University of New Brunswick
Department of Mathematics and Statistics
Intersession 2008

Math 1833
Finite Mathematics for the Management Sciences

Name: _____

Student Number: _____

Time: 3 hours

Mark: _____/44 (max: 48/44)

Instructions:

- Show all your work in this booklet.
- Work neatly and in an organized manner.
- If you run out of space in a problem, use the space on the back of the page and clearly indicate where the solution continues.
- If you are using a formula in a problem, state it first.
- Good luck!

Formulas:

$$A = P(1+i)^{mt} \quad r_{eff} = (1+i)^m - 1 \quad S = R\left(\frac{(1+i)^n - 1}{i}\right) \quad P = R\left(\frac{1-(1+i)^{-n}}{i}\right)$$

Note: You must show your work in order to receive full marks. Do not detach any pages from this booklet. Use the back of the pages for extra space.

(6) 1. Set up, and solve, the following linear programming problem.

Gino Balduzzi, proprietor of Luigi's Pizza Palace, allocates \$9000 a month for advertising in two newpapers, the *City Tribune* and the *Daily News*. The *City Tribune* charges \$300/edition for a certain type of ad, while the *Daily News* charges \$100/edition for the same ad. Gino has stipulated that the ad is to appear in at least 15, but no more than 30 editions of the *Daily News* per month. The *City Tribune* has a daily circulation of 50,000, and the *Daily News* has a circulation of 20,000. Under these conditions, determine how many ads Gino should place in each newpaper in order to reach the largest number of readers.

(5) 2. Gloria Newburg operates three self-service gas stations in different parts of town. On a certain day, Station A sold 600 L of premium, 800 L of super, 1000 L of regular and 700 L of diesel; Station B sold 700 L of premium 600 L of super, 1200 L of regular and 400 L of diesel; station C sold 900 L of premium, 700 L of super, 1400 L of regular, and 800 L of diesel. The price for premium was \$1.46/L, for super \$1.43/L, for regular \$1.37/L, and for diesel \$1.56/L.

(a) Write a matrix to represent the sales at the stations.

(b) Write a column matrix to represent the price of the fuels.

(c) Use matrix algebra to calculate the total revenue at each station.

(d) What was Gloria Newburg's total revenue for the day?

(2) 3. John bought a war bond for $1000 in 1940. When the war was over in 1945 he cashed in the bond for $1350. What rate of simple interest did the bond pay?

(3) 4. Bank A pays interest at a rate of 5% per year compounded monthly. Bank B pays interest at a rate of 4.5% compounded daily. Which bank offers the better deal? Justify your answer.

(3) 5. Mark and Sue are getting married in one year. If they start saving now, how much do they have to save each month to have $5000 on their wedding day? The saving account pays 6% interest per year compounded monthly.

(5) 6. At age 22, Eric started making payments of $1000 per year into a savings account. Eric stopped making deposits at age 30. Sarah started her savings account at age 30 and deposits $1000 per year, and continued until retirement. If both accounts pay 10% interest compounded annually, who has more when they retire at age 65? Justify your answer.

(5) 7. In 2000, the Smiths bought a $200,000 house, paying a 5% downpayment and secured a 25-year mortgage for the remainder. The interest rate was 7% per year compounded monthly. What is their monthly mortgage payment?

(2) 8. Find the equation of the line through the point $(-1, 1)$ which is perpendicular to the line $2x - 4y = 5$. Write the equation in the slope-intercept format.

(7) 9. Natalya and Samantha want to set up a lemonade stand. The lemonade cost 10 cents per glass to make and they are planning to sell the lemonade for 25 cents per glass. The cost of making the stand and sign was \$10.

(a) Find the formulas for cost, revenue, and profit

(b) Calculate the break-even point

(c) Plot the cost and revenue functions, and indicate the regions of profit and loss, and plot the break-even point.

(6) 10. A time study was conducted by the production manager of Universal Instruments to determine how much time it took an assembly worker to complete a certain task. Results of the study indicated that 20% of the workers were able to complete the task in less than 3 minutes, 60% were able to complete the task in 4 minutes or less, and 10% of the workers required more than 5 minutes to complete the task. If an assembly worker is selected at random from this group, what is the probability that:

(a) He or she will be able to complete the task in 5 minutes or less?

(b) He or she will not be able to complete the task within 4 minutes?

(c) The time taken to complete the task will be between 3 and 4 minutes (inclusive)?

(4) 11. The 1992 U.S. Senate was composed of 57 Democrats and 43 Republicans. Of the Democrats, 38 served in the military, whereas 28 of the Republicans had seen military service. If a senator selected at random had served in the military, what is the probability that he was Republican?