B.Sc. Actuarial Science (Semester Wise) 2019-20

Semester	Paper	Subject	Hrs.	Credits	IA	ES	Total
FIRST YEAR							
Semester I	Paper-I	Basics of Business Economics	6	5	50	50	100
Semester II	Paper-II	Basics of Financial Mathematics	6	5	50	50	100
SECOND YEAR							
Semester III	Paper-III	Basics of Financial Accountancy	6	5	40	60	100
Semester IV	Paper-IV	Survival Models	6	5	40	60	100
THIRD YEAR							
Semester V	Paper-V	Basics of Life Contingency	5	5	40	60	100
	Paper-VI	Business Communication	5	5	40	60	100
Semester VI*	Paper-VII	ELECTIVE-1:Mortality and other Actuarial statistics	5	5	40	60	100
		ELECTIVE-2:Actuarial Statistics	5	5	40	60	100
		ELECTIVE-3:Advanced Business Communication	5	5	40	60	100
Semester VI*	Cluster-1	Life contingency-1	5	5	40	60	100
		LifeContingency-2	5	5	40	60	100
		Project	5	5	40	60	100
	Cluster-2	Principles of Insurance	5	5	40	60	100
		Practice of Insurance	5	5	40	60	100
		Project	5	5	40	60	100
	Cluster-3	Finacial	5	5	40	60	100
		Research Methodology	5	5	40	60	100
		Project	5	5	40	60	100

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CBCS SYLLABUS (Semester Wise) 2018-19

I B.Sc. Statistics/Semester-II (With Mathematics Combination)

Actuarial science

Paper – II-Basics of Financial Mathematics

Total hrs.Per week: 04 **Total credits: 03**

Unit-I

Simple and Compound interest, Compound interest tables, Present Value, Normal and Effective rates of interest, Effective rate corresponding to a nominal rate and Vice-Versa, Discount and Discounted value, Varying rates of interest, Equation of Value, Equated time of payment.

Additional Inputs: About Institute of Actuaries of India

Unit-II

Repayment of loan by uniform installments when the frequency of installments is the same as that with which interest is convertible, Repayment of loan by uniform installments consisting of both interest and principle repayment, Redemption of Loans by a sinking fund, Lender's sinking fund, Further consideration on redemption of loan, Capital redemption policies, Office premiums, Surrender Value.

Unit-III

Nominal and Effective rates of Discount, Average interest yield on the life fund, Money weighted rate of return, Time Weighted rate of return and linked internal rate of return,.

Unit-IV

Column l_x , Column d_x , Column q_x , Column p_x , The probabilities of survival and death, Stationary population, L_x , T_x , Curate expectation of life, Complete expectation of life, Central death rate M_x , Selection and select rates, Ultimate table, Aggregate table. Construction of Mortality tables, Stages involved in construction of mortality table, The data to be used, Period of investigation, Unit of investigation, The method of investigation, Census method, application of census method to life office data, Determination of exposed to risk and deaths.

Unit-V

Life Assurance premiums-General Considerations, Assurance benefits-Pure Endowment assurance, Endowment assurance, Temporary Assurance or Team assurance, Whole life Assurance, Double Endowment assurance , Increasing Temporary Assurance, Increasing Whole life Assurance, Commutation functions D_x , C_x , M_x , and R_x , Expressions for present values of assurance benefits in terms of Commutation functions, Fixed term (Marriage) Endowment, Educational annuity plan.

Suggested Readings:

1) **An Introduction to Mathematics of finance by J.J.McCUTCHEON and W.F.SCOTT**
2) **Actuarial Mathematics by Bowers Gerber Hickman J. Nesbit**

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CBCS SYLLABUS (Semester Wise) 2018-19
I B.Sc. Statistics/Semester-II (With Mathematics Combination)
Actuarial science
Paper – II-Basics of Financial Mathematics
(MODEL QUESTION PAPER)

Time; 2 1/2hrs **Max Marks: 50**

SECTION-A

Answer any FIVE questions from the following: **5 x4 = 20M**

1. **Explain Types of Interests?**
2. **Write about Discount and Discounted value.**
3. **Explain Capital Redemption Policies.**
4. **Define life Assurance premiums and its benefits?**
5. **Explain about the average Interest yield on the life fund.**
6. **Explain Construction of Life table.**
7. **Write a short note on mortality table?**
8. **Explain about Education Annuity plan?**

SECTION-B

Answer any FOUR questions from the following: **4x8 = 32M**

9.Explain about Normal and Effective rates of Interest.

10.Explain about varying rates of Interest.

11.Explain about Repayment of loan by Uniform installments

12.Define Annuity? And Explain concepts of Annuity?

13. Explain Nominal and Effective rates of Discount

14.Explain about Census method and how do you apply census method to life office Data

15.Give the expressions for present values of assurance benefits in terms of Commutation functions.

SECTION-C

Answer any FOUR questions from the following: 4x2=8M

16. Define Repayment?

17. Define Assurance?

18. What are Office Premiums?

19. Define Life table?

20. Define Force of Interest?

21. What is Equated time of payment?

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CBCS SYLLABUS (Semester Wise) 2018-19

II B.Sc. Statistics/Semester-IV (With Mathematics Combination)

Actuarial science

Paper – IV-SURVIVAL MODELS

Total hrs.Per week: 04 **Total credits: 03**

Unit-I

Principles of modeling: Need, benefits and limitations of models, stochastic and deterministic models, discrete and continuous state spaces and time sets, suitability of model, short term andlong term properties of a model,analysiing the output of a model.

Unit-II

Concepts of Survival Models:The distribution and density functions of the random future lifetime, the survival function, the force of mortality or hazard rate and derive relationships between them, Laws of mortality like Gompertz and Makeham, the distribution and density functions of the curate future lifetime random variable.

Unit-III

Truncation, Censoring mechanisms: Right censoring, Left or interval censoring, random censoring, informative and non-informative censoring, Type one and two censoring, Likelihood construction for censored and truncated data, Kaplan-Meier model, Nelson Aalen model, Cox proportional hazard model, Breslow's approximations to the partial likelihood estimator.

Unit-IV

Maximum likelihood estimator of transitions intensities in Binomial and Poisson model and their mean-variances, advantages and disadvantages of multiple state models and the binomial models, including consistency, efficiency, simplicity of the actuarial estimators and their distributions, application to practical observations and generality.

Unit-V

Initial and central exposed to risks, graduation, purpose and methods of graduation, testing goodness of fit and testing smoothness of a set of graduated estimates, statistical test for comparing a set of crude estimates and a standard table or a set of crude estimates and a set of graduated estimates, effect of duplicate policies on estimates.

References:

U K Institute of Actuaries core reading for subject CT4-Models.
Klein J.P. and Moeschberger, M.L.(2003) Survival Analysis: Techniques for Censored and Truncated Data 2nd Edition, Springer Verlag, New York, Klugman, S.A.(June 2003), "Estimation, Evaluation, and Selection of Actuarial Models".
Dick London (1997), Survival Models and their Estimation, second edition, ACTEX publications.
Cox, D.R. and Oakes, D.(1984) Analysis of Survival Data, Chapman and Hall, NewYork.

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CBCS SYLLABUS (Semester Wise)2018-19

II B.Sc. Statistics/Semester-IV (With Mathematics Combination)

Actuarial Science

Paper – IV-Survival Models

(MODEL QUESTION PAPER)

Time: 3hrs **Max Marks: 60**

SECTION-A

Answer any FIVE questions from the following: 5 x4 = 20M

1. **Explain the discrete and continuous state spaces and time sets.**
2. **Explain the distribution and density functions of the random future life time.**
3. **Describe a test for smoothness of a set of graduated estimates?**
4. **Write the advantages and disadvantages of multiple state models.**
5. **Explain the need for graduation.**
6. **Define Poisson distribution and its model**
7. **Explain about duplicate policies on estimates.**
8. **Define complete and curate expectation of life. Derive the relation between them.**

SECTION-B

Answer any FOUR questions from the following: 4x8 = 32M

9.Explain the Need, benefits and limitations of models

10.Explain short term andlong term properties of a model, and analyzing the output Of a model

11. **State Gompertz and Make ham laws of Mortality.**

12.A mortality table, which obeys Gompertz law for older ages, has μ_{70}= 0.025330 and μ_{90}=0.126255. Find the probability that a life aged 60 will survive for 20 years.

13.Write a brief note on censoring.

14. Derive the maximum likelihood estimator for the rate of mortality in the binomial model and its mean and variance. ?

15. Write statistical properties of maximum likelihood estimates and extending the models

SECTION-C

Answer any FOUR questions from the following: 4x2=8M

16. Define Survival function?

17. Define Force of Mortality?

18. Definestochastic process?

19. Define Truncation?

20. What is Initial and Central exposed risk?

21. Write any four methods to truncate the data?

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CBCS SYLLABUS (Semester Wise) 2018-19

III B.Sc. Statistics/Semester-VI Actuarial science

Paper – VIII-STATUSTICAL TECHNIQUES FOR RESEARCH METHODS

Total hrs.Per week: 04 **Total credits:03**

UNIT I

Introduction: Meaning, objection and motivation in research, types of research, research approach, significance of research. Research problems: definition, selection and necessity of research problems.

UNIT II

Survey Methodology and Data Collection, inference and error in surveys, the target populations, sampling frames and coverage error, methods of data collection, non-response, questions and answers in surveys.

UNIT III

Processing, Data Analysis and Interpretation: Review of various techniques for data analysis covered in core statistics papers, techniques of interpretation, precaution in interpretation.

UNIT IV

Develop a questionnaire, collect survey data pertaining to a research problem (such as gender discriminations in private v/s government sector, unemployment rates, removal of subsidy, impact on service class v/s unorganized sectors), interpret the results and draw inferences.

UNIT V

Interpretation and Report Writing-Meaning, Techniques of interpretation, Significance of Report Writing –Different steps in Writing Report ,Types of Reports ,Oral Presentation, Precautions for Writing Research Reports and Conclusion

SUGGESTED READING:

1. Kothari, C.R. (2009): Research Methodology: Methods and Techniques, 2nd Revised Edition reprint, New Age International Publishers.
2. Kumar, R (2011): Research Methodology: A Step - by - Step Guide for Beginners, SAGE publications.

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CBCS SYLLABUS (Semester Wise) 2018-19

III B.Sc. Statistics/Semester-VI Actuarial science

Paper – VIII SURVIVAL ANALYSIS AND BIO STATISTICS

Total hrs.Per week: 04 **Total credits:03**

UNIT I

Introduction: Meaning, of survival analysis ,Survival distributions and their applications-Exponential, Gamam, weibull, Lognormal and their density functions

UNIT II

Censoring Schemes: type -1 ,types II and Progressive or random censoring with biological examples Estimation mean survival time and variance of the Type -1 and types II Censored data

UNIT III

Competing Risk Theory : Indices for measurement of Probability of death under competition risks and their inter-relations. Estimation of probabilities of death using maximum likelihood principle and modified minimum chi-square methods

UNIT IV

Stochastic epidemic Models : Simple epidemic models, general epidemic model definition and concept duration of an epidemic

UNIT V

Statistical Genetics: Introduction, Concept –Genotype,Phenotype,Dominance Excessiveness ,linkage and recombination ,coupling and repulsion ,Random mating,Gametic array.Distribution of Genotypes under random mating, Clinical trails planning and design of clinical trails ,Phase I,II and III trails .Single Blinding

SUGGESTED READING;

1. Lee E.T and wang J.w(2003) Statistical methods for Survival data Analysis
2. Biswas Applied stochostics Process
3. Medical biostatisticsby Indrayn A (2008)