

MAS224, Actuarial Mathematics: Problem Sheet 2

*Post your solutions to the starred questions in the **orange box** on the **second floor** of the Maths building by **12 noon on Monday, 28th January 2008**. Do not forget to staple all pages together and write your name and student number at the top of the front sheet.*

Give monetary values to the nearest penny and all other numerical answers to 4 decimal places. Interest rates should be given as percentages.

- 1*. If the rate of interest when interest is compounded monthly is 1% *per month*, find the rate of discount *per month*. How much interest should be paid in arrears for the use of £1000 for 1 month? How much interest should be paid in advance for the use of £1000 over 1 month?
- 2*. John Doe wishes to purchase a deferred annuity of £10,000 per annum paid out for 10 years. Payments are made annually, the first payment being due in 2 years time. What is the present value of the annuity if the annual interest rate stays at 10% over this period?
- 3*. A loan of £50,000 is to be repaid by 25 equal annual payments of £P, the first being due now. Find the annual payment required if the AER of interest charged on the loan is 8%.
- 4*. Joe Bloggs has a debt of £1,000 due in 1 years time, a debt of £1,000 due in 2 years time and a debt of £5,000 due in 4 years time. The prevailing AER is 10%.
If Joe is allowed to discharge these debts by making equal annual payments of £P in arrears each year for 10 years, find this annual payment.
If instead he is allowed to discharge the debts at a time t (to be determined) by a single payment of £7,000 when should that payment be made?
- 5*. Jane Roe wins a prize which can be taken either as a lump sum of £10,000 paid immediately, or as monthly payments of £100 paid in advance for a ten-year period. Assuming that the interest rate stays at 4% per annum over this 10 year period, find the total present value of the monthly payments. Which form of prize would you take?
6. The AER is 8%. Find the present value of a deferred annuity of £13,000 per year paid in perpetuity in the following cases:
 - (i) Payments are made monthly with the first payment in 6 months time.
 - (ii) Payments are made continuously in time starting in 6 months time.
- 7*. An investor takes out a regular savers plan where he agrees to pay £100 every month to a savings account for 3 years, the first payment being made on 1st April 2008 and the final payment on 1st March 2011. The annual effective interest rate paid on this account is 6%. On 1st April 2011 the accumulation is transferred to an ordinary savings account which attracts a lower effective annual interest rate of 5%. He draws the money out from this account on 1st January 2012. How much money will he receive?