PGDM (Insurance Business) 2015-17

Actuarial Science

INS-303

Trimester – III, End-Term Examination: March 2016

Time allowed: 2½ Hours Max Marks: 50

Roll No: _____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means.** In case of rough work please use answer sheet.

Note : - Please be relevant and brief in your answers.
- Section C is compulsory.
- Do not write anything on this question paper except your roll no.
- Use of Scientific Calculators is allowed
-IALM Table is provided along with the question paper

Section-A

There are 5 questions in this section. Attempt any 3 questions. Each question carries 5 marks.

A-1. Calculate the total present value as at 1 June 2008 of payments of INR 100 on 1st January 2009 and INR 200 on 1st May 2009, assuming a rate of interest of 12% p.a. convertible quarterly. [5]

A-2. An investor pays £1000 every half-year in advance into a 20-year savings plan.

Calculate the accumulated fund at the end of the term if the interest rate is 6% per Annum convertible monthly for the first 10 years and 6% per annum convertible half-yearly for the final 10 years. [5]

A-3. Find the present value at the rate of 6% of 10 annual payments of Rs. 500/- p.a. followed by 7 annual payments of Rs. 250/- p.a., the first payment being made at the end of 1st year. [5]

A-4. Two identical coins are tossed and the total number of heads coming in the toss of two coins is recorded. Let X represents the random variable whose value depends on the total number of heads. Find the mean and variance of random variable X. [5]

A-5. **Use IALM Table to calculate the following probabilities**

Of two persons A aged (35) and B aged (42), find the probability that

I. A and B both survive 10 years [1]
II. A and B both die within 10 years [1]
III. One of the two lives survive 10 years while the other dies within that period [2]
IV. At least one survives 10 years [1]

[Total 5]

Section-B

[Note: Answer 2 out of the 3 Questions below. Each Question carries 10 marks.
[2x10=20]

B-1. Consider a group of 10,000 persons all aged 35, seeking to provide an amount of Rs. 10,000 to their family in case of death during the next 10 years.
Assuming a rate of interest of 6% p.a. calculate the amount of Single Premium required.

Age x	Lx	dx
35	10,000	28
36	9,972	31
37	9,941	34
38	9,907	38
39	9,869	42
40	9,827	47
41	9,780	52
42	9,728	57
43	9,671	63
44	9,608	70

Total [10]

B-2.

The table below shows cumulative claims paid on a portfolio of insurance policies. All claims are fully run off by the end of development year 3.

Calculate the total reserve for outstanding claims using the basic chain ladder technique.

Incremental claims		Development Year			
		0	1	2	3
Accident Year	2007	240	281.4	302	305
	2008	260	320	322	
	2009	270	312.9		
	2010	276			

Total [10]

Turn Over

B-3.

At Miracle Cure hospital a pioneering new surgery was tested to replace human lungs with synthetic implants. Operations were carried out throughout 2010. Patients who underwent the surgery were monitored daily until the end of August 2010, or until they died or left hospital if sooner. The result was shown below. Where no date is given, the patient was alive and still in hospital at the end of August.

Patient	Date of Surgery	Date of leaving observation	Reason for leaving observation
A	June 1	June 3	Died
B	June 3	July 2	Left Hospital
C	June 5		
D	June 8		
E	June 9	July 11	Died
F	June 12		
G	June 16	June 21	Died
H	June 17	Aug 12	Left Hospital
I	June 22		
J	June 24	June 29	Died
K	June 25	Aug 20	Died
L	June 26		
M	June 29	Aug 6	Left Hospital
N	June 30		

Calculate the Kaplan-Meier estimate of the survival function for these patients.

Total [10]

Turn Over

Section-C

Case Study ***15 Marks***

A well-established life insurance company, which currently sells a full range of life insurance products, is seeking to set up a branch in a new territory. Initially it intends to sell without profits level immediate annuity policies to the local population.

(i) Describe the risks to which the company will be exposed when it sets up the new branch. [10]

(ii) Discuss how these risks can be managed. [5]

Total [15]

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Indian Assured Lives Mortality (IALM) (1994 -96) (modified) Ultimate mortality functions.

AGE	lx	dx	q_x	AGE
51	927330	5396	0.00582	51
52	921934	5940	0.00644	52
53	915994	6518	0.00712	53
54	909476	7129	0.00784	54
55	902346	7770	0.00861	55
56	894576	8439	0.00943	56
57	886138	9122	0.01029	57
58	877016	9669	0.01103	58
59	867347	10366	0.01195	59
60	856981	11203	0.01307	60
61	845778	12172	0.01439	61
62	833606	13258	0.01590	62
63	820348	14448	0.01761	63
64	805900	15728	0.01952	64
65	790172	17080	0.02162	65
66	773093	17568	0.02272	66
67	755525	19354	0.02562	67
68	736171	21219	0.02882	68
69	714952	23144	0.03237	69
70	691808	25108	0.03629	70
71	666699	27083	0.04062	71
72	639616	29033	0.04539	72
73	610582	30919	0.05064	73
74	579663	32695	0.05640	74
75	546968	34310	0.06273	75
76	512658	35709	0.06966	76
77	476948	36835	0.07723	77
78	440113	37631	0.08550	78
79	402483	38042	0.09452	79
80	364440	38022	0.10433	80
81	326418	37535	0.11499	81
82	288883	36559	0.12655	82
83	252324	35090	0.13907	83
84	217234	32819	0.15108	84
85	184415	29930	0.16230	85
86	154485	26903	0.17415	86
87	127581	23812	0.18664	87
88	103770	20731	0.19978	88
89	83039	17734	0.21356	89
90	65305	14889	0.22800	90
91	50416	12255	0.24307	91
92	38161	9875	0.25878	92
93	28286	7782	0.27511	93
94	20504	5988	0.29203	94
95	14516	4493	0.30952	95
96	10023	3283	0.32755	96
97	6740	2333	0.34607	97
98	4408	1609	0.36505	98
99	2799	1076	0.38444	99
100	1723	624	0.36221	100
101	1099	587	0.53396	101
102	512	512	1.00000	102
103	0			103

Indian Assured Lives Mortality (IALM) (1994 -96) (modified) Ultimate mortality functions.

AGE	lx	dx	q_x	AGE
0	1000000	1630	0.00163	0
1	998370	958	0.00096	1
2	997412	668	0.00067	2
3	996743	618	0.00062	3
4	996125	468	0.00047	4
5	995657	418	0.00042	5
6	995239	378	0.00038	6
7	994861	398	0.00040	7
8	994463	398	0.00040	8
9	994065	398	0.00040	9
10	993667	378	0.00038	10
11	993290	447	0.00045	11
12	992843	526	0.00053	12
13	992317	645	0.00065	13
14	991672	707	0.00071	14
15	990965	763	0.00077	15
16	990202	815	0.00082	16
17	989387	864	0.00087	17
18	988523	908	0.00092	18
19	987614	949	0.00096	19
20	986665	986	0.00100	20
21	985680	1018	0.00103	21
22	984661	1047	0.00106	22
23	983615	1072	0.00109	23
24	982543	1094	0.00111	24
25	981449	1111	0.00113	25
26	980338	1124	0.00115	26
27	979214	1135	0.00116	27
28	978079	1140	0.00117	28
29	976938	1143	0.00117	29
30	975795	1142	0.00117	30
31	974654	1141	0.00117	31
32	973512	1169	0.00120	32
33	972343	1212	0.00125	33
34	971131	1270	0.00131	34
35	969861	1345	0.00139	35
36	968516	1435	0.00148	36
37	967081	1541	0.00159	37
38	965540	1662	0.00172	38
39	963878	1798	0.00187	39
40	962081	1975	0.00205	40
41	960106	2157	0.00225	41
42	957948	2316	0.00242	42
43	955632	2487	0.00260	43
44	953145	2699	0.00283	44
45	950446	2956	0.00311	45
46	947490	3257	0.00344	46
47	944233	3603	0.00382	47
48	940630	3991	0.00424	48
49	936638	4420	0.00472	49
50	932218	4889	0.00524	50