



QP CODE: 25047461



25047461

Reg No :

Name :

M.Sc DEGREE (CSS) EXAMINATION, NOVEMBER 2025

Third Semester

M Sc ACTUARIAL SCIENCE

Core Course - AS010301 - CONTINGENCIES - II

2019 ADMISSION ONWARDS

24BB7883

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

Answer any eight questions.

Weight 1 each.

1. What is direct expenses? Identify the following costs as overheads or direct:
 - (i) £10,000 bonus payable to sales manager on completion of target new business levels.
 - (ii) board of directors' remuneration.
2. Write about FLRV ?
3. How to determining gross premiums using the equivalence principle.?
4. Why hold reserves?
5. How to calculate the profit for the year between policy durations t and $t + 1$ (ie for policy year $t + 1$)?
6. Write down the retrospective accumulation after 10 years of the benefit payable under a pure endowment contract, which has a benefit amount of 50,000 and a term of 10 years.
7. Difference between Last survivor function and Joint life function .
8. The following assurance functions represent the factors used for valuing the benefits from annual premium insurance contracts:
 - i) A_{xy} ii) $A_{\overline{x:y}}$ iii) $A_{1_{x:y}}$ Specify the appropriate annuity factor to be used when valuing premiums.
9. What is DSAR ?
10. A life insurance company has a portfolio of 10,0000 single premium one-year term assurances. For each policy, there is a sum assured of \$50,0000 payable at the end of the year if the policyholder dies during the year. The company assumes that mortality will be 1% pa.
 - (i) Calculate the expected death strain for this portfolio.
 - (ii) Given that 89 people die during the year, calculate the actual death strain and hence the mortality profit or loss for this portfolio.

(8×1=8 weightage)





Part B (Short Essay/Problems)

Answer any **six** questions.

Weight 2 each.

11. What are the ways to pay Premium payments ?
12. Sam, aged 40, buys a 20-year term assurance with a sum assured of £150,000 payable immediately on death. Calculate the quarterly premium payable by Sam for this policy. Assume that initial expenses are 60% of the total annual premium plus £110, and renewal expenses are £30 pa from Year 2 onwards.
Basis: AM92 Select, 4% pa interest
13. Sam, aged 40, purchases a single premium whole life annuity of £8,400 pa payable monthly in advance from age 60. Initial expenses are 2% of the premium and renewal expenses are £60 pa from Year 2 onwards, including during payment of the annuity, assumed incurred annually in advance throughout.
Calculate the reserve for Andy's policy at the end of the tenth policy year. Assume interest of 4% pa, mortality AM92 Ultimate in deferment and PMA92C20 from age 60.
14. Calculate the gross premium retrospective reserve at the end of the second policy year for a 5-year single premium endowment assurance with sum assured £50,000 payable on maturity or at the end of the year of earlier death, issued to a 50-year old. Assume AM92 Select mortality, interest of 4% pa effective, initial expenses of £360 and renewal expenses of £45 at the start of each year excluding the first.
15. Derive density function of T_{xy} ?
16. Develop cumulative distribution function of last survivor R.V $T_{x:y}$
17. Relation of DSAR , EDS , ADS and M.P in group policy .
18. Consider the following group of whole life assurance policies:
year of issue: 2011
number in force at the policy anniversary in 2016: 1,900
number in force at the policy anniversary in 2017: 1,867
exact age at the policy anniversary in 2016: 70
sum assured: 60,000 per policy, payable immediately on death
level premiums are payable annually in advance for the whole of life
Calculate the mortality profit for this group of policies for the policy year commencing at the policy anniversary in 2016, assuming death is the only cause of policy termination, and that the insurer holds net premium reserves for these contracts calculated assuming AM92 Ultimate mortality and 4% pa interest.
(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. I) A man aged 45 buys a 15-year with-profits endowment assurance with a basic sum assured of £25,000. Determine the single premium to be paid for this assurance, assuming that simple reversionary bonuses of 6% pa vest at the end of each policy year and that death benefits are





payable at the end of the year of death. Assume AM92 Ultimate mortality and 4% pa interest. Initial expenses are £200 and renewal expenses are £30 at the start of each policy year, excluding the first.

II) Describe Gross premium.

20. i) A 10-year term assurance with a sum assured of £500,000 payable at the end of the year of death, is issued to a male aged 30 for a level annual premium of £330.05. Calculate the prospective and retrospective reserves at the end of the fifth policy year, ie just before the sixth premium has been paid, assuming AM92 Ultimate mortality and 4% pa interest. Ignore expenses.

ii) An annual premium conventional with-profits endowment assurance policy is issued to a life aged 35. The initial sum assured is £50,000, the gross premium is £1,500 and the term of the policy is 25 years. The death benefit of the sum assured and attaching bonuses is payable at the end of the year of death. The office declares compound reversionary bonuses, vesting at the end of each policy year. Given that bonuses of 3% pa have been declared for each year of the contract so far, calculate the prospective gross premium reserve at the end of the fifth policy year.

Basis: Future bonuses of 1.92308% pa compound
AM92 Ultimate mortality
6% pa interest
Renewal expenses of 5% of each premium
Claim expenses of £350

21. Write Different types of reversionary annuities that depend on term, and some of the possibilities.(any 3) and create one your own idea.

22. I) A pension scheme provides the following benefit to the spouse of a member, following the death of the member in retirement:

A pension of £25,000 pa payable during the lifetime of the spouse, but ceasing 20 years after the death of the member if that is earlier. All payments are made on the anniversary of the member's retirement. Calculate the expected present value of the spouse's benefit in the case of a female member retiring now on her 65th birthday, who has a husband aged exactly 55.

Basis: Mortality: PMA92C20 for the male life, PFA92C20 for the female life
Interest: 4% pa effective
Expenses: None

II) A male and a female, aged 60 and 64 respectively, take out a policy under which the benefits are:

- A lump sum of £50,000 payable at the end of the year of the first death provided this occurs within 10 years.
- An annuity payable annually in advance with the first payment due to be made 10 years from the date of issue. The annuity payments will be £10,000 pa for as long as both lives are still alive or £5,000 while only one of them is alive.

Level premiums are payable annually in advance for at most 10 years and will cease on the first death if this occurs earlier. Calculate the amount of the annual premium on the following

basis: Interest: 4% pa
Mortality: PMA92C20 for the male life and PFA92C20 for the female life
Expenses: Initial: £750
Renewal: 3% of each premium excluding the first

(2×5=10 weightage)

