"QUESTION PAPER MUST BE ATTACHED ALONGWITH THE ANSWER BOOK."

CFL-81

May, 2016 **MATHEMATICAL BASIS OF LIFE ASSURANCE** Reg. No.

[Time : 3 Hours] [Total Marks: 100]

Answer **ANY FIVE** questions only. All questions carry **20** marks each.
(Candidates are allowed to refer handbook on Formulae and Tables).

			Marks
Q.1.	a)	Write short notes on Accumulating With Profit Products	5
	b)	Give expressions for retrospective and prospective policy value under a whole life policy at the end of 30 years effected on a life at her age 30. The sum assured is Rs.25000/=. Annual premiums were limited to 25 years. Show that the two expressions are equal, ignoring expenses.	5
	c)	Explain Briefly on Withdrawal Risk under life insurance contracts	5
	d)	Give a very brief note on different types of life annuity policies sold by life insurers	5
Q.2.	a)	Describe briefly the various advantages of Reversionary Bonus System.	5
	b)	Some time ago, a life office issued an assurance policy to a life now aged exactly 55. Premiums are payable annually in advance, and death benefits are paid at the end of the year of death. The office calculates reserves using gross premium policy values. The following information gives the reserve assumptions for the policy year just completed. Expenses are assumed to be incurred at the start of the policy year. Reserve brought forward at the start of the policy year: Rs. 12,500 Annual premium: Rs. 1,150 Annual expenses: Rs. 75 Death benefit: Rs.50,000 Mortality: IALM(1994-96) (Modified) Ultimate Interest : 5.5% per annum Calculate the reserve at the end of the policy year	5
	c)	Write note on Asset Liability Management.	5
	d)	Give a Brief note on adequacy premiums.	5
Q.3.	a)	Write a note on Policyholders Reasonable Expectations (PRE)	4
	b)	For a participative Endowment policy, what are the components of PRE and how can they be addressed	4
	c)	Describe the nature of various types of expenses of an insurer	4
	d)	Calculate office annual premium for the data given below 1. Policy Term = 15 years, Age = 45 Years	8

2. Expense = First year = 55 % of premium & 17 % of sum assured
   Renewal expenses = 5% of premium & 6% sum assured
3. With profit plan with bonus loading of 20 per 1000 SA per year
4. IALM 94.96 Modified ultimate Mortality table
5. Interest Rate = 6%
6. Benefits.
   - ✓ Rs. 1500 on survival at end of 5^{th} year
   - ✓ Rs. 1500 on survival at the end of 10^{th} year
   - ✓ Rs. 3000 on survival at the end of 15^{th} year
   - ✓ Rs. 6000 on death at any time within 15 year

Q.4. a) On the basis of IALM (94-96) Modified Ultimate table and 6% interest calculate net annual premium for an endowment Assurance for Rs. 10,000 on the life of (30 yrs) for a term of 30 years. Death benefit is payable immediately on death. 8

b) Calculate the true half yearly premium for an endowment assurance at Rs. 50,000 on the life of (40 years) for a term of 15 years.
Basic: IALM (94-96) Modified ultimate & 6% interest. 8

c) Explain Surrender Value & paid up policies. 4

Q.5. a) List out the items for which it is necessary to provide for special reserves and adjustments to arrive at the final valuation liability and discuss the rationale for creating a reserve for early payment of claims and explain how the reserve is calculated. 10

b) i) Deduce the relationship between Net Premium and Office Premium 1

ii) A life insurance company issues a 35-year endowment assurance contract to a life aged 30 exact. The sum assured of Rs.200,000 is payable at maturity or at the end of the year of death if earlier. Level premiums are payable annually in advance for the duration of the contract. 9
Calculate the annual premium, using the following basis:
Interest: 6% p.a.
Mortality: IALM (1994-96) Modified Ultimate
Expenses:
Initial: Rs. 300 plus 50% of the annual premium
Renewal: 2% of the second and subsequent annual premiums
Claim: Rs. 600 on death; Rs.200 on maturity

Q.6. a) Write short notes on

i) Proportionate Paid up values, giving suitable examples 4

ii) Regulatory Aspects in the context of Prospective Method of Valuation of Life Insurance Policies 4

b) i) In the context of a Life Insurance Contract explain how an asset share may be built up using a recursive formula 3

ii) Calculate the asset share of a 10 year endowment assurance policy issued at age 60, for a policyholder surviving exactly three years, (after payment of all surrender and death claims due at the end of the year), given the following information: 6

Sum Assured Payable at the end of the year	Rs.10000/=
Annual Premium	Rs.1000/=
Policy's share of expenses incurred at the start of the year	Rs.25/=
Asset Share per policy at the end of Second Policy Year	Rs.2000/=
Rate of Return on Assets during the year (Net of tax)	11.27%
Expected Mortality	IALM (Modified) Ultimate

A recent investigation of the company's relevant mortality experience has shown that mortality experience has been running at an average of 65% of the expected rate. An investigation of the company's withdrawals has shown that 7% of policyholders with policies in force surrender their policy on the third policy anniversary, without paying the premium then due. An amount equal to 90% of the current asset share is paid as a surrender value in each case

iii) Briefly explain two aspects of life insurance where application of asset share is useful in the management of life insurance business 3

Q.7. a) i) Briefly discuss the risk mitigation techniques for mortality risk faced by life insurers 6

ii) Describe the counter party risk involved under Reinsurance arrangements 4

b) A 20 year special endowment policy is issued to a group of lives aged 45 exact. Each policy provides a sum assured of Rs.10000/= payable at the end of year of death, or Rs.20000/= payable at if the life survives until the maturity date. Premiums on the policy are payable annually in advance for 15 years or until earlier death.

You are given the following information:

Number of Deaths during the 13th policy year	4
Number of Policies in force at the end of 13th Policy year	195

Mortality: IALM(1994-96) (Modified) Ultimate

Interest : 4% per annum

i) Calculate the profit or loss arising from the mortality in the 13th policy year. 8

ii) Comment on the results obtained in (i) above. 2

Q.8. a) A Life Insurer cannot write unlimited new business policies – Discuss the issues involved. 12

b) Derive the relationship between a debt and extra premium by equating the value of the premiums to the value of the benefits on special mortality basis for a whole life policy 8

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