

EA-1  
OVERHEADS

Interest Theory  
Life Contingencies

SPRING 2019

# OVERHEAD SECTIONS

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1. GENERAL
2. INTEREST RATES
3. ANNUITIES CERTAIN
4. LOANS
5. BONDS
6. INVESTMENT YIELDS
7. LIFE CONTINGENCIES
8. LIFE ANNUITIES
9. INSURANCE VALUES
10. JOINT LIFE STATUS
11. ACTUARIAL EQUIVALENCE
12. MULTIPLE DECREMENTS
13. POPULATION THEORY
14. INTERESTING PROBLEMS

# **SECTION 1**

## **GENERAL**

# EXAM CONDITIONS

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1. Normal Retirement Age (NRA) is 65
2. Pension commences at NRA, payable monthly for life @ begin. of month
3. No pre-retirement death benefits
4. Actuarial equivalence is based on mortality / interest for funding
5. Interest rates compounded more frequently than annually are expressed as nominal rates

## EXAM CONDITIONS - CONTINUED

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6. With multiple lives, future lifetimes are assumed to be independent of each other
7. “Gross single premium” is equivalent to “Contract single premium”, and “Net single premium” is equivalent to “Benefit single premium” (and similarly for annual premiums)
8. There are no policy loans in effect
9. Bond redemption value = face amount
10. Interest rate == yield rate
11. Duration == Macaulay duration

# GUIDELINES

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1. Old Exams Too Simple
2. Good Multifunction Calculator
3. Read Questions Carefully
4. Know All Conditions
5. Avoid Arithmetic Errors - Compare Answer To Ranges
6. Calculator “Tricks”
7.  $\ddot{a}_{65}^{(12)} = \ddot{a}_{65} - 11/24$

# IMPLIED RANGES

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## Sample Answer Ranges:

A <10,000

B 10,000 - 10,500

C 10,500 - 11,000

D 11,000 - 11,500

E 11,500 ++

Which answers may be the result of arithmetic errors?

5,000	9,000
9,800	12,500

# IMPLIED RANGES HISTORICAL ANALYSIS

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Number of questions where numerical answer is outside of A/E implied ranges

OLD EA-1A EXAMS

1985-2000: 2 OF 85 O/S implied range

CONCLUSION:

You can know when an A/E answer may be bad. Normally will fall within the implied range!



## SUMMARY OF EA-1 PROBLEMS BY TYPE (INCLUDING 2018)

INTEREST TOPICS	2018 Exam	2017 Exam	2016 Exam	2015 Exam	2014 Exam	2013 Exam	2012 Exam
Identities: calculate $i$ , $\ddot{a}_{\overline{n} }$ , $\ddot{s}_{\overline{t} }$ , etc.		04		01	01, 04	09	
Yield curve / spot rates	15, 28	05, 18	23	18, 27	14, 15	13, 20	16
Profit sharing / money purchase account bal	01	12, 15	08, 15	10	20	04	02
Increasing annuity / perpetuity	04, 08, 12		01, 09	04	06	01, 10, 29	12, 20 29
Sinking funds			31			17	
Loans – “Simple”	20, 26	28	19		23, 30	25	18
Loans – Renegotiated provisions				14, 22	07		05
Loans – Multiple interest rates		30					
Bonds – “Simple”	23	22	22	15	29	26	
Bonds – Callable					09		23
Bonds – Serial		08					
Bonds – Yield rate	07		12, 28				
Duration, modified duration	11	09, 23	26	05, 26	19	05, 19	08
Time / dollar weighted return, Realized and unrealized gain / loss	19	01	05	09, 23	12	32	09, 15, 26
OTHER							

LIFE CONTINGENCIES	2018 Exam	2017 Exam	2016 Exam	2015 Exam	2014 Exam	2013 Exam	2012 Exam
Select and ultimate decrements		29	02, 07	19, 29	27, 31	06	30
Identities with $l_x$ , $n p_x$ , $u_x$ , $e_x$ , etc.	02, 06, 13, 16, 24	02, 03, 06, 24, 27	13, 14, 16, 17	02, 03, 06, 12, 30	05, 13, 28, 32	07, 08, 23, 30	11, 17, 22
PV calc - simple, or salary scale	03, 05				24	21	03, 25
Annuity under DeMoivre’s law	29	10		11			
PV of non-level annuity or insurance							
Projected mortality improvements	21	11, 19	27	24	02	11, 24	06
Insurance / insurance premium	18	25, 31, 32	18, 20, 21, 30	17, 25	03, 17, 26	03, 22	07, 19, 21
Reversionary Annuity	17				21		27
Actuarial Equivalence: J&S form		20	03	08, 13, 20	11, 25	02, 18, 28, 31	13, 28
Actuarial Equivalence: Simple types	10	07	10, 25, 29	16	18	15	04, 10
Balducci / Constant Force / UDD assumption	14, 22, 27	13, 14, 17	11	21, 31	10, 22	16	01
Multiple decrement tables	09, 25	16, 26	04, 06, 24	07, 28	08, 16	12, 27	14, 24
Population theory							
OTHER		21				14	

# OPENING / CLOSING COMMENTS

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- READ**      Overheads - key background for each exam topic area
- WORK**      Prior exam problems
- EXPECT**    Similar problems as last 5 years
- STUDY**    "New stuff" in last 5 years' exams
- REVIEW**   Lengthy exam solutions give background of WHY - not just HOW to solve problem
- NEXT STEPS**    **PRACTICE, PRACTICE, ETC.**  
Be speedy in working problems
- EMAIL**      Follow-up questions, clarifications after the seminar