FINANCIAL MATHEMATICS
(STAT 2032 / STAT 6046)

TUTORIAL EXERCISES WEEK 5

Question 1
Calculate values for the following functions:

a) $\bar{a}_{\overline{7|}}$ at interest rate of 7.5% per annum effective.

b) $(I\bar{a})_{\overline{5|}}$ at interest rate of 10% per annum effective.

c) $\ddot{s}_{\overline{15|}}^{(4)}$ at a nominal rate of 10% convertible quarterly.

d) $s_{\overline{10|}}^{(1/2)}$ at interest rate of 1% per annum effective.

e) $(D\ddot{a})_{\overline{8|}}$ at interest rate of 6% per annum effective.

Question 2
Find $\sum_{t=1}^{20}(t+5)v^t$ where $v = (1.05)^{-1}$

Question 3
The first payment in a series of 30 annual payments is 1000 and each subsequent payment is 1% smaller than the previous one. What is the accumulated value of this series at the time of the final payment if (i) $i = 0.01$, (ii) $i = 0.05$, and (iii) $i = 0.10$?

Question 4
A perpetuity provides payments every 6 months. The first payment is 1 and each subsequent payment is 3% greater than the last.

Find the present value of the perpetuity at the time of the first payment if the effective rate of interest is 8% per annum.

Question 5
Smith has 100,000 with which she buys a perpetuity on January 1, 2013. Suppose that $i = 0.045$ and the perpetuity has annual payments beginning January 1, 2014. The first three payments are 2000 each, the next three payments are $2000(1+r)$ each,…, increasing forever by a factor of $1+r$ every three years. What is r?

Question 6

Smith receives monthly family allowance payments of $25 on the last day of each month, beginning January 31, 2011. The payments are increased *at the end of each calendar year* at 12% per annum effective to meet cost-of-living increases.

Payments are deposited in an account earning a nominal rate of interest convertible monthly of $i^{(12)} = 12\%$. The last payment is made on December 31, 2028 (18 years of payments).

Find the present value (on January 1, 2011) and the accumulated value (on December 31, 2028) of the payments.

Note: The second part of this question is effectively the same as the final exercise in Week 4 lectures. Try the first part and then modify this answer to see if you get the same answer in the second part as the lecture notes.

Past Exam Question – 2005 Final Exam Q1(c)(ii)

Prove the following equality $(I\ddot{a})_{\overline{n}|} = \ddot{a}_{\overline{n}|} + (Ia)_{\overline{n-1}|}$ (3 marks)