

1. (a) Define the symbols $s_{n|}$, $a_{n|}$ and $(Da)_{n|}$.
(b) Prove the following identities by verbal arguments
 - (i) $(1 + i)^n = 1 + is_{n|}$,
 - (ii) $n = a_{n|} + i(Da)_{n|}$.

2. A loan of 4000 is to be repaid by four annual payments of 1200. Determine the effective annual interest rate on the loan and draw up the amortization schedule.

3. (a) Explain the amortization and sinking fund methods to pay off a loan with equal annual payments over n years. From the borrower's point of view, when is the sinking fund method preferable?
(b) A borrower of 10,000 agrees to pay interest annually at the rate of 8% and to contribute equal annual amounts to a sinking fund to repay the loan at the end of four years. The sinking fund accumulates at 5% per year. Draw up the sinking fund schedule.

4. A loan is being repaid with 30 equal annual installments. The principal portion of the eleventh payment is 250 and the interest portion is 350. Determine i and the amount of the loan.

5. (a) For the standard bond issued with semi-annual coupons, define the symbols used in the following formulas and verify these formulas.
$$P = Fra_{n|} + Cv^n = C + (Fr - Ci)a_{n|} = K + \frac{g}{i}(C - K).$$

(b) A 10,000 par value bond has semi-annual coupons with $r = 0.04$. Determine the purchase price at the issue date that will give the purchaser an effective annual yield of 10% over the life of the bond.

6. An asset has an initial value of 10,000 and a salvage value of 2000 at the end of four years. Using three standard methods, draw up the depreciation schedules for this asset.

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McGILL UNIVERSITY
FACULTY OF SCIENCE

FINAL EXAMINATION

MATHEMATICS 189-329B

THEORY OF INTEREST

Examiner: Professor J. Turner
Associate Examiner: Professor N.G.F. Sancho

Date: Monday, April 19, 1999
Time: 2:00 P.M. - 5:00 P.M.

INSTRUCTIONS

**Answer any FIVE questions.
Calculators may be used.**

This exam comprises the cover and 1 page of questions.