

THIRD YEAR SCIENCE/ARTS
Semester-V
MATHEMATICS HONOURS
Core-11/Multivariate Calculus(Calculus-II)
Credit-6(Theory 5+Tutorial 1)
Total Marks:100

Theory:80 Marks+Mid-Sem:20 Marks
Duration of Exam:3 hours (End Sem.) and 1 hours (Mid-Sem)

UNIT-I

Function of several variables, limit and continuity of functions of two variables, partial differentiation, total differentiability and differentiability, sufficient condition for differentiability

UNIT-II

Maxima and Minima: Extrema of functions of two variables, method of Lagrange multiplier, constrained optimization problems

UNIT-III

Multiple Integral: Double integration over rectangular region, double integration over non-rectangular region, Double integrals in polar coordinates ,Change in order of integration ,Triple integrals, Volume by double integrals, Change of variables by Jacobian.

UNIT-IV

Definition of vector field, divergence and curl

UNIT-V

Line integrals, Application of line integrals, Fundamental theorem for line integrals, conservative vector fields, independence of path ,Volume Integrals, Green's theorem, surface integrals, integrals over parametrically defined surfaces, Stoke's theorem, The Divergence theorem

Books Recommended:

G.Samal, S.C.Jena, T.Biswal, D.K.Dalai:- Advanced Higher Calculus, Vidyapuri
Ch-12, Ch-13(13.1 to 13.7), Ch-16(16.1 to 16.8), Ch-17(17.1 to 17.14), 20(20.1 to 20.13 and 20.14 to 20.24)

Books for Reference:

- 1.M.J.Strauss, G.L.Bradley and K.J.Smith ,Calculus 3rd Ed., Dorling Kindersley (India) Pvt. Ltd.(Pearson Education),Delhi,2007.
- 2.G.B.Thomas and R.L.Finney, calculus, 9th Ed., Pearson Education, Delhi, 2005
- 3.E.Marsden, A.J. Tromba and A.Weinstein, Basic Multivariable Calculus, Springer(SIE), Indian reprint, 2005
- 4.Santosh K. Sengar-Advanced Calculus, Cengage Learning India Pvt. Ltd.

24/6/16

24.6.16

THIRD YEAR SCIENCE/ARTS
Semester-V

MATHEMATICS HONOURS

Core-12 Probability Theory

Credit 6 (Theory 5 + Tutorial 1)

Total Marks:100

Theory:80 Marks+Mid-Sem:20 Marks

Duration of Exam:3 hours (End Sem.) and 1 hours (Mid-Sem)

5 Lectures,1 Tutorial(per week per Student)

UNIT-I

Probability axioms, Random variables, Distribution function, Discrete distribution, Binomial distribution, Negative and Geometric binomial distribution, Hyper geometric distribution, Poisson distribution, Continuous distribution, Uniform or Rectangular distribution, Normal (μ, σ) distribution, Exponential distribution.

UNIT-II

Two dimensional Random Variables, Joint distribution function and its properties, Marginal distribution, Independence of PVS, Discrete distribution, Continuous distribution, Some Standard Probability distributions of continuous RV(X,Y) in two dimension, Conditional distribution.

UNIT-III

Mathematical expectation, moments, moment generating function and Characteristic function of a single random variable.

UNIT-IV

Expectation of function of two random variables, covariance, correlation coefficient, bivariate normal distribution, Independent of two random variable joint moment generating function (j mgf).

UNIT-V

Chebyshev's(or Tchebycheff's) inequality statement and interpretation of law of Large numbers, Central limit theorem for independent and identically distributed random variable with finite variance.

Books Recommended:

K C Pal : Matematical Probability, New Central Book Agency Pvt. Ltd., Kolkata, Hyderabad, Bhubaneswar, Delhi.

Ch-2(2.1), Ch-4(4.1 to 4.6), Ch-5(5.1 to 5.7), Ch-6 (6.1 to 6.6, 6.8), Ch-7(7.1 to 7.5, 7.7), Ch-8(8.2 to 8.5), Ch-10(10.1 , 10.2)

Books for Reference:

- 1.Robert V. Hogg, Joseph W.McKean and Allen I. Craig, Introduction to Mathematical Statistics, Pearson Education, Asia, 2007.
- 2.Irwin Miller and Marylees Miller, John E. Freund, Mathematical Statistics with Application, 7th Ed., Pearson Education, Asia,2006.
- 3.Sheldon Ross, Introduction to Probability Models, 9th Ed., Academic Press, Indian Reprint, 2007.
- 4.S.C.Gupta and V.K.Kapoor-Fundamentals of Mathematical Statistics, S.Chand and Company Pvt. Ltd, New Delhi.
- 5.S.Ross: A First Course in Probability ,Pearson Education.

THIRD YEAR SCIENCE/ARTS
Semester-V
MATHEMATICS HONOURS
Discipline Specific Elective(DSE-Iy()
PROGRAMMING USING C++(Compulsory)
Credit 6 (Theory 4 +Practical 2)
Total Marks:100

Distribution of Marks:

75 Marks(End-Sem Theory:60 Marks+Mid-Sem:15 Marks)
+25 Marks Practical(End-Sem)

Duration of Exam:3 hours (End Sem.) and 1 hours (Mid-Sem)

And Practical 3 hours.

5 Lectures,1 Tutorial(per week per Student)

Unit- I

Principles of Object-Oriented Programming: Object-Oriented Programming (OOP)Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages; Applications of OOP, Beginning with C++: Applications of C++, C++ statements, Example with Class, Structure of C++ Program, Creating the Source File, Compiling and Linking. Tokens, Expressions and Control Structures: Tokens, Keywords, Identifiers & Constants, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Deferencing Operators, Memory Management Operators, Manipulators, Type Cast Operators, Expressions and their Types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.

Unit-II

Functions in C++: The Main Function, Function Prototyping, Call By Reference, Return by Reference, Inline Functions, Default Arguments, Const. Arguments, Function Overloading, Friend & Virtual Functions, Math, Library Functions. Classes and Objects: Specifying a Class, Defining Member Functions, Making an outside Function Inline, Nested Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, Cons. Member Functions, Pointer to Members, Local Classes.

Unit- III

Constructors & Destructors: Constructors Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, Constructing Two-Dimensional Arrays, Const. Objects, Destructors, Operator Overloading and Type Conversions: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators using Friends, Manipulation of Strings using Operators, Rules for Overloading Operators, Type Conversions.

Unit-IV

Inheritance: Defining Derived Classes, Single Inheritance, Making a Private

Member Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Member Classes.

Unit-V

Managing Console I/O Operations: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators, Files: Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, File Modes.

Book Recommended:

Object Oriented Programming with C++: E. Balgurusamy, 4/e (TMH).
Chapters:1,2,3,4,5,6,7,8,9,10,11(upto 11.5)

Books for Reference :

- 1.D.S.Malik:-C++ Programming Language, Edition-2009, Course Technology, Cengage Learning India Edition.
- 2.R.Johnsonbaugh and M.Kalin-Applications Programming with C++, Pearson Education.
- 3.S.B.Lippman and J.Lajoie.C++Primer, 3rd Ed. Addison Wesley 2000.
- 4.Bjarne Stroustrup, The C++ Programming Language, 3rd Ed. Addison Wesley

DSE 1.2 **Practical : 25 Marks(Duration of Exam. 3 hours-End Sem.)**

Distribution of Marks: Experiment 15 +Record 5+Viva 5

LISTS OF Practicals (Using any software)

Practical/ Lab work to be performed on a computer

1. Calculate the Sum of the series for $\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$ any positive integer N .
2. Write a user defined function to find the absolute value of an integer and use it to evaluate the function $(-1)^n/|n|$ for $n = -2, -1, 0, 1, 2$.
3. Calculate the factorial of any natural number
4. Read floating numbers and compute two averages, the average of negative numbers and the average of positive numbers.
5. Write a program that prompts the user to input a positive integer. It should then output a message indicating whether the number is a prime number.
6. Write a program that prompts the user to input the value of a , b and c involved in the equation $ax^2 + bx + c = 0$ and outputs the type of the roots of the equation. Also the programs should outputs all the roots of the equation.
7. Write a program that generates random integer between 0 and 99. Given that Fibonacci numbers are 0 and 1. Generate all Fibonacci numbers less than or equal to generated numbers.
8. Write a program that does the following
 - a. Programs the user to input five decimal numbers
 - b. Prints the five decimal numbers
 - c. Converts each decimal number to the nearest number
 - d. Adds these five integers
 - e. Prints the sum and average of them
9. Write a program that uses while loops to perform the following steps:

- a. Prompt the user to input two integers first Num and second Num.
 - b. Output all odd and even numbers between first Num and Second Num
 - c. Output the sum of all even numbers between first Num and Second Num
 - d. Output the sum of the square of the odd numbers between first Num and Second Num
 - e. Output all uppercase letters corresponding to the numbers between first Num and second Num if any.
10. Write a program that prompts the user to input five decimal numbers. The Program should then add the five decimal numbers. Convert the sum to the nearest integer and print the result.
 11. Write a program that prompts the user to enter the lengths of three sides of a triangle and then outputs a message indicating whether the triangle is a right triangle or a scalene triangle.
 12. Write a value returning function smaller to determine the smallest number from a set of numbers. Use this function to determine the smallest number from a set of 10 numbers.
 13. Write a function that takes as a parameter an integer (as a long value) and returns the number of odd, even and zero digits. Also write a program to test your function.
 14. Enter 100 integers into an array and sort them in ascending/ descending order and print the largest/smallest integer.
 15. Enter 10 integers into an array and then search for a particular integer in the array.
 16. Multiplication/Addition of two matrices using two dimensional arrays.
 17. Using arrays read the vectors of the following type: A=(12345678), B=(02340156) and compute the product and addition of these vectors.
 18. Read from a text file and write to a text file.
 19. Write a function, reverse digit that takes an integer as a parameter And returns the number with its digits reversed. For example, the Value of function reverse digit 12345 is 54321 and the value of reverse digit -532 is -235.

THIRD YEAR SCIENCE/ARTS

Semester-V

DSE-II(Mathematics Honours

Discrete Mathematics

Total Marks:100

DISTRIBUTION OF MARKS

Credit 6 (Theory 5 +Tutorial 1)

Theory:80 Marks+Mid-Sem:20 Marks

5 Lectures,1 Tutorial(per week per Student)

Duration of Exam:3 hours (End Sem,Theory) and 1 hour(Mid-Sem)

Unit-I

Logic:-Proposition ,compound proposition ,Conditional proposition ,converse ,inverse ,contrapositive, bi-conditional statement ,negation of compound statement,Methods of proof, Method of induction,Predicate calculus,universal and Existential quantifier,Negation of quantified statements,Multiple quantifiers.Basic counting,Permutation,Combination,Derangements,Pigeonhole principle,Binomial theorem.

Unit-II

Recurrence relation and Generating function:-Recurrence relation,Recurrence relation models,solution of recurrence relation,solution of non-linear recurrence relation,Generating function,Solution of recurrence relation using generating function,counting problems and generating function.

Unit-III

Partially Ordered Sets and Lattices:-Partially Ordered Set,Product and lexicographic Order,Hasse diagram,Special elements of Posets,Lattice,Sub-lattice,Some special lattices

Unit-IV

Boolean Algebra:-Boolean Algebra,Unique features,basic operations,Boolean Functions,De-Morgan's theorem.

Unit-V

Graph Theory:-Introduction,Basic terminology,Simple graph,Multi graph and psuedograph,degree of a vertex,Types of graph,Subgraphs,Isomorphic graphs,Operations of graphs,Paths,Cycles,cut-vertex,cut-edges,connectivity,Eulerian and Hamiltonian Graph,shortest path problem,planar graph.

Book Recommended:-

Swapan Kumar Sarkar,A Text Book of Discrete Mathematics,(Ninth Edn.)S.CHAND, Chapters:-2,3(3,1 to 3,6),9(9,1 to 9,9),10(upto 10,11),11,14.

Books for References:-

- 1.Kenneth H. Rosen,Discrete Mathematics and Applications,Tata McGraw Hill Publications, Chapters:-1(1.1 to 1.5),4(4.1,4.2,4.5),6(6.1,6.2,6.5,6.6),7(7.1,7.2),8,10(10.1,10.2).
- 2.B.A.Davey andH.A.Priestley,Introduction to Lattices and Order,Cambridge University Press,Cambridge,1990.
- 3.Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory (2nd Edition),Pearson Education (Singapore)Pvt.Ltd.,Indian Reprint 2003.
- 4.Rudolf Lidl and GnterPlitz,Applied Abstract Algebra(2nd Edition),Undergraduate Texts in Mathematics,Springer(SIE),Indian Reprint,2004.
- 5.D.S.Malik-Discrete Mathematics:Theory and Applications,Cengage Learning India Pvt.Ltd.
- 6.KevinFerland-Discrete Mathematical Structures ,Cengage Learning Pvt. Ltd.

THIRD YEAR SCIENCE/ARTS

Semester-VI

MATHEMATICS HONOURS

Core-13/Metric Spaces and Complex Analysis(Analysis-IV)

Credit 6(Theory 5 +Tutorial 1)

Total Marks:100

Theory:80 Marks+Mid-Sem:20 Marks

Duration of Exam:3 hours (End Sem.) and 1 hours (Mid-Sem)

5 Lectures,1 Tutorial(per week per Student)

UNIT-I

Metric spaces, definition and examples, Sequence in metric spaces, Cauchy sequences, Complete Metric spaces, Open and closed balls, neighbourhood, open sets, interior of a set, Limit point of a set, closed set, diameter of a set, Cantors theorem

UNIT-II

Subspaces, dense sets, separable spaces, Continuous mappings, sequential criterion and other characterisation of continuity, Uniform continuity, Homeomorphisms, Contraction mappings, Banach Fixed point theorem, Connectedness, connected subsets of \mathcal{R}

UNIT-III

Properties of complex numbers, regions in the complex plane, function of complex variable, mappings of derivatives, differentiation formulas, Cauchy- Riemann equation, Sufficient condition for differentiability

UNIT-IV

Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivative of functions, definite integrals of functions, Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals. Cauchy-Goursat theorem, Cauchy integral formula

UNIT-V

Liouvilles theorem and the fundamental theorem of algebra, Convergence of sequences and series, Taylor series and its examples. Laurent series and its examples, Absolute and uniform convergence of power series

Books Recommended:

- 1.P.K.Jain and K.Ahmad, Metric Spaces.Narosa Publishing House,New Delhi
Chapters:2(1-9),3(1-4),4(1-4),6(1-2),7(1 only).
- 2.T.Biswal, R.B.Dash, D.K.Dalai A Course on Complex Analysis ,Kalyani Publishers
Ch-1,2,4,5,6,7

Books for Reference:

- 1.James Ward Brown and Ruel V. Churchill, Complex variables and Applications, 8th Ed., McGraw Hill International Edition, 2009
- 2.Satish Shirali and Harikishan L. Vasudeva, Metric spaces, Springer Verlag, London,2006
- 3.S.Kumaresan, Topology of Metric Spaces, 2nd Ed., Narosa publishing House, 2011
- 4.S.Ponnusamy-Foundations of Complex analysis, Alpha Science International Ltd.
- 5.J.B.Conway- Functions of one complex variable, Springer
- 6.N.Das-Complex Function theory, Allied Publishers Pvt. Ltd. Mumbai

THIRD YEAR SCIENCE/ARTS

Semester-VI

MATHEMATICS HONOURS

Core-14+1 Linear Programming

Credit 6 (Theory 5 +Tutorial 1)

Total Marks:100

Theory:80 Marks+Mid-Sem:20 Marks

Duration of Exam:3 hours (End Sem.) and 1 hours (Mid-Sem)

5 Lectures,1 Tutorial(per week per Student)

UNIT-I

Introduction to linear programming problem, Graphical Solution, Theory of Simplex method, Optimality and unboundedness, the simplex algorithm, simplex method in tabular format, introduction to artificial variables, two phase method, Big-M method and their comparison

UNIT-II

Duality,Formulation of the dual problem, Primal-dual relationships, economic interpretation of the dual

UNIT-III

Transportation problem and its mathematical formulation, northwest corner method least cost method and Vogel approximation, method for determination of starting basic solution, algorithm for solving transportation problem

UNIT-IV

Assignment problem and its mathematical formulation, Hungarian method for solving assignment problem

UNIT-V

Game theory, formulation of two person zero sum games, Games with mixed strategies, graphical solution procedure

Books Recommended:

Kantiswarup, P.K.Gupta & Manmohan, Operation Research, S.Chand and Co. Pvt.Ltd

Ch- 3(3.1 to 3.5), 4(4.1 to 4.4),5(5.1 to 5.7),10(10.1 to 10.15),11,17(17.1 to 17.7)

Books for Reference:

1.Mokhtar S.Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network Flows, 2nd Ed., John Wiley and Sons, India,2004.

2. F.S.Hillier and G.J.Lieberman, Introduction to Operation Research, 9th Ed., Tata McGraw Hill, Singapore, 2009.

3. Hamdy A. Taha, Operation Research, An introduction, 8th Ed., Prentice Hall India, 2006.

4.N.V.R.Naidu, G.rajendra and T. Krishna Rao-Operation research, I.K.International Publishing House Pvt. Ltd., New Delhi, Bangalore.

5.G.Hardley, Linear Programming , Narosa Publishing House, New Delhi, 2002.

6.R.Veerechamy and V. Ravi Kumar- Operation Research-I.K.International Publishing House Pvt. Ltd., New Delhi, Bangalore.

7. P.K.Gupta and D.S.Hira-Operation Research, S.Chand and Company Pvt. Ltd., New Delhi.

THIRD YEAR SCIENCE/ARTS
Semester-VI
DSE-III-Mathematics Honours
DIFFERENTIAL GEOMETRY OF THREE DIMENSIONS

Total Marks:100

Credit 6 (Theory 5 + Tutorial 1)

DISTRIBUTION OF MARKS

Theory:80 Marks+Mid-Sem:20 Marks

5 Lectures,1 Tutorial(per week per Student)

Duration of Exam:3 hours (End Sem,Theory) and 1 hour(Mid-Sem)

Unit-I

Curves with Torsion:-Space Curves ,Planer Curves ,Tangent ,Principal normal ,Curvature Binormal ,Torsion ,Serret-Frenet Formulae ,Locus of centre of curvature ,Spherical curvature ,Locus of centre of spherical curvature

Unit-II

Existence of Space Curves ,Helices ,Involutives ,Evolutes ,Bertrand Curves

Unit-III

Envelopes ,Developable Surfaces:-Surfaces ,Tangent plane ,Normal ,Envelope Characteristics ,Edge of regression ,Developable surfaces,

Unit-IV

Curvilinear Coordinates on a Surface ,Fundamental Magnitudes:-Curvilinear coordinates First order magnitudes ,Directions on a surface,the normal,Second order magnitudes Derivatives of n ,Curvature of normal section,Meunier's theorem,

Unit-V

Curves on a Surface:-Principal directions ,First and Second Curvatures ,Euler's theorem ,Conjugate directions ,conjugate systems ,Asymptotic lines ,Curvature and torsion

Book Recommended:-

1.C.E.Weatherburn ,Differential Geometry of Three Dimensions ,Radha Publishing House , Calcutta ,Chapters :I(1 to 8,10 to 12),II(13 to 17),III,IV(29 to 31,35 to 38).

Books for References:-

- 1.T.J.Wilmore, An Introduction to Differential Geometry ,Dover Publication,2012.
- 2.S.Lang,Fundamentals of Differential Geometry,Springer,1999.
- 3.B.O'Neill,Elementary Differential Geometry,2ndEdn.,Academic Press,2006.
- 4.A.N.Pressley-Elementary Differential Geometry,Springer.
- 5.B.P.Acharya and R.N.Das-Fundamentals of Differential Geometry, KalyaniPublishers, Ludhiana, New Delhi.

THIRD YEAR SCIENCE/ARTS

Semester-VI

DSE-IV ,Mathematics Honours

Project Work (Compulsory)

Total Marks:100

Credit 6

Project:75 Marks+Viva:25 Marks