INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

05th November, 2014

Subject SA3 – General Insurance

Time allowed: Three hours (14.45* - 18.00 Hours)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. ***Please read the instructions on the front page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception.***
2. **** You have 15 minutes at the start of the examination in which you are required to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.***
3. ***You must not start writing your answers in the answer sheet until instructed to do so by the supervisor.***
4. ***The answers are expected to be India Specific application for the syllabus and corresponding core reading. However, substantially the core reading material is still taken from material supplied by Actuarial Education Company which is meant for UK Fellowship examination. The core reading also contains some material which is India Specific, mostly the IRDA regulation. In view of this, it should be noted that focal point of answers is expected to be India Specific application. However if application specific to any other country is quoted in the answer the candidate should answer the question with reference to Indian environment.***
5. ***Attempt all questions, beginning your answer to each question on a separate sheet.***
6. ***Mark allocations are shown in brackets.***
7. ***Please check if you have received complete Question Paper and no page is missing. If so, kindly get new set of Question Paper from the Invigilator.***

AT THE END OF THE EXAMINATION
Please return your answer book and this question paper to the supervisor separately.

Q.1) You are the pricing actuary for Think Green Insurance (TGI), a niche insurance company specializing in environmentally responsible insurance policies for individuals and small corporations. You are currently developing a "pay per kilometre" comprehensive car insurance policy (Green Rate policy).

The proposal is to use a telematic device which plugs into their car's diagnostic port. The device will keep track of when, how far, and at what speed the car is driven. The data is submitted over a cell phone network back to TGI. It will also track how often and how hard drivers brake and use the braking information when calculating rates. Drivers get back a periodic report that tells them how many kilometres they've logged and other feedback about their driving habits. Based on the data, they'll receive discounts ranging as high as 60%. However for logging excessive kilometres or driving at high speeds with hard braking, a loading of up to 10% could be added.

Your company issues a press release indicating that the Green Rate will be introduced within the next three months.

The next day the following quote appears in a leading newspaper:

"A truly awful example of the use of technology for technology's sake. Instead of a single price for insurance paid for a year in advance, we have dozens of variable prices in the terms of weights assigned to each of the different variables assessed. Market power, such as it is, will shift from the consumer to the actuaries of the insurance companies, and prices will rise."

i) Comment on the appropriateness of per kilometre rating as a measure of exposure for comprehensive motor policies. (2)

ii) Your CEO would like to respond to the opinion article in the newspaper. He has asked you to prepare a bullet point list of talking points to respond to the article, in particular, you should address the price rise concern, and your points should support the idea of refining rating structure. Draft the list of bullet points to respond to the article with a short discussion of each point. (4)

iii) The following day the Green Rate policy is discussed on the radio and a prominent spokeswoman comments as follows:

"Such a device would almost certainly support radical violations of the "locational privacy" of drivers; it would form the basis of a pervasive surveillance and tracking infrastructure. From a pragmatic standpoint we expect that very strong and broad opposition would be mobilized to protest such a device, and this might threaten the adoption of the PAYD (pay as you drive) insurance scheme"

The CEO of TGI has asked you whether it is possible to redesign the policy to work without a telematic device to alleviate privacy concerns. The company is still keen to develop a "pay per kilometre" policy.

Suggest two alternatives and comment on the advantages and disadvantages of each. (4)

iv) How would you go about determining the appropriate relativities for number of kilometres driven? Your answer should include the difficulties in determining relativities. Assume that you have available a set of detailed rates which uses typical rating factors (e.g. age, driving history etc), but does not use "pay per kilometre" rating. (4)

v) The product is introduced subject to your modifications in (iii). You implement a monitoring system. At the end of the first year of operation you notice that some high kilometre drivers have better experience than priced for, and some low kilometre drivers' experience was worse than priced for.

a) Provide possible reasons for this experience (2)

b) If required what are the possible adjustments that may be made to the rating structure, and why? (2)

c) What are the risks associated with these possible adjustments? (2)

[20]

Q. 2) You are the Extended Warranty pricing actuary at GHI Insurance. Aria Appliances has recently approached GHI Insurance about a 3 year extended warranty product for their appliances in the Indian domestic market. Extended Warranty covers losses arising from the need to replace or repair faulty goods in a product after the manufacturer's normal warranty period. Aria Appliances have assured you that the quality of their products is very good. In fact, most of the repairs in the first few years are due to incorrect usage or incorrect installation.

The product manager is very interested in this opportunity, and has asked for your assistance to price this product for the Indian domestic market.

i) What information do you need to determine a robust premium rate for this product? (3)

ii) Set out the formula you would use to calculate the robust premium rate. Define each component in your formula (4)

iii) Below is a list of possible rating factors for this product. Discuss the suitability of each factor.

- Type of product (e.g. washing machine, fridge, dryer, etc.)
- Colour
- Energy star rating
- Price of the product
- Model
- Location sold (3)

The product manager has informed you that Aria Appliances' new marketing strategy is to expand beyond the domestic market and target the commercial market for their products. However, the commercial buyers typically depreciate this type of asset over a 5 year period, hence require the product to have a 5 year warranty. Aria is currently considering 2 options:

Option 1 – Sell the product with a 5 year Manufacturer's warranty, then 100% reinsure the warranty risk beyond the first year with your company. The reinsurance policy will be renewed each year to provide 4 years' cover for all Aria Appliance sales within that year.

Option 2 – Sell the product with the standard 1 year Manufacturer's warranty, and offer a 4 year extended warranty option underwritten by your company.

iv) Discuss the differences between the two options for GHI Insurance with respect to underwriting and product management. (3)

v) Aria Appliances have decided to go with Option 1 and have proposed a profit share arrangement as follows: At the end of each policy year, profit share payable from GHI to Aria is equal to 20% of (premium received in the year less claims paid in the year).

Critique the proposed profit share arrangement (3)

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Q. 3) XYZ Insurance writes Motor and Home Insurance across India. You are an actuary recently employed by XYZ Insurance and reporting to the Chief Risk Officer (CRO), who has asked you to review the reinsurance programme, which is to be renewed at 1st January 2015.

XYZ currently purchases only a catastrophe excess of loss coverage of INR 650 million excess INR 50 million per event. Rate on line (RoL) is 4% with one free reinstatement and one reinstatement at 50% of RoL. The INR 650 million limit is set at the 1 in 250 year probability level.

You have reviewed XYZ's recent loss experience. There have been seven large events over the last three years, six events with losses ranging from INR 25 million to INR 45 million, and the recent Kashmir flood loss of INR 100 million.

i) According to IRDA's General Insurance Reinsurance - Regulations 2000, what are the procedures to be followed for reinsurance arrangements (8)

The CRO has had some preliminary discussions with reinsurers which have proposed the following alternative programmes to augment the existing cover:

- 50% quota share, with an exchange commission of 17% and an event limit of INR 10 million per event. The current catastrophe excess of loss cover would inure to the quota share (i.e. the quota share applies to losses net of the catastrophe excess of loss cover).
- Underlying catastrophe excess of loss coverage of INR 20 million excess of INR 30 million per event, with one reinstatement at 100%, and premium of INR 6 million per annum.

ii) List the relevant points to consider in a qualitative comparison of the two reinsurance programmes above, including consideration of the potential impact on underwriting results and statutory capital requirements. (6)

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Q. 4) A relatively new general insurer specialises in three lines of business viz., home, health and motor insurance. The insurer has not been able to generate underwriting profit and to facilitate greater market penetration in these lines of business; it has had capital calls twice in the previous three years.

The management of the Company is concerned about the efficient use of capital. It is keen to understand capital requirements for each of the lines and also to help identify capital intensive business segments that can help strategize to ensure a positive return on capital employed.

The management has thus advised its CRO (Chief Risk Officer) to evaluate capital requirements by line of business for coming financial year.

i) List out the benefits of capital allocation and mention the important characteristics of a good capital allocation method. (5)

ii) List out at least six measures of risk that may be used in a capital allocation method. (3)

The following information on the three lines of business was available:

Amounts in INR Crore

Metric/LoB	**Motor**	**Health**	**Fire**
Mean Losses	150	100	50
Std. Dev.	20	10	15

The losses are expected to follow a log normal distribution.

Other information (projected numbers for coming year):

Amounts in INR Crore

Metric/LoB	**Motor**	**Health**	**Fire**
GWP	300	200	100
Loss Ratio	70%	65%	60%
Retention	80%	85%	90%

The insurer has been traditionally using only quota share reinsurance and has not projected any change in the same in the coming financial year.

Based on the above information, the CRO approached the Chief Actuary to evaluate capital allocation across the lines of business using the following risk measures and compare the same with the regulatory minimum:

- Value-at-risk @ 99%
- Standard deviation – 2.5 times from the mean
- Tail Value at Risk @ 99%

iii) Discuss the conditions a good risk measure needs to satisfy. (4)

iv) Based on above given information estimate the minimum capital to be allocated for each of the given lines of business as per the Indian Solvency regulations for a general insurer, making any reasonable assumptions. (3)

v) Estimate the capital to be allocated using the three risk measures and their criterion provided above for each of the lines of business and provide your observations comparing with the results in (iv) above. You may add up the capital requirements for each of the lines to estimate total capital requirement. (15)

vi) Explain the advantages and disadvantages of each of the above mentioned risk measures and suggest improvements over the suggest allocation method in (v) above for more effective allocation. (8)

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Q. 5) As a part of annual financial statements submission to IRDA, an Indian general insurer has provided the following information with respect to its overall business for Financial Year 2013-14:

P&L statement for the year 2013-14

Particulars	**INR Crore**
GWP	600
NWP	350
Movement in GUPR	150
Movement in NUPR	120
GEP	450
NEP	230
Gross Paid	250
Movement in Gross O/s	150
Movement in Gross IBNR	100
GIC	500
Net Paid	100
Movement in Net O/s	70
Movement in Net IBNR	30
NIC	200
Commission paid	60
Commission received	25
Net Commission	35
Management expenses	100
Investment Income	45
UW Result	-60

Balance Sheet as on March 31st , 2014:

Liabilities	**INR Crore**	**Assets**	**INR Crore**
Share Capital	250	Investments	590
NUPR	225	Cash & Bank	10
Net Os	125	P & L Debit	80
Net IBNR	90	Other assets	10
Total	**690**	**Total**	**690**

i) What do you infer from the above given information (and making any reasonable assumptions) on the insurer's financial condition and its nature of business? Discuss in detail. (8)

ii) Discuss in light of the recent regulations on FCR from IRDA other information required in order to have greater understanding on the insurer's business and financial health. (4)

[12]

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