website only if you pay a subscription fee.\\

p $\rightarrow$ q

\\

If you can access the website, then you pay a subscription fee.\\

\newpage

\noindent

{\bf Rosen 1.1, Exercise 28(b):} \\

\framebox{

Converse ($q \rightarrow p$): If I go to the beach, then it is a sunny summer day.

}

\framebox{

Contrapositive ($\lnot q \rightarrow \lnot p$): If I do not go to the beach, then it is not a sunny summer day.

}

\framebox{

Inverse ($\lnot p \rightarrow \lnot q$): If it is not a sunny summer day, then I do not go to the beach.

}

\vspace\*{1cm}

\noindent

Student's work goes here\\

\\

I go to the beach whenever it is a sunny summer day.\\

q whenever p\\ \\

\\

p $\rightarrow$ q: If it a sunny summer day, then I go to the beatch

\newpage

\noindent

{\bf Rosen 1.1, Exercise 36(e):} \\

\framebox{

\begin{tabular}{c | c | c | c | c | c}

p & q & r & $\lnot r$ & $(p \vee q)$ & $(p \vee q) \wedge \lnot r$\\

\hline\hline

T & T & T & F & T & F\\

\hline

T & T & F & T & T & T\\

\hline

T & F & T & F & T & F\\

\hline

T & F & F & T & T & T\\

\hline

F & T & T & F & T & F\\

\hline

F & T & F & T & T & T\\

\hline

F & F & T & F & F & F\\

\hline

F & F & F & T & F & F\\

\end{tabular}

}

\vspace\*{1cm}

\noindent

Student's work goes here\\

\newpage

\noindent

{\bf Rosen 1.1, Exercise 42(d):} \\

\framebox{

x = 1

}

\vspace\*{1cm}

\noindent

Student's work goes here\\ \\ \\

if(x+1=2)XOR(x+2=3)thenx:=x+1 \\

p: x+1=2 \\

q: x+2=3 \\ \\

for x = 1: \\

p = T \\

q = T \\

p $\otimes$ q = F \\ \\

x remains unchanged so x = 1

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\noindent

{\bf Rosen 1.2, Exercise 6:} \\

\framebox{

$u \rightarrow (b\_{32} \wedge g\_1 \wedge r\_1 \wedge h\_{16}) \vee (b\_{64} \wedge g\_2 \wedge r\_2 \wedge h\_{32})$

}

\vspace\*{1cm}

\noindent

Student's work goes here\\

Part 1:\\

\underline{You can upgrade your operating system} only if you \\

u $\rightarrow$ \\ \\

Part 2:\\

have a \underline{32-bit processor} running at \underline{1 GHz or faster}, at least \underline{1 GB RAM}, and \underline{16 GB free hard disk space}, \\

$b\_{32} \wedge g\_1 \wedge r\_1 \wedge h\_{16}$ \\ \\

Part 3:\\

or a\\

$\vee$ \\ \\

Part 4:\\

\underline{64- bit processor} running at \underline{2 GHz or faster}, at least \underline{2 GB RAM}, and at least \underline{32 GB free hard disk space}.\\

$b\_{64} \wedge g\_2 \wedge r\_2 \wedge h\_{32}$ \\

\\

\\

\\

$u \rightarrow (b\_{32} \wedge g\_1 \wedge r\_1 \wedge h\_{16}) \vee (b\_{64} \wedge g\_2 \wedge r\_2 \wedge h\_{32})$\\

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\noindent

{\bf Rosen 1.2, Exercise 18:} \\

\framebox{

Invite Jasmine and Kanti but do not invite Samir.

Invite Jasmine only.

Invite none of them

}

\vspace\*{1cm}

\noindent

Student's work goes here\\ \\

Jasmine: j\\

Kanti: k\\

Samir: s\\

\noindent

Jasmine will only attend when Samir is not there\\

$j \rightarrow \lnot s\\$

Samir will only attend if Kanti is there\\

$\lnot k \rightarrow \lnot s\\$

Kanti will not attend without Jasmine\\

$\lnot j \rightarrow \lnot k\\$

\\

\\

Samir will only attend if Kanti is there but Kanti will only attend if Jasmine is there and Jasmine will not attend with Samir so Samir cannot attend.\\

$s \rightarrow k \rightarrow j \rightarrow \lnot s$ \\

creates an impossible loop

\\

\\

Jasmine can attend as long as Samir does not so she can attend either alone or with Kanti.

\\

\\

Kanti can only attend with Jasmine so it leaves only two possibilities.

\\

\\

Two options are either Jasmine attending alone, or Jasmine and Kanti attending together, with the third being inviting none of them.

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\noindent

{\bf Rosen 1.2, Exercise 40(b):} \\

\framebox{

$\lnot((\lnot p \wedge q) \vee p)$: Will only return true if both p and q are false

}

\vspace\*{1cm}

\noindent

Student's work goes here\\

\\

Starting left to right\\

\\

Part 1:\\

$\lnot p$ \\ \\

Part 2:\\

$\lnot p \wedge q$ \\ \\

Part 3:\\

$(\lnot p \wedge q) \vee p$ \\ \\

Part 4:\\

$\lnot((\lnot p \wedge q) \vee p)$ \\ \\

\begin{tabular}{c | c | c | c | c | c}

p & q & $\lnot p$ & $\lnot p \wedge q$ & $(\lnot p \wedge q) \vee p$ & $\lnot((\lnot p \wedge q) \vee p)$\\

\hline\hline

T & T & F & F & T & F\\

\hline

T & F & F & F & T & F\\

\hline

F & T & T & T & T & F\\

\hline

F & F & T & F & F & T\\

\end{tabular}

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\noindent

{\bf EXTRA CREDIT: Rosen 1.2, Exercise 36(a):} \\

\framebox{

John did it.

}

\vspace\*{1cm}

\noindent

Student's work goes here\\ \\

Alice: a\\

John: j\\

Carlos: c\\

Diana: d\\

\\

\\

Alice said Carlos did it: c\\

John said he did not do it: $\lnot$ j\\

Carlos said Diana did it: d\\

Diana said she did not do it: $\lnot$ d\\

\\

\\

The first section is the statements by the 4 people while the second is whether that person did it or not with the default being false and the third is if there is only one suspect\\

\begin{tabular}{c | c | c | c || c | c | c | c || c}

c & $\lnot j$ & d & $\lnot d$ & a & j & c & d & $a \otimes j \otimes c \otimes d$\\

\hline\hline

T & F & F & F & F & T & T & - & F \\

\hline

F & T & F & F & F & F & F & - & F \\

\hline

F & F & T & F & F & T & F & T & F \\

\hline

F & F & F & T & F & T & F & F & T \\

\end{tabular}\\

\\

\\

The first and second rows have issues with both Carlos and Diana lying and result in a contradiction for Diana which means that such situations are impossible and these two rows can therefore be eliminated.\\

\\

The third row returns that both John and Diana were responsible and while this is possible, for the sake of this problem being under the assumption that there is only one person guilty, it can be eliminated.\\

\\

Only the fourth row provides a single suspect so we can assume that this is the correct situation which would make John the one who did it.\\

\end{document}