ACMT 403

CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

ACMT 403: ACTURIAL THEORY OF PENSION FUNDS

STREAMS: **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 12/04/2023   **2.30 P.M – 4.30 P.M**

INSTRUCTIONS:
ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

(a) Briefly discuss the following classification of pension scheme

   i.   Defined-Benefit Scheme   (2 Marks)
   ii. Defined-Contribution Scheme   (2 Marks)

(b) Workers at a company have pay reviews on their birthdays and retire on their 60th birthdays. Using the salary scale (including inflation increases) given in the Tables, estimate the total earnings in the year before retirement of a worker now aged exactly 35 who was paid a total of £25,000 last year. (3 Marks)

(c) List three ways in which the State can encourage private provision, other than through tax advantages or cash incentives.   (3 Marks)

(d) On retirement due to any reason (i.e., normally or through ill-health) before age 65, a pension scheme provides a pension of £20,000 pa paid from the date of retirement for the remainder of life. However, should the member retire on the 65th birthday, this annual pension is increased to £25,000 pa, also payable for life. Calculate the EPV of this benefit, for an active member

currently aged exactly 57. (3 Marks)

   Basis: Use the assumptions of the Pension Scheme Tables and 4% pa interest.

(e) Outline any four statutory objectives of The Pension Regulator (4 Marks)

(f) Calculate the probabilities of the following events using the service table in the Tables:

   i. A member aged 40 exactly will die from service during the next year. (2 Marks)

   ii. A member aged 38 exactly will retire through ill health in the year ending on his

       60th birthday. (2 Marks)

   iii. A member aged 42 exactly will retire in normal health on his 65th birthday. (2 Marks)

(g) Calculate the expected present value of a lump sum benefit of £50,000 paid on normal age retirement, for a scheme member aged exactly 52, assuming that this benefit is paid

   only if the member retires after the 64th birthday. (4 Marks)

   Basis: Use the assumptions underlying the Pension Scheme Tables, and 4% pa interest.

(h) On age retirement between the ages of 60 and 65 a pension fund provides a pension of one eightieth of final pensionable salary for each year of scheme service. Final pensionable salary is defined as the average annual salary earned over the 36 months prior to retirement. James is now aged 40 exact and earned £35,000 over the last year. Calculate the expected present value (to the nearest £100) of James's future pension). (3 Marks)

   Basis: Assuming an interest rate of 4% pa and that all decrements and the salary scale follow the Pension Fund Tables of the Formulae and Tables for Examinations.

QUESTION TWO (20 MARKS)

(a) Outline any six key mandates of Retirement Benefit Authority (RBA) in the pension provision in Kenya. (6 Marks)

(b) A pension scheme provides a pension on age retirement of 1/60th of final pensionable salary for each year of service, with part years counting proportionately. Final pensionable salary is defined to be the average salary over the 3 years prior to retirement. Members contribute 6% of their salaries to the pension fund.

One member aged exactly 48 has 16 years of past service and earned £54,000 in the last year. Using the Pension Scheme Tables from the Actuarial Formulae and Tables, calculate:

    i.   the expected present value of this member's past service benefit. (3 Marks)

    ii.   the expected present value of this member's future service benefit. (3 Marks)

    iii.   the expected present value of this member's future contributions (3 Marks)

(c) Discuss the roles played by the following advisors in the provision of pension funds

    i.   Investment advisors (2 Marks)

    ii.   Legal advisors (1 Mark)

    iii.   Administrators (1 Mark)

    iv.   Accountants (1 Mark)

QUESTION THREE (20 MARKS)

(a) State and explain five main/key responsibilities of a trustee in pension fund provisions. (10 Marks)

(b) A company is about to establish a pension scheme that will provide retirement benefits to its members of n/80ths of final pensionable salary at age 65 or on earlier ill health, where *n* is the total number of years of service to retirement. Age retirement in normal health follows the principles in the Pension Scheme Table for age retirement functions in the Formulae and Tables

for Actuarial Examinations. Final pensionable salary is the average salary in the three years before retirement.

An employee joins the scheme aged 45 exact and is granted exactly 15 years of past service. The employee's salary in the year before joining was Kshs. 35,000.

    i.   Calculate the present value of benefits for this member (including future service). (7 Marks)

    ii.   Calculate the contribution required, as a percentage of future salary, to fund this benefit. (3 Marks)

Basis: Pension Scheme from the Formulae and Tables for Actuarial Examinations.

QUESTION FOUR (20 MARKS)

A large pension scheme only permits retirement, by any cause, between the ages of 60 and 65 exact inclusive. Normal age retirement occurs on any birthday (only) over this age range, and retirement through ill health occurs at any intermediate age. Mortality is the only other cause of decrement.

(a) During a year, 750 members of the scheme pass their 59th birthdays. Calculate using the basis below:

    i.   the expected number of these members who will retire through ill health between the ages of 60 and 61, and between 61 and 62 (separately). (6 Marks)

    ii.   the expected number of these members retiring on their 60th and 61st birthdays. (2 Marks)

Probability of retirement at age 60 exact:	0.3
Probability of retirement at age 61 exact:	0.1
Force of mortality (at all ages):	0.

Force of ill-health retirement (for all ages over 60): 0.0105

(b) The pension scheme provides one-eightieth of final pensionable salary for each year of service, with part years counting proportionately, for normal age retirement. For ill-health retirement the benefit is the same, except the number of years of service is taken to be the total service the member would have achieved if she had retired at her 65th birthday. All pensions are payable monthly in advance, ceasing immediately on death. Final pensionable salary is defined to be the total salary received over the year preceding the retirement date. A member of the scheme is exactly 59 at 31 December 2005, has exactly 35 years of past service, and currently earns an annual salary of £37,000.

Calculate the expected present value as at 31 December 2005 of this member's ill-health and normal age retirement benefits payable as a result of all such retirements occurring up to, but excluding, retirement on the 62nd birthday. Identify any approximations you make. Use the following assumptions: (12 Marks)

Basis:

Mortality and retirement rates as in part (a)

Salaries increase continuously at 4% per annum

Mortality post retirement: normal age retirement: PFA92C20

ill-health retirement: PFA92C20 plus 8 years to the actual age

Interest: 4% pa.

QUESTION FIVE (20 MARKS)

(a) Actuaries play a very critical role in pension fund provision. Discuss their main statutory and advisory roles.   (10 Marks)

(b) A pension scheme provides a pension on retirement (through age or ill-health). Draw a transition state model for the pension scheme fully labelling the diagram. (6 Marks)

(c) An executive pension scheme provides a pension of $\frac{1}{45}$ final salary for each year of scheme service, with a maximum of $\frac{2}{3}$ of final salary, upon retirement due to age between the ages of 60 and 65. Final salary is defined as salary in the 3 years prior to retirement. A director, now aged 43 exactly has 10 years of past service and expects to earn £150,000 over the coming year.

Using the symbols defined in the Formulae and Tables for Actuarial Examinations, what is the expected present value of the future service pension on age retirement for this member?   (4 Mark)