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UNIVERSITY OF MUMBAI



The revised and modified syllabus

POST-GRADUATE DIPLOMA IN

ACTUARIAL SCIENCE

Department of Statistics

(w.e.f. 2012-13)

**The revised and modified syllabus of
POST-GRADUATE DIPLOMA IN ACTUARIAL SCIENCE**

Scheme of Examination:

Subject	Title	Internal	External	Total
Paper I	Financial Mathematics	40	60	100
Paper II	Finance and Financial Reporting	40	60	100
Paper III	Probability and Mathematical Statistics	40	60	100
Paper IV	Business Economics	40	60	100
Paper V	Contingencies	40	60	100
Paper VI	Statistical Methods	40	60	100
Paper VII	Statistical Models	40	60	100
Paper VIII	Finance and Statistical Economics	40	60	100

First term will consist of first four papers & Second term will consist of next four papers.

Paper –I: FINANCIAL MATHEMATICS

1. Interest rates and factors
2. Level annuities
3. Varying annuities
4. Non-annual interest rates and annuities
5. Project appraisal and loans
6. Financial instruments
7. Duration, convexity and immunization
8. The term structure of interest rates
9. Stochastic interest rates

Reference Books:

1. Baxter, Robert. Finance Mathematics, Medford, OR:Baxter
2. Hart, W. L. Mathematics of Investment, Lexington, MA:D.C.Health, 1975, Fifth edition.
Instructional Materials, 1992. Sixth Edition Revised and Expanded.
3. Karatzas, Ioannis and Shreve, Steven E.,Methods of Mathematical Finance, New York, NY:Springer, 1998.
4. Kellison, Stephen G. The theory of Interest, Homewood, IL: Richard D. Irwin, 1970, 1990. Second Edition.
5. Martin, Peter G. and Burrow, Michael. Applied Financial Mathematics, New York, NY; Sydney: Prentice Hall, 1991.

6. McCutcheon, J. J. and Scott, W. F. An Introduction to Mathematics of Finance
7. Roman, Steven. The Mathematics of Finance, Irvine, CA: Innovative Textbooks, 1993.
8. Ruckman Chris & Francis Joe : Financial Mathematics : A practical guide for Actuaries and other Business professionals
9. UK Institute of Actuaries core reading for the subject CT1 financial mathematics
10. Watsham, Terry J. and Parramore, Keith. Quantitative Methods in Finance, London; Boston, MA: International Thomson Business Press, 1997. First Edition.

Paper-II: FINANCE AND FINANCIAL REPORTING

1. Key principles of finance
2. The basic construction of accounts of different types and principal features of the accounts of company
3. Interpretation of the accounts of a company or a group of companies and limitations of such interpretation
4. The characteristics of the principal form of financial instrument used by companies
5. Definition of company's cost of capital and weighted average cost of capital
6. Factors to be considered by company when deciding on its capital structure and dividend policy
7. Financial techniques used in the assessment of capital investment project
8. Definitions & Residential Status under Income Tax Act, 1961
9. Heads of Income under Income Tax Act, 1961
10. Basic principles of personal taxation under Income Tax Act, 1961
11. Basic principles of company taxation under Income Tax Act, 1961

Reference Books

Foreign Authors

1. Brealey, Richard A and Myers, Stewart C, principles of corporate finance.
2. Brigham, Eugene F Houston, Joel F, Fundamentals of financial management
3. Holmes, Geoffrey and Sugden, Alan, interpreting company reports and accounts
4. Samuels, J.M.; Wilkes, F.M; Bray Shaw, R.E. management of company
5. UK Institute of Actuaries Core Reading for subject CT2 Finance and Financial Reporting

Indian Authors

1. Advanced Accountancy – S.N. Maheshwari ISBN 0706999118
2. Advanced Accounts – M.C. Shukla, T.S. Grewal
3. Financial Accounting – P.C. Tulsian

4. Financial Management – M.Y. Khan, P.K. Jain ISBN 9780070656147
5. Financial Management – Prasanna Chandra ISBN 9780070656659
6. T.N. Manoharan – Tax
7. Vinod Singhanian – Tax

Paper III: PROBABILITY AND MATHEMATICAL STATISTICS

1. Main features of a data set (exploratory data analysis)
2. Concepts of probability
3. Concepts of random variable, probability distribution, distribution function, expected value, variance and higher moments
4. Probability generating function, moment generating function, cumulant generating function and cumulant.
5. Basic discrete and continuous distributions
6. Concept of independence, jointly distributed random variables and conditional distributions, use of generating functions
7. Central limit theorem and its applications
8. Concepts of random sampling, statistical inference and sampling distribution
9. Methods of estimation and properties of estimators
10. Confidence intervals for unknown parameters
11. Testing of hypotheses
12. Correlation and regression analysis
13. Concept of analysis of variance
14. Concepts of conditional expectations and compound distribution

Reference books:

1. Hogg, R., and A. Craig: Introduction to Mathematical Statistics, The Macmillan company, New York, 1959.
Mathematical Statistics with applications, Duxbury, 2002.
2. Mood Alexander M., Graybill Franklin A.:(1950) Introduction to the theory of Statistics Second Edition, McGraw –Hill Book Company Inc.
3. Rohatgi V. K. and A. K. MD. Ehsanes Saleh: An introduction to probability theory and mathematical statistics, 2nd ed. John Wiley and Sons, 2001.
4. UK Institute of Actuaries core reading for reading for subject CT3
Probability and mathematical Statistics
5. Wackerly D. D; Mendenhall III, and Scheffer, R. L.

Paper IV: BUSINESS ECONOMICS

1. Relevance of economics to the world of business.
2. The workings of competitive markets.
3. Consumer demand and behaviour.
4. Firm's decision on product selection and marketing and advertising strategies.
5. Production function, costs of production, revenue and profit in order to understand a firm's price and output decisions.
6. Profit maximisation under perfect competition, imperfect competition and monopoly.
7. Role of a firm's growth strategy on its profitability and survival.
8. Pricing strategies that firms can adopt.
9. Reasons for government intervention in the market.
10. Relationship between the government and the individual firm.
11. Globalisation and multinational business.
12. The importance of international trade.
13. The macroeconomic environment of the business.
14. The Balance of payments and concept of exchange rate determination.
15. The role of money and interest rates in the economy.
16. Determinants of level of business activity and how it affects unemployment and inflation.
17. Macroeconomic policies impact on businesses.
18. Supply side policies impact on businesses.

Reference Books:

1. Business economics. Perman, R.; Scouller, J. Oxford University Press, 1999.
2. Economics. Begg, D. K. H.; Fischer, S.; Dornbusch, R. 9th ed. McGraw-Hill, 2008.
3. Economics. Krugman, P.; Wells, R.; Graddy, K. European ed. Worth, 2007.
4. Economics. Lipsey, R. G.; Chrystal, K. A. 11th ed. Oxford University Press, 2007
5. Economics. Mankiw, N.G.; Taylor, M. P. Thomson, 2006
6. Economics. Parkin, M.; Powell, M.; Matthews, K. 7th ed.
7. Economics. Sloman, J. 6th ed. FT Prentice Hall, 2006. ISBN: Pearson Education, 2007.
8. Economics for business. Begg, D. K. H.; Ward, D. 2nd ed. McGraw-Hill, 2007.
9. Essentials of economics. Sloman, J. 4th ed. FT Prentice Hall, 2006.
10. Institute of Actuaries core reading for the subject CT7 economic

Paper V: CONTINGENCIES

1. Simple assurance and annuity contracts
2. Practical methods of evaluating expected values and variances of the simple contracts
3. Life Tables.
4. Variable benefits and annuities.
5. Gross premiums and reserves.
6. Joint life and last survivor status.
7. Multiple decrements.
8. Profit Testing
9. Factors affecting mortality.

Reference Books:

1. Benjamin, Bernard and Pollard, John H., The analysis of mortality and other actuarial statistics. 3rd ed. Institute of Actuaries and Faculty of Actuaries, 1993
2. Booth, P. M. al., Modern actuarial theory and practice, Chpaman &Hall,1999
3. Bowers, Newton L et al., Actuarial Mathematics 2nd ed. Society of Actuaries, 1997.
4. Gerber, H. U.,Life insurance mathematics 3rd ed. Springer , Swiss Association of Actuaries, 1997
5. Haberman, S. and Pitacco, E., Actuarial models for disability insurance Cahpman & Hall, 1999
6. Life Contingencies – A guide for the Actuarial Student – by Robert W Batten
7. Life Contingencies- by C. W. Jordon (Chester Wallance Jordon)
8. Neill,Alistair, Life contingencies. Heinemann, 1977
9. Theory of Interest and Life Contingencies with Pension Applications: A problem solving approach- by Michael M. Parmenter
10. UK Institute of Actuaries Core Reading for subject CT5 contingencies.

Paper VI: STATISTICAL METHODS

1. Claims Reserving and Pricing with Run-off Triangles
2. Loss Distribution
3. Risk Theory
4. Ruin theory
5. Credibility Theory
6. No claim discounting in Motor Insurance
7. Generalized Linear Model
8. Decision and Game Theory
9. The main concepts underlying the analysis of time series models
10. Concepts of “Monte Carlo” simulation

Reference Books:

1. Bolan Philip J. – Statistical and Probabilistic Methods in Actuarial Science
Chapman and Hall/CRC
2. Box G.E.P. and Jenkin's : Time series analysis forecasting and control
3. Morgan B.J.T. Elements of simulation, Chapman & Hall, 1995.
4. UK Institute of Actuaries core reading for subject CTVI statistical methods
5. Ross S. M. Introduction to Probability Models- 7th Edition
Academic Press/Harcourt 2000

Paper VII: STATISTICAL MODELS

1. Principles of Stochastic Processes, their classification into different types
2. Markov Chains
3. Two state Markov Model
4. General Markov Model
5. Markov Jump Process
6. Survival Models and life tables
7. Estimating lifetime distribution function
8. The Cox regression model
9. The binomial and poison Model
10. Exposed to risk
11. Graduation and Statistical tests
12. Methods of graduation.
13. Ross Models: From Data to decisions (third edition)(2008), Klugman S.A.,
Panjer H.H., and Willmot, G.E.

Reference Books:

1. Bain L. J.: Statistical Analysis of reliability and life testing models
2. Bhat Narayan U. & Miller Gregory K (2002): Elements of applied
Stochastic Processes Third edition, John Wiley and sons
3. Durrett R.: Essentials of Stochastic Processes
4. Kulkarni V. G.: Modelling and analysis of stochastic systems.
5. Medhi J.: Stochastic Processes, Wiley Eastern Ltd, 2nd Edition 1994
6. Ross S. M.: Introduction to Probability Models
7. Smith P. J. : Analysis of failure and Survival data
8. UK Institute of Actuaries core Reading for Subject CT4 Models

Paper VIII: FINANCIAL AND STATISTICAL ECONOMICS

1. Mechanics of Future Market & Hedging Strategies
2. Interest Rate
3. Determination of Forward and Future Prices

4. Interest Rate Futures, Swaps
5. Mechanics of options Markets
6. Properties of Stock Options, Trading Strategies involving options
7. Binomial Trees, Wiener Procedures and Ito's Lemma
8. The Black-Scholes-Merton Model
9. Basic Numerical Procedures, Credit Risk
10. Martingales and Measures, Interest Rate Derivatives: the standard market models

Reference Books:

1. Elton Edwin J. and Gruber Martin J. (1997): Modern Portfolio Theory and Investment analysis 7th edition, John Wiley & Sons
2. Hull John C. (2006): Options, Future and other Derivatives 8th Edition
3. Panjer Hary H. (1998): Financial Economics

