



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF MATHEMATICAL & ACTUARIAL SCIENCE
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
(ACTUARIAL) WITH IT
1ST YEAR 1ST SEMESTER 2013/2014 ACADEMIC YEAR
CENTRE: MAIN

COURSE CODE: SAC 101

COURSE TITLE: PRINCIPLE OF ACTUARIAL SCIENCE

EXAM VENUE: LR 1

STREAM: (BSc. Actuarial)

DATE: 14/4/2014

EXAM SESSION: 9.00 – 11.00 AM

TIME: 2 HOURS

Instructions:

- 1. Answer question 1 (compulsory) and ANY other 2 questions.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE

a. Differentiate between Ordinary endowment plan and whole life insurance plan [4 marks]

b) Calculate the total present value as at 1 June 2008 of payments of £100 on 1 January 2009 and £200 on 1 May 2009, assuming a rate of interest of 12% pa convertible quarterly. [3 marks]

(c) On the basis of ELT no 12 males, find the probabilities that a life aged 30 will

(i) Survive to age 40

[2 marks]

(ii) Die before reaching age 50

[2 marks]

(iv) Die between his 40th birthday and his 50th birthday

[2 marks]

(v) Die either between exact ages 35 and 45 or between exact ages 70 and 80

[3 marks]

(d) Find the value at interest rate of 6% per annum effective for the following functions [8 marks]

(i) $\ddot{a}_{\overline{62}|}$

(ii) $\bar{a}_{\overline{15}|}$

(iii) $\ddot{s}_{\overline{61}|}$

(iv) $a^{\overline{(4)}}_{\overline{67}|}$

e) On the basis of interest rate of 12% per annum convertible quarterly, find the present value of an annuity of \$9,000 per annum for 25 years payable : [6 marks]

(i) Annually in arrears

(ii) Quarterly in arrears

(ii) Monthly in arrears

QUESTION TWO

a)(i) Calculate the combined present value of an immediate annuity payable monthly in arrears such that payments are £1,000 pa for the first 6 years and £400 pa for the next 4 years, together with a lump sum of £2,000 at the end of the 10 years. [3 marks]

(ii) Calculate the amount of the level annuity payable continuously for 10 years having the same present value as the payments in (i). [4 marks]

(iii) Calculate the accumulated values of the first 7 years' payments at the end of the 7th year for the payments in (i) and (ii). [3 marks]

Basis: Assume an interest rate of 12% pa convertible monthly

b) On the basis of 12% per annum effective. Find the present value of an annuity of \$6,000 pa payable for 25 years: [10 marks]

(i) Annually in arrears

(ii) Quarterly in arrears

(iii) Monthly in arrears

(iv) Continuously

QUESTION THREE

a)(i) Given that $I=15$ and $R=135$ $i=10.25\%$ and $n=10$ find P [3 marks]

(ii) Find n if $P=78.92$, $I=5$, $R=125$ and $i=10\%$ [3 marks]

(iii) Find a rough value of i given that $P=75$, $I=5$, $R=125$ and $n=10$ [3 marks]

b) An investor is to pay \$1000 for a property payment. The investor will then be entitled to receive rent payment for 99 years payable at the end of each year at a constant rate for the first 33 years, increasing to double that rate for the next 33 years and three times that rate for the remaining 33 years. The value of the property at the end of the 99 years is \$250,000. Find the amount of rent payable in the first year, if the investor expects to obtain a return of 8% on purchase. [6 marks]

c) Under its current rent agreement, a company is obliged to make annual payments of kshs.7, 500 for the building it occupies. Payments are due on 1 January 2004, 1 January 2005 and January 2006. The nominal rate of interest is 8% per annum convertible quarterly. Find the present value of these payments on 1 January 2003. [5 marks]

QUESTION FOUR

a) Two Projects A and B have the following expected cash flows:

	Project A	Project B
Initial Outlay	\$170,000	\$ 200,000
Other expenses	\$20,000 at the end of year 1	-
	\$ 10,000 at the end of year 2	-
Income	\$20,000 at the end of year 1	\$14,000 pa at the end of year of the first 6 years
	\$20,000 at the end of year 2	\$200,000 at the end of year 6
	\$200,000 at the end of year 3	

(i) Calculate the internal rate of return (correct to 1 decimal place) for each project [4 marks]

(ii) Calculate the net present value of each project using risk discount rate of 6% pa [3 marks]

(iii) If funds for the projects can be raised by borrowing from a bank, determine the interest rate charged by the bank above which each project becomes unprofitable. Mention any other factors that should be taken into account when deciding between the projects [3 marks]

b) A company is considering two capital investment projects. Project A requires an immediate expenditure of \$1,000,000 and will produce returns of \$ 270,000 at the end of each of the next 8 years. Project B requires an immediate investment of \$ 1,200,000 together with a further expenditure of \$ 20,000 at the end of each of the first three years, will produce returns of \$ 135,000 at the end of each of the sixth, seventh and eighth years

(i) Calculate (to the nearest 0.1%) the IRR per annum for each project. [5 marks]

(ii) Find the NPV of each project on the basis of effective annual interest rate of 15% [5 marks]

QUESTION FIVE

a) State the 8 principles of insurance [4 marks]

b). Differentiate between insurance and assurance [2 marks]

c) Given that $u = 0.1$ find the values of: [10 marks]

i) $i, i^{(4)}, i^{(52)}$

ii) $d^{(12)}, d^{(365)}$

d) i.) Distinguish between effective rate of interest and the nominal rate of interest [2 marks]

ii.) Given the nominal rate of interest of 18.5% per year, convertible monthly, calculate the nominal rate of discount convertible monthly [2 marks]