OLD SCHEME

Scheme of Examination of
5-Years Integrated M.Sc. (Honours) Mathematics, Semester-III
(only for the session 2010-2011)

Paper Code	Title of the paper	Teaching Hours	Max. Marks			Total Marks
			Theory	Internal Assesment	Practicals	
MHM 231	Advanced Calculus	4 Hours/ week	90	10	-	100
MHM 232	Partial Differential Equations	4 Hours/ week	90	10	-	100
MHM 233	Statics	4 Hours/ week	90	10	-	100
MHM 234	Opt (i) Probability Theory + Opt (ii) Principles of Computer Sciences-I++	4 Hours/ week	90	10	-	100
MHM 235	Advanced Number Theory	4 Hours/ week	90	10	-	100
MHM 236	Opt (i) Data and File Structure-I*	4 Hours/ week	40	5	-	45
	Opt (ii) Elementary Inference*	4 Hours/ week	45	5	-	50
MHM 237	Opt (i) Object Oriented Design and C++ - I*	4 Hours/ week	40	5	-	45
	Opt (ii) Sample Survey*	4 Hours/ week	45	5	-	50
MHM 238	Practical/ Computational Work Opt (i) Based on MHM 236 (i) and MHM 237(i)*	4 Hours/ week	-		60	60
	Opt (ii) Based on MHM 236 (ii) and MHM 237(ii)*	4 Hours/ week	-		50	50

* The syllabi of the papers MHM 236, MHM 237 and MHM 238 shall be the same as that of the corresponding syllabi for the pass course of B.Sc. Semester-III .

+ Option is not allowed to students offering Statistics as a subsidiary subject.

++ Option is not allowed to students offering Computer Science as a subsidiary subject.

Note: 1. Other requirements of the languages and/or qualifying subjects, if any, will remain the same as approved by the University for the Honours courses.

2. The option of the papers MHM 236, MHM 237 and MHM 238 shall correspond with the similar option exercised for the papers MHM 116, MHM 117 and MHM 118 of Semester-I of the Course.

3. The other conditions will remain the same as per relevant Ordinance and rules and regulations of the University.

Advanced Calculus

Code: MHM 231

Max. Marks: 90
Time : 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.

Section – II

Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions and implicit functions. Change of variables. Homogenous functions and Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.

Section – III

Differentiability of real valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.

Section – IV

Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. Locus of the centre of curvature, Spherical curvature, Locus of centre of Spherical curvature, Involutes, evolutes, Bertrand Curves. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes.

Books Recommended:

1. C.E. Weatherburn : Differential Geometry of three dimensions, Radhe Publishing House, Calcutta
2. Gabriel Klaumber : Mathematical analysis, Mrcel Dekkar, Inc., New York, 1975
3. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
4. Gorakh Prasad : Differential Calculus, Pothishala Pvt. Ltd., Allahabad
5. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan : A Course in Mathemtical Analysis, S.Chand and company, New Delhi
7. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York

Partial Differential Equations

Code: MHM 232

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

Section – II

Linear partial differential equations of second and higher orders, Linear and non-linear homogenious and non-homogenious equations with constant co-efficients, Partial differential eqution with variable co-efficients reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.

Section – III

Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.

Section – IV

Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation, Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Books Recommended:

1. D.A.Murray: Introductory Course on Differential Equations, Orient Longman, (India), 1967
2. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
4. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
5. Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972
6. J.N. Sharma and Kehar Singh : Partial Differential Equations

Statics

Code: MHM 233

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Composition and resolution of forces. Parallel forces. Moments and Couples.

Section – II

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.

Section – III

Virtual work. Forces in three dimensions. Poinsots central axis.

Section – IV

Wrenches. Null lines and planes. Stable and unstable equilibrium.

Books Recommended:

1. S.L. Loney : Statics, Macmillan Company, London
2. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

Probability Theory

Code: MHM 234 [Opt (i)]

Max. Marks : 90
Time : 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Concepts in Probability: Random experiment, trial, sample point, sample space, operation of events, exhaustive, equally likely and independent events; Definition of probability—classical, relative frequency, statistical and axiomatic approach; Addition and multiplication laws of probability; Boole's inequality.

Section – II

Bayes' theorem and its applications.

Random Variable and Probability Functions : Definition and properties of random variables, discrete and continuous random variable, probability mass and density functions, distribution function.

Section – III

Concepts of bivariate random variable: joint, marginal and conditional distributions.

Mathematical Expectation: Definition and its properties –moments, measures of location, dispersion, skewness and kurtosis.

Section – IV

Generating Functions: Moment generating functions, cumulant generating function, along with their properties and uses.

Tchebychev's inequality, Convergence in probability, Weak and strong laws of large numbers (Statements only).

Books recommended:

1. S.M. Ross, Introduction to Probability Models (Sixth edition) Academic Press, 1997.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2002.
3. A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the theory of Statistics, McGraw Hill, 1974.
4. P.L.Meyer, Introductory Probability and Statistical Applications, Addison-Wesley Publishing Company, 1970.
5. Baisnab and M. Jas, Element of Probability and statistics, Tata McGraw Hill.
6. J.L. Devore, Probability and Statistics for Engineers, Cengage Learning India Private Limited, 2008.

Principles of Computer Sciences-I

Code: MHM 234 [Opt (ii)]

Max. Marks : 90
Time : 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Data Storage – Storage of bits. Main Memory. Mass storage. The Binary System, Storing integers, Storing fractions.

Data Manipulation – The Central Processing Unit. The Stored – Program Concept. Programme Execution.

Section – II

Arithmetic/Logic Instructions. Computer-Peripheral Communication. Operating System and Networks – The Evolution of Operating System. Operating System Architecture. Coordinating the Machine's Activities.

Section – III

Networks and Network Protocol. Algorithms – The Concept of an Algorithm. Algorithm Representation. Iterative Structures. Recursive Structures. Efficiency and Correctness.

Section – IV

Programming Languages – Historical Perspective. Traditional Programming Concepts, Program Units. Language Implementation. Parallel Computing. Declarative Computing.

Books Recommended

1. J. Glen Brookshear, Computer Science : An Overview, Addition – Wesley.
2. Rajaraman V., "Fundamentals of Computers", Prentice Hall of India.
3. Schaum's Outline Series, Data Structures, Tata McGraw Hill.
4. Gill, N.S., Essentials of Computer and Network Technology, Khanna Publishing Co.
5. Mano M., Computer System Architecture, Prentice Hall of India.
6. Leon and Leon, "Fundamental of Computer Science and Communication Engineering", Leon Techworld.
7. Pressman, "Software Engineering", Tata McGraw Hill.
8. Tannenbaum, "Operating System Concept", Prentice Hall of India.
9. Gills, N.S., "Software Engineering", Pub. Co., Khanna Pub. Co.

Advanced Number Theory

Code: MHM 235 **Max. Marks : 90**
Time : 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections ***(I-IV)*** will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Unit-I

Congruences and residues, Elementary results for congruences. The ϕ-function and reduced residue systems. Multiplicity of ϕ-function. Formula for $\phi(n)$. The order of an integer (modulo m). Necessary and sufficient condition for a linear congruence $ax \equiv b \pmod{m}$ to have a solution. Number of solutions of the linear congruence. Wilson's Theorem and Eulers criterion and Chinese Remainder Theorem.

Unit-II

Polynomial congruences. Polynomial congruences modulo a prime. Polynomial congruences modulo a power of a prime and their solutions. Primitive roots and their existence. Fundamental theorem of primitive roots.

Unit-III

Quadratic residues. The Legendre symbol. Elementary results for the Legendre symbol. Lemma of Gauss. Law of Quadratic Reciprocity. (Both the Number Theoretic and Geometrical proofs). Arithmetical functions. Mobius inversion formula and its applications.

Unit-IV

Finite continued fractions. Finite simple continued fractions. Expansion of a rational number into a finite simple continued fraction. The uniqueness of simple continued fraction if the last term is bigger than 1, partial quotients and its elementary properties, use of continued fractions to solve the equation $ax+by = 1$, Infinite irrational number into an infinite s.c.f., uniqueness of infinite s.c.f., complete quotients. Farey sequences and their application to approximation of irrationals by rationals Hurwitz's Theorem.

Books Recommended

1. David M. Burton, Elementary Number Theory, Wm. C. Brown Publishers, Dubuque, Iowa, 1989.
2. K. Ireland, and M. Rosen, A Classical Introduction to Modern Number Theory, GTM Vol. 84, Springer-Verlag, 1972.
3. G.A. Jones, and J.M. Jones, Elementary Number Theory, Springer, 1998.
4. W. Sierpinski, Elementary Theory of Numbers, North-Holland, 1988, Ireland.
5. K. Rosen and M. Rosen, A Classical Introduction to Modern Number Theory, GTM Vol. 84. Springer-Verlag, 1972.
6. I. Niven, S.H. Zuckerman, and L.H. Montgomery, A Introduction to the Theory of Numbers, John Wiley, 1991.
7. Car-Michael, R.D., The Theory of Numbers, John Wiley and Sons.
8. Davenport, H., The Higher Arithmetic, Hutchinson University Library.
9. Hardy, G.H. and E.M. Wright, An Introduction to the Theory of Numbers, Oxford.

Data and File Structures - I

Code: MHM 236 [Opt (i)]

Max. Marks : 40
Time : 3 Hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from each Unit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Data structure and its essence, Data structure types.
Linear and list structures: Arrays, stacks, queues and lists; Sequential and linked structures; Simple lists, circular lists, doubly linked lists.

Unit-II

Inverted lists, threaded lists, Operations on all these structures and applications. Arrays; Multidimensional arrays, sequential allocation, address calculations, sparse arrays.

Unit-III

Tree structures: Trees, binary trees and binary search trees. Implementing binary trees, Tree traversal algorithms, threaded trees, trees in search algorithms, AVL Trees, Polish notation and expression trees.

Suggested Readings:

1. Lipschutz: Data Structures (Schaum's Outline Series), Tata McGraw-Hill.
2. Adam Drozdek: Data Structures and Algorithms in C++, Vikas Pub. House (Thmpson), New Delhi.
3. Gupta Amit: Data Structures Through C, Galgotia Booksource Pvt. Ltd., New Delhi.
4. Sofat S.: Data Structures With C and C++, Khanna Book Pub. Co.(P) Ltd, N. Delhi.
5. Dromey R.G: How to Solve it by Computer ?, Prentice Hall India.
6. Loomis: Data Structure and File Management, Prentice-Hall India Ltd.
7. Tannenbaum: Data Structure Using C, Tata McGraw-Hill.

Elementary Inference

Code: MHM 236 [Opt (ii)]

Max. Marks : 45
Time : 3 hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Three Questions)

Statistical Estimation: Parameter and statistic, sampling distribution of statistic. Point estimate of a parameter, concept of bias and standard error of an estimate. Standard errors of sample mean, sample proportion, standard deviation, Unbiasedness, Efficiency, Consistency and Sufficiency.

Section-II (Three Questions)

Methods of Estimation: Method of moments and maximum likelihood
Testing of Hypotheses: Null and alternative hypotheses. Simple and composite hypotheses, critical region, level of significance, one tailed and two tailed testing, Types of errors, Neyman- Pearson Lemma, Test of simple hypothesis against a simple alternative in case of Binomial, Poisson and Normal distribution.

Section-III (Two Questions)

Large Sample Test: Testing and interval estimation of a single mean and a single proportion and difference of two means of two proportions. Fisher's Z transformation.

Books Suggested:

1. Hogg, R.V. and A.T. Craig: Introduction to Mathematical Statistics.
2. Mood, A.M. and Graybill, F.A.: Introduction to the theory of Statistics

Object Oriented Design and C++ - I

Code: MHM 237 [Opt (i)]

Max. Marks : 40
Time : 3 Hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from each Unit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Object-Oriented Concepts: Data abstraction, encapsulation, classes and objects, modularity, hierarchy, typing, concurrency, persistence.

Unit-II

Object-Oriented Methodology: Advantages and disadvantages of OO methodologies. Modeling, Domain analysis. OMT Methodology- Object Model, links and associations, multiplicity, link attributes, role names, ordering qualification, aggregation, generalization and inheritance, abstract class, meta data, object diagram.

Unit-III

Dynamic Model-events, states, scenarios, event traces, state diagram. Functional Model-data flow diagrams. Analysis, system design and object design.

Suggested Readings:

1. Balagurusamy, E.: Object-Oriented Programming With C++, Tata McGraw-Hill.
2. Subburaj, R.: Object-Oriented Programming With C++, Vikas Pub. House, New Delhi.
3. Rumbaugh, J. et. al.: Object-Oriented Modelling and Design, Prentice Hall of India.
4. Booch, Grady: Object-Oriented Analysis & Design, Addison Wesley.
5. Chndra, B.: Object Oriented Programming Using C++, Narosa Pub. House, New Delhi.
6. Stroustrup, B.: The C++ Programming Language, Addison-Wesley.
7. Lippman: C++ Primer, 3/e, Addison-Wesley.
8. Schildt, Herbert: C++: The Complete Reference, 2/e, Tata McGraw-Hill

Sample Survey

Code: MHM 237 [Opt (ii)]

Max. Marks : 45
Time : 3 Hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Two Questions)

Concepts of census and sample survey, basic concepts in sampling. Sampling and Non-sampling errors. Principal steps involved in a sample survey; bias, precision and accuracy and mean squared errors.

Section-II (Three Questions)

Some basic sampling methods-simple random sampling (SRS) with and without replacement. Use of random number tables, estimator of mean and its variance in case of simple random sampling. Estimators of proportions and ratios.

Section-III (Three Questions)

Stratified random sampling, estimation of population mean, variance of the estimate of population mean of stratified random sampling, allocation of sample size, proportional allocation, optimum allocation, comparison of stratified random sampling with simple random sampling, systematic random sampling and its various results about variance.

Books Suggested:

1. Goon, A.M., Gupta, M.K., and B. Das Gupta: Fundamentals of Statistics, Vol-II.
2. Daroga Singh and F.S. Chaudhary: Theory and Analysis of Sample Surveys

Practical/Computational Work

Code: MHM 238 [Opt (i)]
[Based on papers MHM 236 [Opt (i)] and MHM 237 [Opt (i)]]

Max Marks : 60
Time : 4 Hrs

Note:

i) Practical : 45 Marks
(Implementation of data structure in C and Programming in C++)

ii) Viva-voce : 15 Marks

Practical/Computational Work

Code: MHM 238 [Opt (ii)]

[Based on papers MHM 236 [Opt (ii)] and MHM 237 [Opt (ii)]]

Max. Marks: 50

i) Written Practical/ Lab Work : 40 Marks

ii) Viva-voce and Practical Record : 10 Marks

Time: 3 hours

Note: The examiner is requested to set **4(four)** experiments. The candidate is required to attempt **2(two)** of the allotted experiments.

At least the following practicals are required to be done by the students during the Third Semester:

1. To apply large sample test of significance for single proportion and difference of two proportions and obtain their confidence intervals.
2. To apply large sample test of significance for single mean and to obtain confidence interval.
3. To apply large sample test of significance for difference between two means and standard deviations.
4. To estimate population total from the given sampled data and obtain confidence interval for population total.
5. To find standard error of estimate of population total for a given grouped frequency distribution for the population by:
   (a) Selecting a sample random sample of some specified size n (say).
   (b) Selecting a sample of size n (say) that include some particular number of observations k (say) of the population and which is a simple random sample of size n-k from the remaining observation of population.
6. To estimate the total number of words in a dictionary using simple random sampling.
7. To divide the given population into two/three strata and then selecting sample of given size, find the S.E. of estimate of population total for:
   (a) Stratified sampling with proportional allocation
   (b) Stratified sampling with given number of units drawn from each stratum.
8. To estimate the total number of words in a dictionary using stratified random sampling. Also find S.E. of the estimate.

OLD SCHEME

Scheme of Examination of
5-Years Integrated M.Sc. (Honours) Mathematics, Semester-IV
(only for the session 2010-2011)

Paper Code	Title of the paper	Teaching Hours	Max. Marks			Total Marks
			Theory	Internal Assesment	Practicals	
MHM 241	Sequences and Series	4 Hours/ week	90	10	-	100
MHM 242	Special Functions and Integral transforms	4 Hours/ week	90	10	-	100
MHM 243	Programming in C and Numerical Methods	4 Hours/ week	60	-	40	100
MHM 244	Opt (i) Probability Distributions+ Opt (ii) Principles of Computer Sciences-II++	4 Hours/ week	90	10	-	100
MHM 245	Differential Geometry	4 Hours/ week	90	10	-	100
MHM 246	Opt (i) Data and File Structures-II*	4 Hours/ week	40	5	-	45
	Opt (ii) Parametric and non-parametric tests*	4 Hours/ week	45	5	-	50
MHM 247	Opt (i) Object Oriented Design and C++ -*	4 Hours/ week	40	5	-	45
	Opt (ii) Design of Experiments*	4 Hours/ week	45	5	-	50
MHM 248	Practical/ Computational Work Opt (i) Based on MHM 246 (i) and MHM 247(i)	4 Hours/ week	-		60	60
	Opt (ii) Based on MHM246 (ii) and MHM 247(ii)	4 Hours/ week	-		50	50

* The syllabi of the papers MHM 246, MHM 247 and MHM 248 shall be the same as that of the corresponding syllabi for the pass course of B.Sc. Semester-IV.

+ Options are not allowed to students offering Statistics as a subsidiary subject.

++ Option is not allowed to students offering Computer Science as a subsidiary subject.

Note: 1. Other requirements of the languages and/or qualifying subjects, if any, will remain the same as approved by the University for the Honours courses.

2. The option of the papers MHM 246, MHM 247 and MHM 248 shall correspond with the similar option exercised for the papers MHM 116, MHM 117 and MHM 118 of Semester-I of the Course. 3. The other conditions will remain the same as per relevant Ordinance and rules and regulations of the University.

Sequences and Series

Code: MHM 241

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set, closure of a set in real numbers and their properties. Bolzano-Weiestrass theorem, Open covers, Compact sets and Heine-Borel Theorem.

Section – II

Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Subsequential limits.

Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series, Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series.

Section – III

Infinite series: D-Alembert's ratio test, Raabe's test, Logarithmic test, de Morgan and Bertrand's test, Cauchy's n^{th} root test, Gauss Test, Cauchy's integral test, Cauchy's condensation test.

Section – IV

Alternating series, Leibnitz's test, absolute and conditional convergence, Arbitrary series: abel's lemma, Abel's test, Dirichlet's test, Insertion and removal of parenthesis, re-arrangement of terms in a series, Dirichlet's theorem, Riemann's Re-arrangement theorem, Pringsheim's theorem (statement only), Multiplication of series, Cauchy product of series, (definitions and examples only) Convergence and absolute convergence of infinite products.

Books Recommended:

1. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
2. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
3. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
4. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
5. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. Earl D. Rainville, Infinite Series, The Macmillan Co., New York

Special Functions and Integral Transforms

Code: MHM 242

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Series solution of differential equations – Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.

Section – II

Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orhogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre and Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

Section – III

Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, solution of ordinary differential equations using Laplace transform.

Section – IV

Fourier transforms: Linearity property, Shifting, Modulation, Convolution Theorem, Fourier Transform of Derivatives, Relations between Fourier transform and Laplace transform, Parseval's identity for Fourier transforms, solution of differential Equations using Fourier Transforms.

Books Recommended:

1. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
2. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
3. I.N. Sneddon : Special Functions on mathematics, Physics and Chemistry.
4. W.W. Bell : Special Functions for Scientists and Engineers.
5. I.N. Sneddon: the use of integral transform, McGraw Hill, 1972
6. Murray R. Spiegel: Laplace transform, Schaum's Series

Programming in C and Numerical Methods

Code: MHM 243

Part-A (Theory) **Max. Marks: 60**

Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions.

Section – II

Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement and Case control structures. Functions, Preprocessors and Arrays.

Section – III

Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Pointers Data type, Pointers and Arrays, Pointers and Functions.

Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number, Order of convergence of above methods.

Section – IV

Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1998
4. Babu Ram: Numerical Methods, Pearson Publication.
5. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
6. M.K. Jain, S.R.K.Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
7. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
8. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
9. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.

Part-B (Practical)

Max. Marks: 40
Time: 3 Hours

There will be a separate practical paper which will consist of simple programs in C and the implementation of Numerical Methods, studied in the paper MHM 243 (Part-A).

Probability Distributions

Code: MHM 244 [Opt (i)]

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Discrete uniform, Bernoulli, binomial and Poisson distributions with their properties.

Section – II

Negative binomial, geometric, multinomial and hyper-geometric distributions with their properties.

Section – III

Uniform, gamma, beta (first and second kind) and exponential distributions with their properties.

Section – IV

Normal distribution with its properties. Central Limit Theorem (Statement only) and its applications..

Books recommended:

1. S.M. Ross, Introduction to Probability Models (Sixth edition) Academic Press, 1997.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2002.
3. A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the theory of Statistics, McGraw Hill, 1974.
4. P.L.Meyer, Introductory Probability and Statistical Applications, Addison-Wesley Publishing Company, 1970.
5. R.P.Hooda, Statistics for Business and Economics, MACMILLAN INDIA LTD., 2003.

Principles of Computer Science-II

Code: MHM 244 [Opt (ii)]

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Software Engineering – The Software Engineering Discipline. The Software Life Cycle. Modularity. Development Tools and techniques. Documentation. Object-Oriented Programming.

Section – II

Data Structures – Arrays. Lists. Stacks. Queues. Trees. Customised Data Types.

Section – III

File Structure – Sequential Files. Text Files. Indexed Files. Hashed Files. The Role of the Operating System.

Database Structure – General Issues. The Relational Model.

Section – IV

Object-Oriented Database. Maintaining Database Integrity. E-R models.

Theory of Computation – Turing Machines. Computable functions. A Non computable Function. Complexity and its Measures. Problem Classification.

Books Recommended:

1. J. Glen Brookshear, Computer Science : An Overview, Addition – Wesley.
2. Rajaraman V., "Fundamentals of Computers", Prentice Hall of India.
3. Schaum's Outline Series, Data Structures, Tata McGraw Hill.
4. Gill, N.S., Essentials of Computer and Network Technology, Khanna Publishing Co.
5. Mano M., Computer System Architecture, Prentice Hall of India.
6. Leon and Leon, "Fundamental of Computer Science and Communication Engineering", Leon Techworld.
7. Pressman, "Software Engineering", Tata McGraw Hill.
8. Tannenbaum, "Operating System Concept", Prentice Hall of India.
9. Gills, N.S., "Software Engineering", Pub. Co., Khanna Pub. Co.

Differential Geometry

Code: MHM 245

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

One Parameter family of Surfaces : Envelope, Characteristics , edge of regression , Developable surfaces.

Developables Associated with a Curve : Osculating developable, Polar developable, Rectifying developable.

Section – II

Two- parameter Family of Surfaces: Envelope, Characteristics points,

Curvilinear coordinates, First order magnitudes, Directions on a surface, The normal, Second order magnitudes, Derivatives of **n**.

Section III

Curves on a Surface: Principal directions and curvatures, First and second curvatures, Euler's theorems, Dupin's indicatrix, The surfaces z = f(x,y), Surface of revolution.Conjugate directions, Conjugate systems.Asymptotic lines, Curvature and torsion,Isometric parameters, Null lines, or minimal curves.

Section IV

Geodesics and Geodesic Parallels: Geodesics: Geodesic property, Equation of Geodesics, Surface of revolution, Torsion of Geodesic.

Curves in Relation to Geodesics: Bonnet's theorem, Joachimsthal's theorems, Vector curvature, Geodesic curvature, κ_g, Other formulae for κ_g, Bonnet's formula.

Books Recommended:

1. Weatherburn, C.E., Differential Geometry of Three Dimensions, Radhe Publishing House.
2. Erwin Kreyszig, Differential Geometry.
3. Singh, A.K., Mittal, P.K., A Textbook of Differential Geometry, Har-Anand Publications.

Data and File Structures – II

Code: MHM 246 [Opt (i)]

Max. Marks : 40
Time : 3 Hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from each Unit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Graph data structure and their applications. Graph traversals, shortest paths, spanning trees and related algorithms.
Family of B-Trees: B-tree, B*-Trees, B+ Trees.

Unit-II

Sorting: Internal and External sorting. Various sorting algorithms, Time and Space complexity of algorithms.
Searching techniques and Merging algorithms. Applications of sorting and searching in computer science.

Unit-III

Physical storage devices and their characteristics, constituents of a file viz. Fields records, fixed and variable length records, primary and secondary keys.
File operations, Basic file system operations, File Organizations serial sequential, Indexed sequential, Direct, inverted, multilist. Hashing functions and collision handling methods.

Suggested Readings:

1. Lipschutz: Data Structures (Schaum's Outline Series), Tata McGraw-Hill.
2. Adam Drozdek: Data Structures and Algorithms in C++, Vikas Pub. House (Thmpson), New Delhi.
3. Gupta Amit: Data Structures Through C, Galgotia Booksource Pvt. Ltd., New Delhi.
4. Sofat S.: Data Structures With C and C++, Khanna Book Pub. Co.(P) Ltd, N. Delhi.
5. Dromey R.G: How to Solve it by Computer ?, Prentice Hall India.
6. Loomis: Data Structure and File Management, Prentice-Hall India Ltd.
7. Tannenbaum: Data Structure Using C, Tata McGraw-Hill.

Parametric and Non-Parametric Tests

Code: MHM 246 [Opt (ii)]

Max. Marks: 45
Time : 3 hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Two Questions)

Chi-square distribution: Definition, derivation of y^2 distribution, moment generating function, Cumulant generating function, mean mode, skweness, additive property, conditions for the validity of chi-square, Pearson's chi-square test for goodness of fit. Contingency table, coefficient of contingency, test of independence of attributes in a contingency table.

Section-II (Three Questions)

t and F statistics: Definition of Student's 't' and Fisher's 't', derivation of Student's 't' distribution, distribution of Fisher's 't' , constant of t-distribution, limiting form and graph of t-distribution. Definition and derivation of Snedcor's F-distribution, constants of F-distribution, mode of F-distribution. Testing for the mean and variance of univariate normal distributions, testing of equality of two means and testing of equality of two variances of two univariate normal distributions. Related confidence intervals. Testing for the significance of sample correlation coefficient in sampling from bivariate normal distribution.

Section-III (Three Questions)

Nonparametric Tests: Definition of order statistics and their distributions, Non-parametric test: Sign test for univariate and bevariate distribution, run test and median test.

Books Suggested:

1. Goon, A.M., Gupta, M.K., and B. Das Gupta: Fundamentals of Statistics, Vol-II.
2. Mood, A.M. and Graybill, F.A.: Introduction to the theory of Statistics
3. Hogg, R.V. and A.T. Craig: Introduction to Mathematical Statistics.

Object Oriented Design and C++ - II

Code: MHM 247 [Opt (i)]

Max. Marks : 40
Time : 3 Hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from each Unit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Fundamentals of C++, Data types, structs vs classes, static data and member function, constant parameters and member functions, friend functions and friend classes, control statements, arrays and pointers.

Unit-II

Role of constructors and destructors, dynamic objects, operator overloading, function overloading, inheritance, virtual functions, abstract class, virtual class, template functions and template classes.

Unit-III

Exception handling, Files and streams, stream classes, data structures using C++, ASCII and Binary files, sequential and random access to a file. Program development in C++.

Suggested Readings:

1. Balagurusamy, E.: Object-Oriented Programming With C++, Tata McGraw-Hill.
2. Subburaj, R.: Object-Oriented Programming With C++, Vikas Pub. House, New Delhi.
3. Rumbaugh, J. et. al.: Object-Oriented Modelling and Design, Prentice Hall of India.
4. Booch, Grady: Object-Oriented Analysis & Design, Addison Wesley.
5. Chndra, B.: Object Oriented Programming Using C++, Narosa Pub. House, New Delhi.
6. Stroustrup, B.: The C++ Programming Language, Addison-Wesley.
7. Lippman: C++ Primer, 3/e, Addison-Wesley.
8. Schildt, Herbert: C++: The Complete Reference, 2/e, Tata McGraw-Hill

Design of Experiments

Code: MHM 247 [Opt (ii)]

Max. Marks: 45
Time: 3 hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Three Questions)

Analysis of variance (ANOVA), definition, assumptions of ANOVA test, one-way and two-way classifications for fixed effect model with one observation per cell. Introduction to design of experiment, terminology, Experiment, treatment, experimental unit, blocks, experimental error, replication, precision, efficiency of a design, need for design of experiments, size and shape of plots and blocks.

Section-II (Three Questions)

Fundamental principles of design, randomization, replication and local control, completely randomized design, randomized Block Design, their layout, statistical analysis, applications, advantages and dis-advantages and efficiency or RBD raltive to CRD.

Section-III (Two Questions)

Latin square design (LSD), standard Latin square design, layout of LSD, its statistical analysis, applications, merits and de-merits. Factorial design- 2^2 and 2^3 designs, illustrations, main effects and interaction effects, Yate's method for computing main and interaction effects.

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Books Suggested:

1. Goon, A.M., Gupta, M.K., and B. Das Gupta: Fundamentals of Statistics, Vol-II.
2. Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics, Sultan Chand & Sons.

Practical/Computational Work

Code: MHM 248 [Opt (i)]
[Based on papers MHM 246 [Opt (i)] and MHM 247 [Opt (i)]]

Max Marks : 60
Time : 4 Hrs

Note:

i) Practical : 45 Marks
(Implementation of data structure in C and Programming in C++)

ii) Viva-voce : 15 Marks

Practical/Computational Work

Code: MHM 248 [Opt (ii)]

[Based on papers MHM 246 [Opt (ii)] and MHM 247 [Opt (ii)]]

Max. Marks: 50

i) Written Practical/ Lab Work : 40 Marks

ii) Viva-voce and Practical Record : 10 Marks

Time: 3 hours

Note: The examiner is requested to set **4(four)** experiments. The candidate is required to attempt **2(two)** of the allotted experiments.

At least the following practicals are required to be done by the students during the Fourth Semester:

1. To apply t-test for testing single mean and difference between means and to obtain their confidence intervals.
2. To apply paired t-test for difference between two means.
3. To apply Chi-square test for goodness of fit.
4. To apply Chi-square test for independence of attributes.
5. To apply test of significance of sample correlation coefficient.
6. To apply F-test for testing difference of two variances.
7. To apply sign test for the given data.
8. To apply Run test for the given data.
9. To apply Median test for the given data.
10. To apply Mann – Whitney test for the given data.
11. To perform ANOVA in case of CRD and test whether the treatments/verities are equally effective.
12. For an RBD, construct an ANOVA table and test:
    (a) Whether row effects are equal.
    (b) Whether column effects are equal.
13. Perform ANOVA for an LSD and test whether the treatments/rows/columns effects are equal.
14. To analyse 2^2 and 2^3 factorial designs.

OLD SCHEME

Scheme of Examination of
5-Years Integrated M.Sc. (Honours) Mathematics Semester-V
(only for the session 2011-2012)

Paper Code	Title of the paper	Teaching Hours	Max. Marks			Total marks
			Theory	Internal Assesment	Practicals	
MHM 351	Real Analysis	4 Hours/ week	90	10	-	100
MHM 352	Groups and Rings	4 Hours/ week	90	10	-	100
MHM 353	Numerical Analysis	4 Hours/ week	60	-	40	100
MHM 354	Integral Equations	4 Hours/ week	90	10	-	100
MHM 355	Fluid Dynamics	4 Hours/ week	90	10	-	100
MHM 356	Opt (i) Database Management System, Oracle and Visual Basic -I *	4 Hours/ week	40	5	-	45
	Opt (ii) Applied Statistics*	4 Hours/ week	45	5	-	50
MHM 357	Opt (i) Software Engineering -I*	4 Hours/ week	40	5	-	45
	Opt (ii) Numerical Methods and Fundamentals of Computers	4 Hours/ week	45	5	-	50
MHM 358	Practicals/ Computational work Opt (i) Based on MHM356 (i) and MHM 357 (i)*	4 Hours/ week	-		60	60
	Opt (ii) Based on MHM356 (ii) and MHM 357 (ii)*	4 Hours/ week	-		50	50

* The syllabi of the papers MHM 356, MHM 357 and MHM 358 shall be the same as that of the corresponding syllabi for the pass course of B.Sc. Semester-V.

Note: 1. Other requirements of the languages and/or qualifying subjects, if any, will remain the same as approved by the University for the Honours course.
2. The option of the papers MHM 356, MHM 357 and MHM 358 shall be the same as offered in corresponding papers of Semester-I of the course.
3. The other conditions will remain the same as per relevant Ordinance and rules and regulations of the University.

Real Analysis

Code: MHM 351

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus.

Section – II

Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter. Continuity, Differentiability and integrability of an integral of a function of a parameter.

Section – III

Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction principle

Section – IV

Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness , components, continuity in relation with connectedness.

Book s Recommended:

1. P.K. Jain and Khalil Ahmad: Metric Spaces, 2nd Ed., Narosa, 2004
2. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
4. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
5. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
6. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
7. G.F. Simmons : Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

Groups and Rings

Code: MHM 352

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Definition of a group with example and simple properties of groups, Subgroups and Subgroup criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, Index of a sub-group Coset decomposition, Largrage's theorem and its consequences, Normal subgroups, Quotient groups,

Section – II

Homoomorphisms, isomophisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, Permutations groups. Even and odd permutations. Alternating groups, Cayley's theorem, Center of a group and derived group of a group.

Section – III

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (principle, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

Section – IV

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, R unique factorization domain implies so is $R[X_1, X_2, \ldots\ldots X_n]$

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2^{nd} edition).
3. Vivek Sahai and Vikas Bist : Algebra, NKarosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Norsa Publishing House.

Numerical Analysis

Code: MHM 353

Part-A (Theory)

Max. Marks: 60
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.

Section – II

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula.

Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution: Mean, Variance and Fitting.

Section – III

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I and II.

Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method, QR method, Lanczos method.

Section – IV

Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one- third and three-eighth rule, Chebychev formula, Gauss Quadrature formula.

Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Books Recommended:

1. Babu Ram: Numerical Methods, Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M.K. Jain, S.R.K.Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C.E. Froberg : Introduction to Numerical Analysis (2^{nd} Edition).
6. Melvin J. Maaron : Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York
7. R.Y. Rubnistein : Simulation and the Monte Carlo Methods, John Wiley, 1981
8. Computer Oriented Numerical Methods, Practice Hall of India Pvt. Ltd.

Part-B (Practical)

Max. Marks: 40
Time: 3 Hours

There will be a separate practical paper which will consist of implementation of numerical methods, studied in the theory paper MHM 353(Part-A), in C Programming Language.

Integral Equations

Code: MHM 354

Max. Marks : 90
Time : 3 Hours

Section I

Linear integral equations, Some basic identities, Initial-value problems reduced to Volterra integral equations, Method of successive approximation to solve Volterra integral equations of second kind, Iterated kernels and Neumann series for Volterra equation. Resolvent kernel as a series in λ, Laplace transform method for a difference kernel, Solution of a Volterra integral equation of the first kind.

Section II

Boundary value problems reduced to Fredholm integral equations, method of successive approximations to solve Fredholm equation of second kind, Iterated kernels and Neumann series for Fredholm equations, Resolvent kernel as a sum of series, Fredholm resolvent kernel as a ratio of two series. Fredholm equations with degenerate kernel, approximation of a kernel by a degenerate kernel, Fredholm Alternative.

Section III

Green's function. Use of method of variation of parameters to construction the Green's function for a nonhomogeneous linear second degree BVP, Basic four properties of the Green's function, Alternate procedure for construction of the Green's function by using its basic four properties. Method of series representation of the Green's function in terms of the solutions of the associated homogeneous BVP. Reduction of a BVP to a Fredholm integral equation with kernel as Green's function.

Section IV

Homogeneous Fredholm equations with symmetric kernels, Solution of Fredholm equations of the second kind with symmetric kernel, Method of Fredholm Resolvent Kernel, Method of Iterated Kernels, Fredholm Equations of the First Kind with Symmetric Kernels.

Books Recommended:

1. Jerri, A.J., Introduction to Integral Equations with Applications.
2. Polyanin, A.D., Manzhirov, A.V., handbook of Integral Equations, CRC Press.
3. Kondo, J., Integral Equations, Oxford Applied mathematics and Computing Science Series.

Fluid Dynamics

Code: MHM 355

Max. Marks : 90
Time : 3 Hours

Section - I

Kinematics - Eulerian and Lagrangian methods. Stream lines, path lines and streak lines. Velocity potential. Irrotational and rotational motions. Vortex lines. Equation of continuity. Boundary surfaces.

Section - II

Acceleration at a point of a fluid. Components of acceleration in cylindrical and spherical polar co-ordiantes, Pressure at a point of a moving fluid. Euler's and Lagrange's equations of motion. Bernoulli's equation. Impulsive motion. Stream function.

Section - III

Acyclic and cyclic irrotation motions. Kinetic energy of irrotational flow. Kelvin's minimum energy theorem. Axially symmetric flows. Liquid streaming past a fixed sphere. Motion of a sphere through a liquid at rest at infinity. Equation of motion of a sphere. Three-dimensional sources, sinks, doublets and their images. Stoke's stream function.

Section - IV

Irrotational motion in two-dimensions. Complex velocity potential. Milne-Thomson circle theorem. Two-dimensional sources, sinks, doublets and their images. Blasius theorem. Two- dimensional irrotation motion produced by motion of circular and co-axial cylinders in an infinite mass of liquid.

Books Recommended:

1. F. Chorlton, Text Book of Fluid Dynamics, C.B.S. Publishers, Delhi, 1985
2. M.E. O'Neill and F. Chorlton, , Ideal and Incompressible Fluid Dynamics, Ellis Horwood Limited, 1986.
3. R.K. Rathy, An Introduction to Fluid Dynamics, Oxford and IBH Publishing Company, New Delhi, 1976.
4. W.H. Besant and A.S. Ramsay, A Treatise on Hydromechanics Part I and II, CBS Publishers, New Delhi.
5. Bansi Lal, Theoretical Fluid Dynamics, Skylark Pub., New Delhi.

Database Management System, Oracle and Visual Basic –I

Code: MHM 356 [Opt (i)]

Max. Marks : 40
Time : 3 hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from each Unit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Basic Concepts: File systems Vs. DBMS, advantages and disadvantages of DBMS, objectives of a database. Database systems concepts and architecture.
Data Modeling for a database: records and files, abstraction and data integration.
Database Management System: Relational, Network, and Hierarchical.

Unit-II

Relational Data Manipulations: Relational Algebra, Relational Calculus, SQL.
Relational Database Design: Functional Dependencies, Finding Keys; 1st to 3rd NFs, CNF, Lossess Join and Dependency preserving decomposition, computing closures of set FDs, Finding Keys.

Unit-III

Practical database design: Role of information systems in organizations, database design process, physical database design in relational databases.
Query Processing: General Strategies for query processing, query optimization, query, processor, concepts of security, concurrency and recovery.
Database security issues and recovery techniques.

Suggested Readings:

1. Using Visual Basic 6 by Reselman and Other (Prentice-Hall of India)
2. Visual Basic 6 from Scratch by Donald and Oancea (Prentice-Hall of India)
3. Using Oracle-8 by Austin (Prentice-Hall of India)
4. Oracle 8 by Ivan Bayross (BPB Publication)
5. Special Edition Using Oracle 8/8i by Jr. Page (Prentice-Hall of India)
6. Teach Yourself More VB in 21 days by Days Maver (Techmedia)
7. Any other book/manual covering contents of this paper.

Applied Statistics

Code: MHM 356 [Opt (ii)]

Max. Marks : 45
Time: 3 hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Two Questions)

Index Number: definition, problems involved in the construction of index numbers, calculation of index numbers-simple aggregate method, weighted aggregates method, simple average of price relatives, weighted average of price relatives, link relatives, chain indices, value index numbers, price and quantity index numbers, Laspeyre's, Paasche's, Marshall-Edgeworth and Fisher's index numbers, time and factor reversal tests of index numbers, consumer price index number and its uses. Base shifting, splicing and deflating of index numbers.

Section-II (Three Questions)

Time Series Analysis: Definition, components of time series-trend, seasonal variations, cyclic variations, irregular component, illustration, additive and multiplicative models, determination of trend-graphic method, semi-averages method, method of curve fitting by principle of least squares, growth curves and their fitting, moving average method. Analysis of seasonal fluctuations, construction of seasonal indices using method of simple averages, ratio to trend method, ratio to moving average method and link relative method.

Section-III (Three Questions)

Demographic Methods: Sources of demographic data-census, register, adhoc survey, hospital records, measurement of mortality, crude death rate, specific death rate, standardized death rates, complete life tables and its main features, assumptions, descriptions and construction of life tables, uses of life tables, Abridged life table using King's method, stationary and stable population, measurement of fertility-crude birth rate, general fertility rate, specific fertility rate, total fertility rate, measurement of population growth, gross reproduction rate, net reproduction rate.

Books Suggested:

1. Goon, A.M., Gupta, M.K., and B. Das Gupta: Fundamentals of Statistics, Vol-II.
2. Kapoor, V.K. and Gupta, S.C.: Applied Statistics

Software Engineering – I

Code: MHM 357 [Opt (i)]

Max. Marks : 40
Time : 3 hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from eachUnit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Software and software engineering: Software characteristics, software crisis, software engineering paradigms, goals and principles of software engineering.
Software project management: Planning a software project, Software cost estimation, project scheduling, personnel planning, team structure.

Unit-II

Software configuration management, software quality and quality assurance, project monitoring, risk management.
Software requirement analysis : Structured analysis, object-oriented analysis and data modeling, software requirement specification, validation.

Unit-III

Design and implementation of software- Software design fundamentals, software design principles, design methodology (structured design and object-oriented design), design strategies, design verification, monitoring and control, coding, programming styles.

Suggested Readings:

1. Gill, Nasib S.: Software Engineering, Khanna Book Pub. Co.(P) Ltd, N. Delhi.
2. Singh, Rajender: Software Engineering, Excel Books, New Delhi.
3. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications, New
Delhi.
4. Pressman : Software Engineering, TMH.
5. Ghezzi, Carlo : Fundaments of Software Engineering, PHI.
6. Fairley, R.E. : Software Engineering Concepts,McGraw-Hill.

Numerical Methods & Fundamentals of Computers

Code: MHM 357 [Opt (ii)]

Max. Marks : 45
Time: 3 hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Three Questions)

Numerical Methods: Difference tables, methods of interpolation, Newton's formula for forward and backward interpolation with equal intervals, Lagrange's method of interpolation, Divided differences, numerical integration, General Quadrature formula for equidistant ordinates, Trapezoidal rule, Simpson's one-third and three-eight formula.

Section-II (Two Questions)

Basic of Computer: Introduction, origin, development, uses and limitation of computers. Types of computers, computer structure, input-unit, CPU, output unit, secondary storage, High level and low level languages, compiler and interpreter.

Computer Arithmetic: Floating point representation of numbers, arithmetic operations with normalized floating point numbers. Number systems- Binary, decimal, octal and hexadecimal number systems and their conversions into each other. Binary arithmetic's, (Addition, subtraction, multiplication and division).

Section-III (Three Questions)

Flow Charts and Algorithm: Concepts of flow chart, algorithm and programming. Flow charts and algorithms for the following: Mean, Standard Deviation, Coefficient of Correlation, Straight line fitting. Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Books Suggested:

1. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
2. Sastry, S.S.: Introduction to Methods of Numerical Analysis
3. Ram Kumar: Introduction to Fortran – 77
4. V Raja Raman: Fortran – 77

Practical/Computational Work

Code: MHM 358 [Opt (i)]
[Based on papers MHM 356 [Opt (i)] and MHM 357 [Opt (i)]]

Max Marks: 60
Time: 4 Hrs

Note:

i) Practical : 45 Marks
(Application Development using Oracle and Visual Basic)

ii) Viva-voce : 15 Marks

Practical/Computational Work

Code: MHM 358 [Opt (ii)]

[Based on papers MHM 356 [Opt (ii)] and MHM 357 [Opt (ii)]]

Max. Marks: 50
i) Written Practical/ Lab Work : 40 Marks
ii) Viva-voce and Practical Record : 10 Marks
Time: 3 hours

Note: The examiner is requested to set **4(four)** experiments. The candidate is required to attempt **2(two)** of the allotted experiments.

At least the following practicals are required to be done by the students during the Fourth Semester:

1. To calculate price and quantity index numbers using the formulae given by Laspyre, Paasche, Marshal – Edgeworth and Fisher.
2. To obtain cost of living index number for the given data using:
   - Aggregate Expenditure Method
   - Family Budget Method
3. To test for the given data whether the formulae given by Laspyre, Paasche, Marchal – Edgeworth and Fisher satisfy reversal tests.
4. To work out trends using moving average method for the given data estimating the mostly appropriate period of moving averages.
5. To obtain seasonal variation indices using ratio to moving average method for quarterly data.
6. To obtain seasonal variation indices using ratio to trend method.
7. To obtain seasonal variation indices using method of link relatives.
8. To calculate the crude and standardized death rates of the population using Direct Method and Indirect Method regarding one of the population and standard population.
9. To calculate the following for the given data:
   CDR, CBR, Sex/Age SDR, GFR, TFR, GRR, NRR.
10. To complete the given incomplete life table by computing various elements of life table.
11. To interpolate the required value for the given data using Newton's forward/backward interpolation formula for equal intervals.
12. To interpolate the required value for the given data of unequal intervals using Newton's/Lagrange's interpolation formulae.

16-17. To evaluate the integral of the type $\int f(x)\,dx$ using
   (i) Trapezodial rule
   (ii) Simpson's one-third rule
   (iii) Simpson's three-eight rule

   Where the function f(x) and the values of a and b may be taken a follows:
   - $f(x) = \sin x - \log x + e^x$; a = 0.2, b = 1.4
   - $f(x) = e^{x^2}$; a = 0, b = 1
   - $f(x) = \frac{1}{1+x^2}$; a = 0, b = 1

OLD SCHEME

Scheme of Examination of
5-Years Integrated M.Sc. (Honours) Mathematics Semester-VI
(only for the session 2011-2012)

Paper Code	Title of the paper	Teaching Hours	Max. Marks			Total Marks
			Theory	Internal Assesment	Practicals	
MHM 361	Real and Complex Analysis	4 Hours/ week	90	10	-	100
MHM 362	Linear Algebra	4 Hours/ week	90	10	-	100
MHM 363	Dynamics	4 Hours/ week	90	10	-	100
MHM 364	Elementary Topology	4 Hours/ week	90	10	-	100
MHM 365	Methods of Applied Mathematics	4 Hours/ week	90	10	-	100
MHM 366	Opt (i) Database Management System, Oracle and Visual Basic -II *	4 Hours/ week	40	5	-	45
	Opt (ii) Statistical Quality Control*	4 Hours/ week	45	5	-	50
MHM 367	Opt (i) Software Engineering -II*	4 Hours/ week	40	5	-	45
	Opt (ii) Operations Research*	4 Hours/ week	45	5	-	50
MHM 368	Practical/ Computational work Opt (i) Based on MHM366 (i) and MHM 367 (i)*	4 Hours/ week	-		60	60
	Opt (ii) Based on MHM366 (ii) and MHM 367 (ii)*	4 Hours/ week	-		50	50

* The syllabi of the papers MHM 366, MHM 367 and MHM 368 shall be the same as that of the corresponding syllabi for the pass course of B.Sc. Semester-VI.

Note: 1. Other requirements of the languages and/or qualifying subjects, if any, will remain the same as approved by the University for the Honours course.
2. The option of the papers MHM 366, MHM 367 and MHM 368 shall be the same as offered in corresponding papers of Semester-I of the course.
3. The other conditions will remain the same as per relevant Ordinance and rules and regulations of the University.

Real and Complex Analysis

Code: MHM 361

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals.

Section – II

Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co-efficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals.

Section – III

Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.

Section – IV

Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings, Mobius transformations. Fixed pints, Cross ratio, Inverse Points and critical mappings.

Books Recommended:

1. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
2. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
3. D. Somasundaram and B. Choudhary : A First Course in Mathematical, Analysis, Narosa Publishing House, New Delhi, 1997
4. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
5. R.V. Churchill and J.W. Brown: Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
6. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

Linear Algebra

Code: MHM 362

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vactor space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

Section – II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vactor spaces, Vactor space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimentional vactor spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

Section – III

Algebra of Liner Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

Section – IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt, Orthogonalization process, Adjoint of a linear transformation and its properties, Unitary linear transformations.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2nd edition).
3. Vivek Sahai and Vikas Bist : Algebra, NKarosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Norsa Publishing House.

Dynamics

Code: MHM 363

Max. Marks: 90
Time: 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections (***I-IV***) will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section – I

Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.

Section – II

Mass, Momentum and Force. Newton's laws of motion. Work, Power and Energy. Definitions of Conservative forces and Impulsive forces.

Section – III

Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.

Section – IV

General motion of a rigid body. Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions. Acceleration in terms of different co-ordinate systems.

Books Recommended:

1. S.L.Loney : An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
2. F. Chorlton : Dynamics, CBS Publishers, New Delhi
3. A.S. Ramsey: Dynamics Part-1&2, CBS Publisher & Distributors.

Elementary Topology

Code: MHM 364

Max. Marks : 90
Time : 3 hours

Note: The question paper will consist of **five** sections. Each of the first four sections***(I-IV)*** will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section - I

Statements only of (Axiom of choice, Zorn's lemma, Well ordering theorem and Continnum hypothesis).

Definition and examples of topological spaces, Neighbourhoods, Interior point and interior of a set , Closed set as a complement of an open set , Adherent point and limit point of a set, Closure of a set, Derived set, Properties of Closure operator, Boundary of a set , Dense subsets, Interior, Exterior and boundary operators.

Base and subbase for a topology, Neighbourhood system of a point and its properties, Base for Neighbourhood system.

Relative(Induced) topology, Alternative methods of defining a topology in terms of neighbourhood system and Kuratowski closure operator.

Comparison of topologies on a set, Intersection and union of topologies on a set.

Section - II

Continuous functions, Open and closed functions , Homeomorphism.

Connectedness and its characterization, Connected subsets and their properties, Continuity and connectedness, Components, Locally connected spaces,

Section - III

Compact spaces and subsets, Compactness in terms of finite intersection property,Continuity and compact sets, Basic properties of compactness, Closedness of compactsubset and a continuous map from a compact space into a Hausdorff and its consequence. Sequentially and countably compact sets, Local compactness and one point compatification

Section - IV

First countable, second countable and separable spaces, hereditary and topological property, Countability of a collection of disjoint open sets in separable and second countable spaces, Lindelof theorem. T_0, T_1, T_2 (Hausdorff) separation axioms,their characterization and basic properties.

Books Recommended :

1. George F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company, 1963.
2. K.D. Joshi, Introduction to General Topology, Wiley Eastern Ltd.
3. J. L. Kelly, General Topology, Affiliated East West Press Pvt. Ltd., New Delhi.
4. J. R. Munkres, Toplogy, Pearson Education Asia, 2002.
5. W.J. Pervin, Foundations of General Topology, Academic Press Inc. New York, 1964.

Methods of Applied Mathematics

Code: MHM 365

Max. Marks : 90
Time : 3 Hours

Note: The question paper will consist of **five** sections. Each of the first four sections***(I-IV)*** will contain two questions and the students shall be asked to attempt **one** question from each section. **Section-V** will contain **six** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.**

Section - I

Solution of 3D Laplace, wave and heat equations in spherical polar co-ordinates and cylindrical polar co-ordinates by the method of separation of variables. Fourier series solution of the wave equation, transformation of boundary value problems.

Section - II

Fourier series solution of the heat equation, steady-state temperature in plates, The heat and wave equations in unbounded domains, Fourier transform solution of boundary value problems. The heat equation in an infinite cylinder and in a solid sphere.

Section - III

Hankel transform of elementary functions. Operational properties of the Hankel transform. Applications of Hankel transforms to PDE.
Definition and basic properties of finite Fourier sine and cosine transforms, its applications to the solutions of BVP's and IVP's.

Section - IV

Moments and products of inertia, Angular momentum of a rigid body, principal axes and principal moment of inertia of a rigid body, kinetic energy of a rigid body rotating about a fixed point, Momental ellipsoid and equimomental systems, coplanar mass distributions, general motion of a rigid body.

Books Recommended :

1. Jerri, A.J., Introduction to Integral Equations with Applications.
2. Lokenath Debnath, Integral Transforms and their Applications, CRC Press, Inc., 1995.
3. Peter V. O'Neil, Advanced Engineering Mathematics, 4th Edition, An International Thomson Publishing Company.
4. Sneddon, I.N., Elements of Partial Differential Equations, Printice Hall, McGraw Hill.
5. Sneddon, I.N., Special Functions of Mathematical Physics and Chemistry.
6. Chorlton, F., Dynamics, CBS publishers and Distributors.

Database Management System, Oracle and Visual Basic -II

Code: MHM 366 [Opt (i)]

Max. Marks: 40
Time: 3 Hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from each Unit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Oracle

Introduction to Oracle: Modules of Oracle, Invoking SQLPLUS, Data types, Data Constraints, Operators, Data manipulation: Create, Modify, Insert, Delete and Update; Searching, Matching and Oracle Functions.

SQL*Forms: Form Construction, user-defined form, multiple-record form, Master-detail form. PL/SQL Blocks in SQL*Forms, PL/SQL syntax, Data types, PL/SQL functions, Error handling in PL/SQL, package functions, package procedures, Oracle transactions.

SQL*ReportWriter: Selective dump report, Master-detail Report, Control-break Report, Test report.

` `Unit-II

SQL*Menu: Various menu styles, using pull-down and bar-menu, Authorization of SQL*Menu, Creating Oracle Menu, Granting Role Access, Generating & Executing Applications.

Stored Procedures/Functions: Stored procedures, How to create and execute procedures?, Where to store procedures?; Stored functions, How to create and execute functions?, Where to store functions? Where do procedures and functions reside?

Database Triggers: Use and type of database Triggers, Database Triggers Vs SQL*Forms, Database Triggers Vs. Declarative Integrity Constraints, BEFORE Vs. AFTER Trigger Combinations, Creating a Trigger, Dropping a Trigger.

Unit-III

Visual Basic

Introduction, Analyzing, Controls and Properties, Coding, Loops, Dialog Boxes, Additional Controls: Option Buttons, Frames, Check Boxes, Scroll Bars, Timer Control, Procedures and Functions, Using Debugging Windows, Database Programming, Crystal Reports. Simple Active X controls.

Suggested Readings:

1. Using Visual Basic 6 by Reselman and Other (Prentice-Hall of India)
2. Visual Basic 6 from Scratch by Donald and Oancea (Prentice-Hall of India)
3. Using Oracle-8 by Austin (Prentice-Hall of India)
4. Oracle 8 by Ivan Bayross (BPB Publication)
5. Special Edition Using Oracle 8/8i by Jr. Page (Prentice-Hall of India)
6. Teach Yourself More VB in 21 days by Days Maver (Techmedia)
7. Any other book/manual covering contents of this paper.

Statistical Quality Control

Code: MHM 366 [Opt (ii)]

Max. Marks: 45
Time: 3 Hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Three Questions)

Statistical Quality Control: Meaning and uses of SQC, causes of variations in quality, product and process control, control charts, 3-σ control limits, control chart for variables- X and R chart, criteria for detection of lack of control in X and R Charts, Interpretation of X and R charts, control chart for standard deviation (σ charts), control charts for attributes- p and c charts.

Section-II (Two Questions)

Acceptance sampling: Problem of lot acceptance, stipulation of good and bad lots, producer's and consumers risks, single and double sampling plans, their OC functions, concepts of AQL, LTPD, AOQL, average amount of inspection and ASN function, rectifying inspection plans. Sampling inspection plans.

Section-III (Three Questions)

Demand Analysis: Laws of supply and demand, price elasticity of demand, demand function with constant price elasticity, particle elasticities of demands (income elasticity and cross elasticity), types of data required for estimating elasticities, family budget data, time series data, Leontief's and Pigous's methods from time series data to estimate demand functions. Engel's law, Pareto's law of income distribution, curves of concentration, Lorenz curve and Gini's coefficient.

Books Suggested:

1. Goon, A.M., Gupta, M.K., and B. Das Gupta: Fundamentals of Statistics, Vol-II.
2. Kapoor, V.K. and Gupta, S.C.: Applied Statistics

Software Engineering - II

Code: MHM 367 [Opt (i)]

Max. Marks: 40
Time: 3 Hours

Note: ***Eight questions in all will be set by the paper setter with minimum two questions from each Unit and the candidates shall be required to attempt five questions in all by selecting at least one question from each unit. All questions shall carry equal marks.***

Unit-I

Software metrics: Need of software metrics and their benefits, size metrics, control complexity metrics, composite metrics, object-oriented metrics, and software quality metrics. Software reliability: metric and specification, fault avoidance and tolerance, exception handling, defensive programming.

Unit-II

Software Testing: Testing fundamentals, objectives of software testing, white box and black box testing techniques, software testing strategies: unit testing, integration testing, validation testing, system testing, debugging.

Unit-III

Software maintenance: Aims of software maintenance, types of software maintenance, maintenance characteristics, maintainability, maintenance tasks, maintenance side effects. CASE tools: Overview of CASE and types of CASE tools.

Suggested Readings:

1. Gill, Nasib S.: Software Engineering, Khanna Books Pub. Co.(P) Ltd, N. Delhi.
2. Singh, Rajender: Software Engineering, Excel Books, New Delhi.
3. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications, New Delhi.
4. Pressman : Software Engineering, TMH.
5. Ghezzi, Carlo : Fundaments of Software Engineering, PHI.
6. Fairley, R.E. : Software Engineering Concepts, McGraw-Hill.

Operations Research

Code: MHM 367 [Opt (ii)]

Max. Marks: 45
Time: 3 Hours

Note: The examiner is requested to set 8 (eight) questions in all, as mentioned above for each section. The candidate is required to attempt 5 (five) questions in all, selecting at least one question from each unit.

Section-I (Two Questions)

Objectives of O.R., nature and definitions of O.R., Scope of O.R., Meaning and necessity of O.R. models, classification of O.R. models, Advantages and disadvantages of O.R. models. Steps in model formulation, principles of modeling. Characteristics of a good model, Allocation problems, General linear programming problem, formulation of G.L.P.P., (formulation only for Transportation problem, trim loss problem, product mix problem, Diet problem).

Section-II (Three Questions)

Linear programming problem; definition, objective function, constraints, graphical solution of L.P.P., limitation of graphical method, simplex method to solve L.P.P., concept of initial basic feasible solution computation procedure for simplex method. (Not included the case of degeneracy) unrestricted variables.

Section-III (Three Questions)

Transportation Problem, Formulation of T.P., BFS to TP, Determination of initial feasible solution North-West corner rules Row minima method, column minima method, Matrix minima method (Least cost entry method), Vogel's Approximation method (or Unit cost penalty method). Assignment problem and its solution.

Books Suggested:

1. J.K. Sharma: An Introduction to Operations Research
2. Kanti Swaroop, P.K. Gupta and Manmohan: Operations Research

Practical/Computational Work

Code: MHM 368 [Opt (i)]

[Based on papers MHM 366 [Opt (i)] and MHM 367 [Opt (i)]]

Max Marks : 60
Time: 4 Hrs

Note:

i) Practical : 45 Marks
(Application Development Using Oracle and Visual Basic)

ii) Viva-voce : 15 Marks

Practical/Computational Work

Code: MHM 368 [Opt (ii)]

[Based on papers MHM 366 [Opt (ii)] and MHM 367 [Opt (ii)]]

Max. Marks: 50

i) Written Practical/ Lab Work : 40 Marks

ii) Viva-voce and Practical Record : 10 Marks

Time: 3 hours

Note: The examiner is requested to set **4(four)** experiments. The candidate is required to attempt **2(two)** of the allotted experiments.

At least the following practicals are required to be done by the students during the Fourth Semester:

1. To construct X chart and R-chart and comment on the state of control of the process.
2. To construct p-chart and d-chart and comment on the state of control of the process.
3. To obtain the control limits for number of defects and comment on the state of control plotting the appropriate chart.
4. To use computer software SPSS for computing/constructing the following: Correlation coefficient, Regression line, ANOVA, Test of significance applying t, F and x^2 tests.
5. To solve the problems on Linear Programming by simplex method
6. To solve the transportation and assignment problems.