



QP CODE: 26019277



Reg No :

Name :

M.Sc DEGREE (CSS) EXAMINATION, MARCH 2026
Fourth Semester
M Sc ACTUARIAL SCIENCE
Core Courses - AS010403 - ACTUARIAL COMPUTING III
2019 Admission Onwards
79E55CC2

Time: 3 Hours

Weightage: 30

(Answer any **Three** questions. Each question carries a weight of 10)

1. Calculate the annual premium, payable monthly in advance, for a deferred annuity of £12,400 pa to be paid quarterly in advance from age 60 to a male now aged 40. Initial expenses are 80% of the annual premium, renewal expenses are 4% of the annual premium incurred at the start of each year from Year 2 onwards, annuity payment expenses are £15 per payment, and the EPV of profit is 2% of the annual premium. Assume AM92 Ultimate mortality and 4% pa interest.
2. i) Calculate the annual premium payable in advance by Edward now aged exactly 32, in respect of a deferred annuity payable from age 60 for 5 years certain and for life thereafter. The amount of the annuity is 400 pa, payable annually in arrear, and the insurer incurs an additional administration cost of 2 when each annuity payment is made. The premium is paid throughout the deferred period or until the earlier death of the policyholder.

Basis: AM92 Ultimate mortality, 6% pa interest

ii) An annuity of £9,500 pa is to be paid monthly in advance for the remaining lifetime of Mrs Matt, who is currently aged exactly 60. Calculate the single premium that should be paid for this annuity, allowing for initial expenses of 1.5% of the premium and administration expenses payable at the start of each year, including the first. Administration expenses are £120 at the start of Year 1 and increase at the rate of 1.9231% pa. Assume AM92 Select mortality and 6% pa interest.





3. On 1 January 2012, a life insurance company issued joint life whole life assurance policies. Each policy was issued to a male life aged 65 exact and a female life aged 60 exact. A sum assured of 75,000 is payable immediately on the death of the second of the lives to die. Premiums of 1,395.11 are payable annually in advance for each policy while at least one of the lives is alive. At the beginning of 2014, there were 5,997 policies in force. For all of these policies, both lives were still alive.

During 2014, the following experience was observed:

- for 2 policies, both lives died ☐
- for 12 policies, only the male life died ☐
- for 8 policies, only the female life died.

Calculate, showing all your workings, the mortality profit or loss for the group of policies for the calendar year 2014.

Basis: Mortality: PMA92C20 for the male PFA92C20 for the female Interest : 4% per annum
Expenses: Ignore

4. A life insurance company sells a 5-year regular-premium endowment assurance policy to a 50-year old male. The sum insured is 20,000 payable at the end of year of death. Initial expenses are 50% of annual premium, renewal expenses are 5% of subsequent premiums. Premiums are payable annually in advance. There is a surrender benefit payable equal to a return of premiums paid, with no interest. This is paid at the end of the year of withdrawal. The company is required to hold net premium reserves, calculated ignoring surrenders. calculate the projected yearly cashflows per policy in force at the start of each year, using the following bases.

For pricing: AM92 Ultimate mortality, 4% pa interest, expenses as above and ignoring surrenders, using the equivalence principle

For reserving: Interest and mortality as per pricing

For future cashflow projection: Interest and expenses as per pricing, dependent surrender and mortality probabilities as in the table below.

Age x	$(aq)_x^d$	$(aq)_x^w$
55	0.005	0.1
56	0.006	0.05
57	0.007	0.05
58	0.008	0.01
59	0.009	0





5. A conventional 3-year endowment assurance is issued to a life aged exactly 56. The details are:
- sum assured 5,000 payable after 3 years or at the end of the year of death, if earlier
 - surrender value equal to the return of premiums without interest, less 400, at the end of the year of surrender
 - annual premium 3,250 paid at the start of each year.

The company calculates its reserves for this contract on the following basis: Expenses: 30 at the start of Year 2 32 at the start of Year 3 Surrender probabilities: 4% of policies in force at the end of Year 2 only Mortality: AM92 Ultimate Interest: 2% pa

(i) Calculate the prospective gross premium reserves required per policy in force at the start of Years 2 and 3, according to the above basis, using a cashflow projection approach.

(ii) Calculate the expected profit arising in the second year per policy in force at the start of Year 2, assuming the following profit test experience basis:

Expenses: as reserving basis

Surrenders: as reserving basis

Reserves: as calculated in part (i)

Mortality: 75% of AM92 Select from policy outset

Interest: 4% pa

