

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	208/2	All except EC	
Examination	Date	Time	Pages
Final	December 2014	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.**
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MARKS

- [10] 1. A firm producing poultry feed finds that the total cost $C(x)$ in dollars of producing and selling x units is given by

$$C(x) = 20x + 100.$$

Management plans to charge \$24 per unit for the feed.

- (A) How many units must be sold for the firm to break even?
- (B) For what values of x will a loss occur? A profit?
- (C) What is the profit if 100 units of feed are sold?
- (D) How many units must be sold to produce a profit of \$900?

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

(A) $9^{-x+15} = 27^x$

(B) $(e)^{-3x^2+15x-72} = (e)^{-x^2+35x-22}$

(C) $\log_7 \left(\frac{x}{5} \right) + \log_7 625 + 2 \log_7 \sqrt{5} = 3 \log_7 \sqrt[3]{7} + 4 \log_7 5$

(D) $\log_5(x + 6) + \log_5(x + 2) = 1$

(E) $\log_3 \sqrt{(x - 2)} = 2$

- [10] 3. For $f(x) = 180 - 30x$ and $g(x) = 5^{x-5}$ find the following by only using a proper formula:

(A)
$$\sum_{k=1}^{50} f(k) = f(1) + f(2) + f(3) + \cdots + f(50).$$

(B)
$$\sum_{h=0}^{29} g(h) = g(0) + g(1) + g(2) + \cdots + g(29).$$

- [10] 4. A man deposits \$2,000 in an IRA on his 21st birthday and on each subsequent birthday up to, and including, his 29th. The account earns 8% compounded annually.

- (A) If he leaves the money in the account without making any more deposits, how much will he have on his 65th birthday, assuming the account continues to earn the same rate of interest?
- (B) How much would be in the account on his 65th birthday if he had started the deposits on his 30th birthday and continued making deposits on each birthday until (and including) his 65th birthday?

- [10] 5. Consider a \$21,281.27 loan for 7 years at 8% interest compounded quarterly and a payment of \$1000 per quarter-year.

- (A) Compute the unpaid balance after 5 years.
- (B) How much interest is paid during the fifth year?
- (C) How much principal is repaid in the first payment?
- (D) What is the total amount of interest paid on the loan?

- [10] 6. A company that rents small moving trucks wants to purchase 16 trucks with a combined capacity of 19,200 cubic feet. Three different types of trucks are available: a cargo van with a capacity of 300 cubic feet, a 15-foot truck with a capacity of 900 cubic feet, and a 24-foot truck with a capacity of 1,500 cubic feet.

- (A) Write the linear system of equations in terms of x , y and z ; x , y and z being the number of a cargo vans, 15-foot trucks, and 24-foot trucks respectively.
- (B) Solve this system of equations.
- (C) The rental company charges \$24.95 per day for a cargo van, \$39.95 per day for a 15-foot truck, and \$49.95 per day for a 24-foot truck. Which of the solutions would produce the lowest daily income from the truck rentals?

- [10] 7. An economy is based on three sectors, coal, oil, and transportation. Production of a dollar's worth of coal requires an input of \$0.20 from the coal sector and \$0.40 from the transportation sector. Production of a dollar's worth of oil requires an input of \$0.10 from the oil sector and \$0.20 from the transportation sector. Production of a dollar's worth of transportation requires an input of \$0.40 from the coal sector, \$0.20 from the oil sector, and \$0.20 from the transportation sector.
- (A) Write the technological matrix M for this economy.
- (B) If a final demand of \$20 billion for coal, \$5 billion for oil, and \$10 billion for transportation is to be met, set up the equations to be satisfied by the inputs from the respective sectors.
- (C) Solve for the respective inputs satisfying these demands.
- [10] 8. Extremize $P(x, y) = 50x + 150y$ subject to
- $$6x + 3y \geq 48, \quad 5x + 5y \geq 60, \quad 3x + 6y \geq 42, \quad x \geq 0, \quad y \geq 0.$$
- [10] 9. A corporation plans to fill 2 different positions for vice-president, V_1 and V_2 , from administrative officers in 2 of its manufacturing plants. Plant A has 6 officers and plant B has 8 officers.
- (A) How many ways can these 2 positions be filled if the V_1 position is to be filled from plant A and the V_2 position from plant B?
- (B) How many ways can the 2 positions be filled if the selection is made without regard to plant?
- [10] 10. A shipment of 40 Mickey Mouse watches contains 6 defective ones. The quality control department selects seven of these watches for testing, and rejects the entire shipment if one or more are defective.
- (A) What is the probability that the entire shipment shall be accepted?
- (B) What is the probability that the entire shipment shall be rejected?

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