Prince Sultan University

Department of Mathematical Sciences

Major II Exam

Semester I, 2014B FALL (141)

8th December, 2014

MATH 101 – Finite Mathematics

Time Allowed : 90 minutes
Maximum Points: 80 points

Name of the student : _____

ID number : _____

Section : 222 and 223
Dr. Kamal Mr. Khaled

Important Instructions:

1. You may use a scientific calculator that does not have programming or Financial capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. This examination has 14 problems, some with several parts and a total of 6 pages. Make sure your paper has all these problems.

Question	Your Score	Maximum score
Q.1 , Q.2		16
Q.3 , Q.4 , Q.5 , Q.6		21
Q.7 , Q.8 , Q.9 , Q.10 , Q.11		22
Q.12		8
Q.13 , Q.14		13
Total		**80**

Q.1 (12 points) **Circle the correct answer.**

1) Five non-permanent seats in the UN Security Council are to be selected from among 15 countries. How many such sets of 5 nations are possible?
(a) $3,003$ (b) 75 (c) $759,375$ (d) $360,360$

2) Find the proceeds for a discounted loan of $45000\ \text{SR}$ repaid in 20 months at 8%.
(a) $41000\ \text{SR}$ (b) $39000\ \text{SR}$ (c) $51000\ \text{SR}$ (d) $117000\ \text{SR}$

3) In how many ways can eight people be arranged in a row for a group picture
(a) C(8, 8) (b) 40,320 (c) 640 (d) 64

4) The simple interest due on a $2000 loan at 15% at the end of 18 months is:
(a) $550 (b) $500 (c) $400 (d) $450

5) The effective rate for an account that pays 9% interest compounded monthly is?
(a) 8.16% (b) 12.25% (c) 9.78% (d) 9.38%

6) If $n(A)=20$, $n(B)=30$, $n(A\bigcup B)=45$, and $n(\overline{A}\bigcap\overline{B})=10$, then $n(U)=$
(a) 55 (b) 50 (c) 60 (d) 95

7) The solution of the standard minimum problem that has been solved by the ***Duality Principle*** and has the following final tableau is:

$$\begin{array}{c|cccccc|c} P & y_1 & y_2 & y_3 & s_1 & s_2 & RHS \\ \hline 0 & 1 & 1 & 1 & 1 & 0 & 4 \\ 0 & -1 & 1 & 0 & -1 & 1 & 5 \\ \hline 1 & 4 & 1 & 0 & 8 & 0 & 30 \end{array}$$

(a) $C_{\min.}=-30$, $x_1=8$, $x_2=0$ (b) $C_{\min.}=30$, $x_1=8$, $x_2=1$

(c) $C_{\min.}=30$, $x_1=8$, $x_2=0$ (d) $C_{\min.}=30$, $x_1=4$, $x_2=5$

8) 12 people at a party shake hands once with everyone else in the room. How many shake hands took place?
(a) 66 (b) 132 (c) 144 (d) 24

Q.2 (4 points) How much should you invest now at 7% to have $\$8,000$ toward the purchase of a car in 5 years if the interest is compounded monthly?

Q.3 (6 points) Consider the universal set *U*, and the sets *A*, *B*, and C given by
$U=\{1,3,4,5,10,11,13\}$, $A=\{1,10,11\}$, $B=\{3,4,10\}$, and $C=\{3,11\}$

Find a) $(A\cup B)\cap C$

b) $\overline{B}\cap A$

c) $\overline{A}\cup\overline{B}$

Q.4 (5 points) A committee of 5 is to be formed from a group of 8 Finance students and 3 Accounting students. In how many ways can this be done if the committee must have **at least** 3 Finance students?

Q.5 (5 points) A **5-character** username is to be chosen from among the letters(a ,b ,c , and d) and from among the digits(1 ,2 ,3 ,4 ,5 and 6). How many different usernames can be formed if:

(a) you can use any letter or digit. (Repeating characters is **allowed)**.

(b) the username must start with a letter or must start with a digit. You cannot choose two letters next to each other or two digits next to each other. (Repeating characters is **not allowed**)

Q.6 (5 points) (a) Find the coefficient of the term **containing** a^5 in the expression $(5a-2b)^9$.

(b) Find the value of $\binom{15}{0}+\binom{15}{1}+\binom{15}{2}+.....+\binom{15}{15}$

(c) How many different subsets with 4 letters each does the set $A=\{a,b,c,d,e,f,g\}$ have?

Q.7 (4 points) A company estimates that it will have to replace a piece of equipment at a cost of $\$800,000$ in 6 years. A fund is established by making equal monthly payments into an account paying 6.6% compounded monthly. How much should each payment be?

Q.8 (4 points) If the world population is now about 6.5 billion people and is growing at 1.14% compounded continuously, how long will it take the population to grow to 10 billion people? (Round up to the next higher year)

Q.9 (4 points) A small lock on a suitcase has 3 wheels, each labeled with one of the 10 digits 0 to 9. How many 3 digit arrangements are possible if no digit is repeated?

Q.10 (4 points) Ten cars (3 red, 5 blue, and 2 black) are to be parked in a line. How many different lines can be formed? Assume that cars of each color are identical.

Q.11 (6 points) A survey of 200 graduates revealed that 85 took Arabic, 90 took English, 60 took French, 43 took Arabic and English, 28 took Arabic and French, 23 took French and English, and 7 took all three Languages.

a) How many graduates took Arabic or English?

b) How many graduates took English but not French?

c) How many graduates took neither Arabic nor French?

Q.12 (8 points) Use the simplex method to minimize $C = -x_1 - 4x_2 - 2x_3$ subject to the constraints

$$x_2 + x_3 \le 4$$
$$x_1 - x_3 = 6$$
$$x_1 - x_2 - x_3 \ge 1$$
$$x_1 \ge 0 \text{ , } x_2 \ge 0 \text{ , and } x_3 \ge 0$$

(Write the complete solution at the end)

Q.13 (8 points) Use the simplex method to maximize $P = 3x_1 + 4x_2$ subject to the constraints:

$$2x_1 + 4x_2 \le 160$$
$$2x_1 + 2x_2 \le 80$$
$$x_1 \ge 0 \ , \ x_2 \ge 0$$

(Write the complete solution at the end)

Q.14 (5 points) Write the **Dual Problem** for the following linear programming problem

minimize $C = 2x + 3y$ subject to the constraints:

$$x + y \ge 10$$
$$4x + y \le 16$$
$$x \ge 0 \ , \ y \ge 0$$

(Don't Solve)