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**University Examinations 2016/2017**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE.

**SMS 3314: ACTUARIAL MATHEMATICS II**

**DATE: DECEMBER, 2016 TIME: 2 HOURS**

**INSTRUCTIONS: -** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Define  fully in words calculate its value using pmA92c20 and PFA 92c20 tables for the two lives respectively at 4% interest. (6 marks)
2. Write down an alternative expression for each of the following statements. Use notation as set out in the “International Actuarial Notation” section of the “Formulae and Tables for Examinations” where appropriate and express your answer as concisely as possible.
3. Prob.  (1 mark)
4.  for  (1 mark)
5. Probability  (1 mark)
6.  (1 mark)
7.  (1 mark)
8. Explain how an insurance company uses risk classification to control the profitability of its life insurance business. (5 marks)
9. Using the PmA92c20 table for both lives, calculate;
10.  (2 marks)
11.  (2 marks)
12. Explain why a life insurance company will need to set up reserves for the endowment assurance contracts, it sells. (4 marks)
13. Why study actuarial mathematics? (4 marks)

**QUESTION TWO (20 MARKS)**

1. Tx and Ty are the complete future lifetimes of two lives aged x and y respectively. Let the random variable g(T) take the following values;



1. Describe the benefit which has the present value equal to (3 marks)
2. Express  as an integral (3 marks)
3. Write down an expression for the variance of using assurance functions. (4 marks)
4. A life office issues an annuity to a woman aged 65 exact and a man aged 68 exact. The annuity of 20,000 per annum is payable annually in areas for as long as either of the lives is alive. The office values this benefit using the following basis:

Interest: 4% per annum

Mortality: Female: PFA92c20

 Male: PmA 92c20

1. Calculate the expected present value of the benefit. (4 marks)
2. Calculate the probability that the life office makes a profit in this case if it charges a single premium of 320,000. (6 marks)

**QUESTION THREE (20 MARKS)**

1. (i) Define the following actuarial notations in words:  (2 marks)

(ii) Calculate  (3 marks)

1. The annual premiums payable continuously unit the 2nd death of the above (a) assurance with sum assured of 1000.

Basis:

M=0.02 for a life aged 30 exact at entry level throughout the life.

M=0.03 for a life aged 40 exact at entry level throughout the life



No expenses (10 marks)

1. Explain the main deficiency of the above premium policy scheme and suggest an alternative for the policy. (5 marks)

**QUESTION FOUR (20 MARKS)**

1. An assurance contract provides a death benefit of 1000 payable immediately on death, with a saving benefit of 500 payable on every fifth anniversary of the inception of the policy. The following basis is used:

Force of mortality: for all

Force of interest: 

Expenses: none

Calculate the level premium payable annually in advance for life. (10 marks)

1. A term assurance contract for a life aged 50 exact for a term 10 years provides a benefit of 10,000 payable at the end of the year of death. Calculate the expected present value and variance of benefits payable under this contract.

Basis

Mortality: Amaz select

Interest: 40% p.a (10 marks)

**QUESTION FIVE (20 MARKS)**

1. The random variable represents the time to failure of the joint-life status is subject to a constant force of mortality of and is subject to a constant force of mortality ) and are independent with respect to mortality. Calculate the value of (10 marks)
2. A life insurance company provides a special annuity contract to a male life aged 70 exact and female life aged 60 exact. Annuity payments are due on the first day of the month. Under the contract an annuity of 50,000 p.a is payable monthly to a female life, provided that she survives at least 5 years longer than the male life. The annuity starts on the monthly policy anniversary next following the 5th anniversary of the death of the male life and is payable for the balances of the female’s lifetime.

Calculate the single premium required for the contract

Basis:

Mortality:PmA92c20 for males, PFA92c20 for females

Interest: 4% per annum

No expenses. (10 marks)