CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	208/4		All except EC
Examination	**Date**	**Time**	**Pages**
Final	April 2017	3 Hours	3
Instructors			**Course Examiner**
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FORMULAE:

$$A = P(1+i)^n, \quad A = Pe^{rt}, \quad FV = PMT\frac{(1+i)^n - 1}{i}, \quad PV = PMT\frac{1-(1+i)^{-n}}{i}$$

Special Instructions:

- ▷ Answer all questions.
- ▷ **Only approved calculators are allowed.**

MARKS

[10] **1.** Suppose a company has fixed costs of \$28,000 and variable cost per unit of $\frac{2}{5}x + 222$ dollars, where x is the total number of units produced. Suppose further that the selling price of its product is $1250 - \frac{3}{5}x$ dollars per unit.

(A) Find the break-even points.

(B) Form the profit function from the cost and revenue functions and find the maximum profit.

(C) What price will maximize the profit?

[10] **2.** Solve for x in the following equations:

(A) $(49)^{2x} = (7)^{x^2-12}$

(B) $3\log_2(x-1) + \log_2 4 = 5$

(C) $\ln\left(\frac{x}{5}\right) + \ln 625 + 2\ln\sqrt{5} = 3\ln\sqrt[3]{7} + 4\ln 5$

(D) $\log_a x + \log_a(x+1) = \log_a(6)$

(E) $\frac{1}{4}\log_x 256 = 12$

[10] **3.** For $f(x) = 48x - 5$ and $g(x) = 5(2.4)^x$ find the following by only using a proper formula:

(A) $\sum_{k=0}^{69} f(k) = f(0) + f(1) + f(2) + \cdots + f(69)$.

(B) $\sum_{h=1}^{50} g(h) = g(1) + g(2) + g(3) + \cdots + g(50)$.

[10] **4.** Chuck Hickman bought a rare stamp for his collection. He agreed to pay a lump sum of \$4,000 after 4 years. Until then, he pays 6% simple interest semiannually.

(A) Find the amount of each semiannual interest payment.

(B) Chuck Hickman sets up a sinking fund so that enough money will be present to pay off the \$4,000. He wants to make annual payments into the fund. The account pays 8% compounded annually. Find the amount of each payment.

(C) Prepare a table showing the amount in the sinking fund after each deposit.

[10] **5.** On December 31, 1990, a house was purchased with the buyer taking out a 30 year, \$112,475 mortgage at 9% interest, compounded monthly. The mortgage payments are made at the end of each month.

(A) Calculate the amount of the monthly payment.

(B) How much interest will be paid during the month of January 2017?

(C) How much of the principal will be paid off during the year 2016?

(D) How much interest will be paid during the year 2016?

[10] **6.** The U-Drive Rent-a-Truck Company plans to spend 3 million dollars on 200 new vehicles. Each van will cost \$10,000, each small truck \$15,000, and each large truck \$25,000. Past experience shows that U-Drive needs twice as many vans as small trucks..

(A) Write the linear system of equations in terms of x, y and z; x, y and z being the number of vans, small trucks and large trucks respectively.

(B) How many of each kind of vehicle can the company buy?

[10] **7.** An economy is based on three sectors, shipping, agriculture, and mining. Production of a dollar's worth of shipping requires an input of \$0.50 from the shipping sector, \$0.20 from the agriculture sector and \$0.10 from mining sector. Production of a dollar's worth of agriculture requires an input of \$0.10 from the shipping sector, \$0.50 from the agriculture sector and \$0.30 from mining sector. Production of a dollar's worth of mining requires an input of \$0.10 from the shipping sector, \$0.30 from the agriculture sector and \$0.40 from mining sector.

(A) Write the technological matrix M for this economy.

(B) If a final demand of \$85 million for shipping, \$65 million for agriculture, and \$0 million for mining is to be met, then set up the equation to be satisfied by the inputs from the respective sectors.

(C) Solve the respective inputs satisfying these demands.

[10] **8.** Extremize $P(x, y) = 40x + 100y$ subject to

$$3x + 2y \leq 6,\ -4x + 8y \leq 16,\ 6x + 6y \geq 6,\ x \geq 0,\ y \geq 0.$$

[10] **9.** A child has a set of differently shaped plastic objects. There are 2 pyramids, 5 cubes, and 6 spheres.

(A) How many arrangements are possible if objects of the same shape must be grouped together and each object is a different color?

(B) In how many distinguishable ways can the objects be arranged in a row if objects of the same shape are also the same color, but need not be grouped together?

[10] **10.** A company needs to hire a new director of advertising. It has decided to try to hire either person A or person B, both of whom are assistant advertising directors for major competitors. To decide between A and B, the company does research on the campaigns managed by A or B (none are managed by both) and finds that A is in charge of twice as many advertising campaigns as B. Also, A's campaigns have yielded satisfactory results three out of four times, while B's campaigns have yielded satisfactory results only two out of five times. Suppose one of the competitors advertising campaigns is selected randomly.

(A) What is the probability that the selected campaign is satisfactory?

(B) Find the probability that either A runs the campaign or the results are satisfactory (or possibly both).