PRINCE SULTAN UNIVERSITY

MATH 101 FINITE MATHS

FINAL EXAM 5TH JANUARY 2013

Time Allowed: 2 hours 15 mins

Name: _____

I.D.: _____

1. Answer all questions.
2. This exam consists of 6 pages including this cover sheet.
3. There are 14 questions. CHECK YOU HAVE ALL THE QUESTIONS.
4. You can use a calculator, NOT a mobile phone.
5. Show all working out in the space provided. If you use the back of a page indicate this on the front.

Question No.	Max. Points	Points Scored
1,2,3	18	
4,5	20	
6,7,8,9	26	
10,11,12	16	
13,14	20	
TOTAL	100	
TOTAL	40	

1) [4 points] The supply S and demand D equations of a certain commodity are given as follows, where p is the price: $S = 2p + 5$ and $D = -kp + 23$
If it is known that the market price is \$3, find the value of k.

2) [8 points] A company that manufactures glass vases has found that it has fixed costs of \$1500 per day and it can produce vases at \$20 per piece. It has also found that it can sell each vase for \$40.

a) Find the cost C, revenue R and profit P , functions.

b) Draw the cost revenue and profit function of the same axes. Find the break-even point.

c) If the company makes 60 vases a day is it making a profit or a loss?

3) [6 points] Given that $A = \begin{bmatrix} 3 & 1 & 2 \\ 1 & 0 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 2 \end{bmatrix}$

Show that: $\text{Transpose}(AB) = \text{Transpose}(B) \times \text{Transpose}(A)$

4) [10 points] A company produces two types of steel. Type 1 requires 2 hours of melting, 4 hours of cutting and 10 hours of rolling per ton. Type 2 requires 5 hours of melting, 1 hour of cutting and 5 hours of rolling per ton. Forty hours are available for melting, 20 for cutting and 60 for rolling. Each ton of Type 1 produces $240 profit, and each ton of Type 2 yields $80 profit. **Use a graph of inequalities** to find the maximum profit and the numbers of tons of each type that will produce this profit.

5) [10 points] Maximize $P = 5x_1 + 2x_2$ subject to the constraints

$$x_1 + x_2 \geq 11$$
$$2x_1 + 3x_2 \geq 24$$
$$x_1 + 3x_2 \leq 18$$
$$x_1 \geq 0 \qquad x_2 \geq 0$$

6) [10 points] Of the cars sold in the month of July , 90 had heated seats, 100 had GPS, and 75 had satellite radio. Five cars had all three of these extras. Twenty had none of these extras. Twenty cars had only heated seats. 60 cars had only GPS, and 30 cars had only satellite radio. Ten cars had both GPS and satellite radio. How many cars:

a) Had both satellite radio and heated seats?

b) Had both GPS and heated seats?

c) Had neither satellite radio nor GPS?

d) Were sold in July?

e) Had GPS or heated seats or both?

7) [4 points] How many 4-digit numbers greater than 6000 can be formed with the digits 1, 3, 6 and 8 if no digit is repeated? Write down all the numbers in increasing order.

8) [6 points] From 4 men and 20 women a committee of 4 is to be formed. The committee must include at least 1 woman. In how many ways can this be done?

9) [6 points] In the experiment of tossing two fair dice, find the probability of each of the following events:

a) The sum of the faces is 4

b) The sum of the faces is 9

c) The sum of the faces is 4 or 9.

10) [6 points] In a survey of the number of cars owned by families, the following probability table was constructed.

No. of cars	*0*	*1*	*2*	*3*	*4 or more*
Probability	*0.02*	*0.35*	*0.31*	*0.18*	*0.14*

Find the probability of a family having:

a) not exactly 2 cars

b) 3 or less cars

c) more than 1 car

11) [4 points] If $U = \{a,b,c,d,e,f,g,h\}$ and $A = \{a,c,d,f\}$, $B = \{b,c,e,f,g\}$ and $C = \{a,d,e,g\}$, find $\left[\overline{\left(A \cap \overline{B}\right) \cup \left(\overline{C} \cap A\right)}\right]$

12) [6 points] A box contains 20 bulbs, of which 6 are defective. All bulbs look alike and have an equal probability of being chosen. Five bulbs are selected at random.

a) What is the probability that all 5 are defective?

b) What is the probability that exactly 2 are defective?

c) What is the probability that at most 2 are defective?

13) [12 points] The following table summarizes the result of a survey conducted by a drinks company to determine customers' preferences:

	Do not drink cola N	***Prefer diet cola D***	***Prefer regular cola R***	***Total***
Male, M	243	424	286	953
Female, F	423	201	441	1065
Total	666	625	727	2018

A respondent is selected at random. Find the probability that the respondent:

a) is male

b) does not drink cola

c) is a female who prefers regular cola

d) is a female, given the respondent prefers diet cola

e) does not drink cola, given the respondent is male

f) is a female, given that the respondent does not drink cola or prefers diet cola

14) [8 points] Suppose E and F are events of a sample space for which

$P(E)=0.4$ $P(F)=0.7$ $P(E \cap F)=0.3$

Find:

a) $P(E \cup F)$

b) $P(E|F)$

c) $P(F|E)$

d) $P(\overline{E}|\overline{F})$