B.Sc. Honours (Mathematics) ANNEXURE-A

Course Structure & Distribution of Marks

Duration: Three years

w.e.f. Session 2007-2008 onwards

B.Sc. Honours 1st Year

Course: Title	Time	Total Marks	Theory Paper	Internal Assessment (H.E.+ Attendance)	Pass Percentage
101: Algebra and Trigonometry	3 Hrs.	66	52	14 (= 10+04)	40%
102: Calculus	3 Hrs.	66	52	14 (= 10+04)	40%
103:Vector Analysis and Geometry	3 Hrs.	68	54	14 (= 10+04)	40%
104: Probability Theory and Optimization	3 Hrs.	50	40	10 (= 08+02)	40%

B.Sc. Honours 2nd Year

201: Advanced Calculus	3 Hrs.	66	52	14 (= 10+04)	40%
202: Differential Equations	3 Hrs.	66	52	14 (= 10+04)	40%
203: Mechanics	3 Hrs.	68	54	14 (= 10+04)	40%
204: Discrete Mathematics	3 Hrs.	50	40	10 (=08+02)	40%

B.Sc. Honours 3rd Year

301: Analysis	3 Hrs.	66	52	14 (=10+04)	40%
302: Abstract Algebra	3 Hrs.	66	52	14 (=10+04)	40%
303: Programming in C and Numerical Analysis	3 Hrs. (Theory) 4 Hrs. (Practical)	68	54*(Theory Exam =30 marks+ Practical exam=24 marks)	14 (=10+04)	40%
304: Elementary Number Theory and Abstract Algebra	3 Hrs.	50	40	10 (=08+02)	40%

H.E. stands for House examination test etc.

*Course 303 shall consist of two examinations namely (a) Theory Examination and (b) Practical Examination. Theory examination shall be of three hours duration of 30 marks and in this paper Practical examination shall be of four hours duration of 24 marks (with Practical and written examination of 16 marks + Viva-voce of 08 marks)

Courses 101, 102, 201, 202, 301, 302 Maximum Marks 52 in each Course

Section-I (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of twelve marks each to be set, out of which one is to be attempted)
(Total = 20+20+12=52)

Courses 103 & 203 Maximum Marks 54 in each Course

Section-I (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of fourteen marks each be set) out of which one is to be attempted)
(Total = 20+20+14=54)

Course 303 Maximum Marks (Theory + Practical)= 54

(a) Theory Examination: Maximum Marks = 30

Section-I (4 Questions of six marks each to be set out of which two are to be attempted)

Section-II (4 Questions of six marks each to be set out of which two are to be attempted)

Section-III (2 Questions of six marks each to be set out of which one is to be attempted)
(Total = 12+12+6=30)

(b) Practical Examination: Maximum Marks = 24 marks:
(Practical & written examination = 16 marks) +(Viva-Voce = 08 marks).

Courses 104, 204 & 304: Maximum Marks 40 in each Course

Section-I (4 Questions of eight marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of eight marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of eight marks each to be set, out of which one is to be attempted)
(Total = 16+16+8=40).

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B.A. Pass (Mathematics) ANNEXURE-B

Course Structure & Distribution of Marks for Private/ICDEOL Students

Duration: Three years w.e.f. 2007-2008 onwards

B.A. Pass Course 1st Year

Course: Title	Time	Total Marks	Theory Paper	Pass Percentage**
101: Algebra and Trigonometry	3 Hrs.	33	33	
102: Calculus	3 Hrs.	33	33	
103: Vector Analysis and Geometry	3 Hrs.	34	34	

B.A. Pass Course 2nd Year

201: Advanced Calculus	3 Hrs.	33	33	
202: Differential Equations	3 Hrs.	33	33	
203: Mechanics	3 Hrs.	34	34	

B.A. Pass Course 3rd Year

301: Analysis	3 Hrs.	33	33	
302: Abstract Algebra	3 Hrs.	33	33	
303: Programming in C and Numerical Analysis	3 Hrs. (Theory) 4 Hrs. (Practical)	34	34* (Theory Exam=20 marks) + (Practical Exam=14 marks)	

* Course 303 shall consist of two examinations namely (a) Theory Examination and (b) Practical Examination. Theory examination shall be of three hours duration of 20 marks and in this paper Practical examination shall be of four hours duration of 14 marks (with Practical and written examination of 9 marks + Viva-voce of 5 marks)

** Pass percentage shall be as approved by the Faculty of Arts for B.A. Courses.

Courses 101, 102, 201, 202, 301, 302 Maximum Marks 33 in each Course

Section-I (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-III (2 Questions of **seven marks** each to be set, out of which **one** is to be attempted)
(Total = 13+13+07=33)

Courses 103 & 203 Maximum Marks 34 in each Course

Section-I (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-III (2 Questions of **eight marks** each to be set, out of which **one** is to be attempted)
(Total = 13+13+08=34)

Course 303 Maximum Marks (Theory + Practical)= 34

(a) Theory Examination: Maximum Marks = 20

Section-I (4 Questions of **four marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of **four marks** each to be set, out of which **two** are to be attempted)

Section-III (2 Questions of **four marks** each to be set, out of which **one** is to be attempted)
(Total = 8+8+4=20)

(b) Practical Examination: Maximum Marks = 14

(Practical & written examination = 10 marks) + (Viva-Voce = 04 marks).

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B.A. Pass (Mathematics) ANNEXURE-C

Course Structure & Distribution of Marks for Regular College Students

Duration: Three years

w.e.f. 2007-2008 onwards

B.A. Pass Course 1st Year

Course: Title	Time	Total Marks	Theory Paper	Internal Assessment (H.E.+ Attendance)	Pass Percentage**
101: Algebra and Trigonometry	3 Hrs.	33	26	07 (= 5+2)	
102: Calculus	3 Hrs.	33	26	07 (= 5+2)	
103:Vector Analysis and Geometry	3 Hrs.	34	27	07 (= 5+2)	

B.A. Pass Course 2nd Year

201: Advanced Calculus	3 Hrs.	33	26	07 (= 5+2)	
202: Differential Equations	3 Hrs.	33	26	07 (= 5+2)	
2.3: Mechanics	3 Hrs.	34	27	07 (= 5+2)	

B.A. Pass Course 3rd Year

301: Analysis	3 Hrs.	33	26	07 (= 5+2)	
302: Abstract Algebra	3 Hrs.	33	26	07 (= 5+2)	
303: Programming in C and Numerical Analysis	3 Hrs. (Theory) 4 Hrs. (Practical)	34	27* (Theory Exam=15 marks) +(Practical exam=12 marks)	07 (= 5+2)	

H.E. stands for House examination test etc.

* Course 303 shall consist of two examinations namely (a) Theory Examination and (b) Practical Examination. Theory examination shall be of three hours duration of 15 marks and in this paper Practical examination shall be of four hours duration of 12 marks (with Practical and written examination of 8 marks + Viva-voce of 4 marks)

** Pass percentage shall be as approved by the Faculty of Arts for B.A. Courses.

Courses 101, 102, 201, 202, 301, 302 Maximum Marks 26 in each Course

Section-I (4 Questions of five marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of five marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of six marks each to be set, out of which one is to be attempted)

(Total = 10+10+06=26)

Courses 103 & 203 Maximum Marks 27 in each Course

Section-I (4 Questions of five marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of five marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of seven marks each to be set, out of which one is to be attempted)

(Total = 10+10+07=27)

Course 303 Maximum Marks (Theory + Practical)= 27

(a) Theory Examination: Maximum Marks 15

Section-I (4 Questions of three marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of three marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of three marks each to be set, out of which one is to be attempted)

(Total = 6+6+3=15)

(b) Practical Examination: Maximum marks 12
(Practical & written examination = 08 marks)+(Viva-Voce = 04 marks).

B.Sc. Pass (Mathematics) ANNEXURE-D

Course Structure & Distribution of Marks for Regular College Students

Duration: Three years w.e.f. 2007-2008 onwards

B.Sc. Pass Course 1st Year

Course: Title	Time	Total Marks	Theory Paper	Internal Assessment (H.E. + Attendance)	Pass Percentage
101: Algebra and Trigonometry	3 Hrs.	66	52	14 (= 10+04)	40%
102: Calculus	3 Hrs.	66	52	14 (= 10+04)	40%
103:Vector Analysis and Geometry	3 Hrs.	68	54	14 (= 10+04)	40%

B.Sc. Pass Course 2nd Year

201: Advanced Calculus	3 Hrs.	66	52	14 (= 10+04)	40%
202: Differential Equations	3 Hrs.	66	52	14 (= 10+04)	40%
203: Mechanics	3 Hrs.	68	54	14 (= 10+04)	40%

B.Sc. Pass Course 3rd Year

301: Analysis	3 Hrs.	66	52	14 (=10+04)	40%
302: Abstract Algebra	3 Hrs.	66	52	14 (=10+04)	40%
303: Programming in C and Numerical Analysis	3 Hrs. (Theory) 4 Hrs. (Practical)	68	54*(Theory Exam =30 marks+ Practical exam=24 marks)	14 (=10+04)	40%

H.E. stands for House examination test etc.

* Course 303 shall consist of two examinations namely (a) Theory Examination and (b) Practical Examination. Theory examination shall be of three hours duration of 30 marks and in this paper Practical examination shall be of four hours duration of 24 marks (with Practical and written examination of 16 marks + Viva-voce of 08 marks)

Courses 101, 102, 201, 202, 301, 302 Maximum Marks 52 in each Course

Section-I (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of twelve marks each to be set, out of which one is to be attempted)
(Total = 20+20+12=52)

Courses 103 & 203 Maximum Marks 54 in each Course

Section-I (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-II (4 Questions of ten marks each to be set, out of which two are to be attempted)

Section-III (2 Questions of fourteen marks each be set) out of which one is to be attempted)
(Total = 20+20+14=54)

Course 303 Maximum Marks (Theory + Practical)= 54

(a) Theory Examination: Maximum Marks = 30

Section-I (4 Questions of six marks each to be set out of which two are to be attempted)

Section-II (4 Questions of six marks each to be set out of which two are to be attempted)

Section-III (2 Questions of six marks each to be set out of which one is to be attempted)
(Total = 12+12+6=30)

(b) Practical Examination: Maximum Marks 24

(Practical & written examination = 16 marks) + (Viva-Voce = 08 marks)

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ANNEXURE E

B.A. Honours (Mathematics)

Course Structure & Distribution of Marks for **Regular College Students**

Duration: Three years

w.e.f. the session when this new Honours scheme is adopted for implementation by the Faculty of Arts

B.A. Honours 1st Year

Course: Title	Time	Total Marks	Theory Paper	Internal Assessment (H.E.+ Attendance)	Pass Percentage**
101: Algebra and Trigonometry	3 Hrs.	33	26	07 (= 5+2)	
102: Calculus	3 Hrs.	33	26	07 (= 5+2)	
103:Vector Analysis and Geometry	3 Hrs.	34	27	07 (= 5+2)	
104: Probability Theory and Optimization	3 Hrs.	33	26	07 (= 5+2)	

B.A. Honours 2nd Year

201: Advanced Calculus	3 Hrs.	33	26	07 (= 5+2)	
202: Differential Equations	3 Hrs.	33	26	07 (= 5+2)	
203: Mechanics	3 Hrs.	34	27	07 (= 5+2)	
204: Discrete Mathematics	3 Hrs.	33	26	07 (=5+2)	

B.A. Honours 3rd Year

301: Analysis	3 Hrs.	33	26	07 (= 5+2)	
302: Abstract Algebra	3 Hrs.	33	26	07 (= 5+2)	
303: Programming in C and Numerical Analysis	3 Hrs. (Theory) 4 Hrs. (Practical)	34	27* (Theory Exam=15 marks) +(Practical exam=12 marks)	07 (= 5+2)	
304: Elementary Number Theory and Abstract Algebra	3 Hrs.	34	27	07 (=5+2)	

H.E. stands for House examination test etc.

*Course 303 shall consist of two examinations namely (a) Theory Examination and (b) Practical Examination. Theory examination shall be of three hours duration of 15 marks and in this paper Practical examination shall be of four hours duration of 12 marks (with Practical and written examination of 8 marks + Viva-voce of 4 marks).

** Pass percentage shall be as approved by the Faculty of Arts for B.A. Courses.

Courses 101, 102, 104, 201, 202, 204, 301, 302 Maximum Marks 26 in each Course

Section-I (4 Questions of **five marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of **five marks** each to be set, out of which **two** are to be attempted)

Section-III (2 Questions of **six marks** each to be set, out of which **one** is to be attempted)

(Total = 10+10+06=26)

Courses 103, 203 & 304 Maximum Marks 27 in each Course

Section-I (4 Questions of **five marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of five marks each to be set, out of which two are to be attempted)
Section-III(2 Questions of seven marks each to be set, out of which one is to be attempted)
(Total = 10+10+07=27)

Contd..2/..

Course 303 Maximum Marks (Theory + Practical)= 27

(a) Theory Examination: Maximum Marks 15

Section-I (4 Questions of three marks each to be set, out of which two are to be attempted)
Section-II (4 Questions of three marks each to be set, out of which two are to be attempted)
Section-III(2 Questions of three marks each to be set, out of which one is to be attempted)
(Total = 6+6+3=15)

(b) Practical Examination: Maximum marks 12

(Practical & written examination = 08 marks)+(Viva-Voce = 04 marks)

B.A. Honours (Mathematics)
Course Structure & Distribution of Marks for Private/ICDEOL Students
Duration: Three years
w.e.f. the session when this new Honours scheme is adopted for implementation by the Faculty of Arts

B.A. Honours Course 1st year

Course: Title	Time	Total Marks	Theory Paper	Pass Percentage**
101: Algebra and Trigonometry	3 Hrs.	33	33	
102: Calculus	3 Hrs.	33	33	
103: Vector Analysis and Geometry	3 Hrs.	34	34	
104: Probability Theory and Optimization	3 Hrs.	33	33	

B.A. Honours Course 2nd year

201: Advanced Calculus	3 Hrs.	33	33	
202: Differential Equations	3 Hrs.	33	33	
203: Mechanics	3 Hrs.	34	34	
204: Discrete Mathematics	3 Hrs.	33	33	

B.A. Honours Course 3rd year

301: Analysis	3 Hrs.	33	33	
302: Abstract Algebra	3 Hrs.	33	33	
303: Programming in C and Numerical Analysis	3 Hrs. (Theory) 4 Hrs. (Practical)	34	34* (Theory Exam=20 marks) + (Practical Exam=14 marks)	
304: Elementary Number Theory and Abstract Algebra	3 Hrs.	34	34	

* Course 303 shall consist of two examinations namely (a) Theory Examination and (b) Practical Examination. Theory examination shall be of three hours duration of 20 marks and in this paper Practical examination shall be of four hours duration of 14 marks (with Practical and written examination of 9 marks + Viva-voce of 5 marks).

** Pass percentage shall be as approved by the Faculty of Arts.

Contd...3/...

Courses 101, 102, 104, 201, 202, 204, 301, 302 Maximum Marks 33 in each Course

Section-I (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-III (2 Questions of **seven marks** each to be set, out of which **one** is to be attempted)
(Total = 13+13+07=33)

Courses 103, 203 & 304 Maximum Marks 34 in each Course

Section-I (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of **6.5 marks** each to be set, out of which **two** are to be attempted)

Section-III (2 Questions of **eight marks** each to be set, out of which **one** is to be attempted)
(Total = 13+13+08=34)

Courses 303 Maximum Marks (Theory + Practical)= 34

(a) Theory Examination: Maximum Marks = 20

Section-I (4 Questions of **four marks** each to be set, out of which **two** are to be attempted)

Section-II (4 Questions of **four marks** each to be set, out of which **two** are to be attempted)

Section-III (2 Questions of **four marks** to be set, out of which **one** is to be attempted)
(Total = 8+8+4=20)

(a) Practical Examination: Maximum Marks = 14

(Practical & written examination = 9 marks) + (Viva-Voce = 5 marks)

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ANNEXURE-F

HIMACHAL PRADESH UNIVERSITY
B.A./B.Sc.(Mathematics) 1st Year Examination

Course 101: Algebra and Trigonometry
(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours **Maximum Marks**

(I) B.A. Regular College Students :	26
(ii) B.Sc. Students :	52
(iii) B.A.(Pvt./ICDEOL) Students:	33

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (10) [6.5].

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (12) [7]

Section – I (4 Questions)

Algebra

Elementary operations on matrices and their use to find inverse of a matrix Linear dependence and Independence of row and column vectors. Dimensions of row and column spaces. Row Rank, Column rank and rank of a matrix (normal form). Equivalence of column and row ranks. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of matrix. Applications of matrices to a system of linear homogenous and non-homogeneous equations. Consistency of a system of linear equations.

Books Recommended

1. Schaum's Outline of "Theory of Problems of matrices", Schaum's Outline series, McGraw – Hill, Book Company, New York, St. Louis, San Francisco, Toronto Sydney ,1962. (Chapter 1, 2, 5, 9, 19, 23).

2. Shanti Narayan, 'A Text Book of Matrices' S Chand & Co. 5th Edition. Chapter 2 (\$\$ 33.1), Chapter 4, (\$\$ 52, 54.1), Chapter 5 (\$\$ 58, 58.1, 58.2).

Section – II (4 Questions)

Relations between the roots and coefficients of general polynomial equation in one variable, Transformation of equation, Horner's method. Descartes rule of signs with applications. Solution of cubic equations (Cardon method only) Biquadratic equations (Ferrari's and Descartes Method).

Books Recommended

1. J.V. Uspensky,' Theory of Equations', McGraw – Hill, Book Company, Inc. New York, Toronto (London). Chapter 3 (\$\$ 5), Chapter 5, Chapter 6 (\$\$ 10, 12).

Section – III (2 Questions)

Trigonometry

De Moivre's theorem and its applications. Direct and inverse hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometrical functions (expansion of $\sin^n$ and $\cos^n$ in terms of sines and cosines of multiples of θ). Gregory's series. Summation of finite trigonometric series depending on a G.P.

Books Recommended

1. S.L. Loney: Plane Trigonometry-II, A.I.T. B.S., Publishers & Distributers (2003). Chapter 2nd (\$\$ 21),Chapter 4th (\$\$ 42-48),Chapter 5th (\$\$ 74-77), Chapter 6th, Chapter 7th (103-109).

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Course 102: Calculus
(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours

Maximum Marks

(i) B.A. Regular College Students :	**26**
(ii) B.Sc. Students :	**52**
(iii) B.A.(Pvt./ICDEOL) Students:	**33**

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (10) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (12) [7]

Section-I (4 Questions)

Differential Calculus

$\in$-δ definition of the limit of a function. Basic properties of limits. Continuity. Properties of Continuous functions. Uniform continuity (its definition and examples). Classification of discontinuities. Differentiability. Successive Differentiation. Rolle's theorem. Mean value theorem. Taylor's theorem with various forms of remainders. Leibnitz theorem (Its definition with some examples). Indeterminate from, Asymptotes, Curvature, Concavity, Convexity, Points of inflexion and Tracing of curves.

Books Recommended

1. Shanti Narayan. 'Differential Calculus',Shyamlal charitable trust, RamNagar, New-Delhi-110055(2002). Chapter 3rd ($$ 3.11, 3.14, 3.21, 3.22, 3.31, 3.4, 3.5, 3.7, 3.8), Chapter 5th, Chapter 7th ($$ 7.1-7.2, 7.61), Chapter 9, Chapter 11th, Chapter 12th ($$12.1, 12.3, 12.5), Chapter 13th, Chapter 14th ($$ 14.1), Chapter 15th ($$ 15.2 & 15.6)

Section-II (4 Questions)

Ordinary Differential Equations

Linear differential equations: Basic theory of Linear differential equation, homogeneous linear equation with constant coefficients, non-homogeneous linear equation with constant coefficients of dependent variables & its derivative, variation of parameters, Cauchy-Euler equation.

System of linear differential equations: Differential operators & operator method, homogeneous

linear system with constant coefficients (two equations in two unknown functions)

Differential equation of first order but not of first degree: Equations solvable for p, y& x. Singular solution of differential equation: Discriminant, envelop, singular solution, Clairaut's equation.

Books Recommended

1. Shapley,L.Ross , 'Differential equation' , John Wiley & sons , Third Edition , 1984 Chapter4th ($$4.1 to 4.5) , Chapter 7th ($$ 7.1 & 7.4)

2. H.T.H. Piaggio, 'An Elementary treatise on differential equations & application', C.B.S. Publisher & distributors, Delhi 1985. Chapter 5th ($$ 51-54) , Chapter 6th ($$ 65-68).

Section-III (2 Questions)

Integral Calculus

Reduction formulae, $\int \sin^n x\,dx$, $\int \cos^n x\,dx$, $\int e^{ax} x^n dx$, $\int x^n (\log x)^m dx$, $\int x^n \sin x\,dx$,

$\int x^n \cos x\,dx$, $\int \sin^n x \cos^m x\,dx$. $\int_0^{\pi/2} \sin^n x\,dx$, $\int_0^{\pi/2} \cos^n x\,dx$, $\int_0^{\pi/2} \sin^n x \cos^m x\,dx$

Books Recommended

1. Shanti Narayan, 'Integral Calculus', S. Chand & Co. Ltd., Delhi, 2004, Chapter 4th.

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Course 103: Vector Analysis and Geometry

(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours **Maximum Marks**

(i) B.A. Regular College Students :	27
(ii) B.Sc. Students :	54
(iii) B.A.(Pvt./ICDEOL) Students:	34

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as

5 (10) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as

7 (14) [8]

Section-I (4 Questions)

Geometry

General equation of second degree. System of conics, Confocal conics, Polar equation of a conic ,Sphere, Cone, Cylinder.

Books Recommended

1. Shanti Narayan, Analytical Solid Geometry Thirteenth Edition, S. Chand & Co. Delhi.Chapter 6^{th} ($$ 6.1- 6.3, 6.5-6.8), Chapter 7^{th} ($$7.1 - 7.4, 7.7 – 7.8).

Section-II (4 Questions)

Vector Analysis

Scalar and Vector product of three vectors, Product of four vectors, Reciprocal Vectors. Vector differentiation. Gradient of a scalar function, Divergence of a vector, curl of a vector.

Vector integration Double integrals, Double integral over a region, Green's Theorem, Change of variables.

Books Recommended

1. Berry Spain, ' Vector Analysis', London , D. Von. Nostrand Co., 1965. Chapter 1^{st} ($$ 10, 11, 12 & 13), Chapter 3^{rd}, Chapter 5^{th}, Chapter 6^{th} and Chapter 7^{th}.
2. S.C. Malik & Savita Arora, 'Mathematical Analysis', New Age International Pvt. Ltd., Second Addition, 1997, Chapter 17 ($$ 2 to 5).

Section-III (2 Questions)

Central conicoids. Paraboloids. Plane Sections of Conicoids. Generating lines, Confocal Conicoids. Reduction of Second degree equations.

Books Recommended

Shanti Narayan, 'Analytical Solid Geometry', S. Chand & Co. Delhi, Chapter 8^{th} ($$ 8.1, 8.2, 8.3 & 8.9), Chapter 9^{th}, Chapter 10^{th} ($$ 10.1 & 10.7), Chapter 11^{th} ($$ 11.1, 11.6, 11.7 & 11.21 to 11.24).

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Course 104: Probability Theory and Optimization

(For Honours Stream only)

Time Allowed: 3 hours **Maximum Marks**

(i) B.A. Regular College Students :	26
(ii) B.Sc. Students :	40
(iii) B.A.(Pvt./ICDEOL) Students:	33

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of eight marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (8) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows for:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (8) [7]

Section – I (4 Questions)

Convex sets, convex functions.

Linear programming problem (L.P.P.): Formulation of L.P.P. Linear programming problem in matrix notation. Graphical solution of L.P.P, Simplex method for solution of L.P.P., Charne's big M-method. The two phase method.

Principle of duality in L.P.P. Formulation of dual problem corresponding to a given primal LPP.

The Assignment Problem: Mathematical formulation, assignment methods, Hungarian method, Unbalanced assignment problem.

Section – II (4 Questions)

Notion of Probability, Axiomatic approach to probability. Elementary properties of probability like addition and multiplication theorems and conditional probability. Independent and pair-wise independent events. Baye's theorem. Geometric probability. Random variables, Distribution functions and their properties, discrete and continuous random variables. Various measure of central tendency (Arithmetic Mean (A.M.), Geometric Mean (G.M.), Harmonic Mean (H.M.), median, mode and mean deviation), dispersion (variance, Karl Pearson coefficient of dispersion), Skewness and kurtosis, Moments and central moments of higher order and their relations; for continuous distributions. Moment generating functions.

Section – III (2 Questions)

Standard Distributions: Bernoulli's distribution, Binomial distributions, negative Binomial distribution, Poisson's distribution, geometric distribution, Hyper-geometric distribution, rectangular distribution and Normal distribution (First four moments and central moments for above distributions and their properties).

The Transportation Problem: Mathematical formulation, Basic feasible solution of transportation problem by least cost-method and Vogel's approximation method, Optimality testing of basic feasible

olution, Unbalanced transportation problems.

Text Books

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, Eleventh Edition, June, 2002, **Chapter 3:** 3.1, 3.3, 3.4, 3.4.1, 3.5, 3.5.1, 3.7, 3.7.1 to 3.7.5, 3.8, 3.8.1 to 3.8.6, 3.9, 3.9.1 to 3.9.3, 3.10, 3.11, 3.12, 3.13, 3.14, 3.14.1, 3.15, 3.15.1 & 3.15.2; **Chapter 4:** 4.2, 4.2.1, 4.3; **Chapter 5:** 5.1, 5.2, 5.2.1, 5.3, 5.3.1 to 5.3.2, 5.4, 5.4.1 to 5.4.3; **Chapter 7:** 7.1, 7.1.1 to 7.1.3; **Chapter 8:** 8.2, 8.2.1, 8.3, 8.3.1, 8.4, 8.4.1, 8.5, 8.5.1, 8.5.2, 8.6, 8.6.5, 8.7, 8.7.1, 8.7.2, 8.8, 8.8.1 and **Chapter 9:** 9.2, 9.2.1 to 9.2.5, 9.2.7 to 9.2.14, 9.3, 9.3.1, 9.3.2 & 9.3.4.
2. S.D. Sharma, Operations Research, Kedar Nath Ram Nath & Co. 14th Edition 2004.

Reference Books

1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons 12th Edition, 2004.

2. H.S. Kasana & K.D. Kumar, Introductory Operations Research, Theory and Applications, Published by Springer, Indian Edition, 2005.

Reference Books for 1st year Courses

K.B.Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt Ltd., New Delhi, 2000.

P.B.Bhattacharya, S.K.Jain and S.R.Nagpaul, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1997.

P.B.Bhattacharya, S.K.Jain and S.R.Nagpaul, First Course in linear Algebra, Wiley Eastern , New Delhi, 1983.

S.K.Jain, A Gunawardena & P.B.Bhattacharya, Basic Linear Algebra with MATLAB, Key College Publishing (Springer-Verlag) 2001.

Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum's Outline series, Schaum Publishing Co. New York.

N.Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow.

D.A.Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.

E.A. Codington, An Introduction to ordinary differential Equations, Prentice Hall of India, 1961.

W.E.Boyce and P.G.Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 1986.

Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 1999.

Murray R.Spiegel, Vector Analysis, Schaum Publishing Company, New York.

N.Saran and S.N.Nigam, Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.

Shanti Narayan, A Text Book of Vector Calculus, S. Chand & Co. New Delhi.

S.L.Loney, The Elements of Coordinate Geometry, Macmillan and Co., London.

R.J.T.Bell, Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd. 1994.

N.Saran and R.S.Gupta, Analytical Geometry of Three Dimensions, Pothishala Pvt. Ltd., Allahabad.

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HIMACHAL PRADESH UNIVERSITY
B.A./B.Sc.(Mathematics) 2nd Year Examination

Course 201: Advanced Calculus
(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours **Maximum Marks**

(I) B.A. Regular College Students :	**26**
(ii) B.Sc. Students :	**52**
(iii) B.A.(Pvt./ICDEOL) Students:	**33**

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (10) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (12) [7]

Section-I (4 Questions)

Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences and their convergence. Cauchy's convergence criterion, Algebra of sequences some important theorems, monotonic sequences, series of non-negative terms, comparison test, [Cauchy's Integral test, Ratio test, Raabe's test, logarithmic test, Gauss's test, (without proofs)] Alternating series, Leibnitz's test. Absolute and conditional convergence.

Section-II (4 Questions)

Limit and continuity of functions of two variables, Partial differentiation, Change of variables, Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians.

Envelopes, Evolutes, Maxima, minima and saddle points of functions of two variables, Lagrange's multiplier method.

Quadrature rectification, volumes and surfaces of solids revolution in Cartesian and Parametric

rm.

Books Recommended for Section I & II

1. S.C. Malik & Savita Arora,' Mathematical Analysis', New Age International (P) Ltd. Publishers, Second edition. Chapter 3rd, Chapter 4th ($$ 1-9), Chapter 4th (10.1 & 10.2), Chapter 15 ($$ 1.2 to 1.7, 2 to 5, 8 to 10) Chapter 16th ($$ 2, 3).

2. Shanti Narayan, 'Integral Calculus', S. Chand & Co. New Delhi, Chapters 8th and 9th.

Section-III (2 Questions)

Beta and Gamma functions, Triple integrals, Theorems of Gauess' Green and Stokes' (Statement only) and problems based on these.

Books Recommended

1. S.C. Malik & Savita Arora,' Mathematical Analysis', New Age International (P) Ltd. Publishers, Second edition. Chapter 18 ($$ 5 to 8), Appendix-I (page 872 to 878).

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Course 202: Differential Equations
(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours **Maximum Marks**

(i) B.A. Regular College Students :	26
(ii) B.Sc. Students :	52
(iii) B.A.(Pvt./ICDEOL) Students:	33

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (10) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The disturibution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (12) [7]

Section-I (4 Questions)

First order partial differential equations:

Partial differential equations of the first order in two independent variables, formulation of first order partial differential equation, solution of linear first order partial differential equations (Lagrange's Method), integral surfaces passing through a given curve, surfaces orthogonal to a given system of surfaces, solution of non-linear partial differential equation of first order by Charpit's Method.

Second order partial differential equations:

Origin and classification of second order partial differential equation, Solution of linear partial differential equation with constant coefficients. Monge's method to solve the non-linear partial differential equation $Rr+Ss+Tt = V$.

Section-II (4 Questions)

Power series solution of differential equations and orthogonal functions:

Solution by Power series method and its basis, Solution of Bessel and Legendre's equations, properties of Bessel and Legendre functions.

Laplace Transformation

Introduction, basic theory of Laplace transform. Laplace transform solution of initial value problem, shifting theorems (shifting on s-axis, translation t-axis), unit step function, Dirac-delta function. Differentiation and integration of Laplace transform. Convolution theorem.

Books Recommended

1. J.N. Sharma and Kehar Singh,'Partial differential equations for engineers and scientists', Narosa Publishing house, Edition 2001,Chapter 1st ($$ 1.1 –1.7, 1.91-1.93), Chapter 2nd (2.1 – 2.3, 2.6)

2. Erwin Kreyszig,' Advanced Engineering Mathematics, John Wiley & Sons Inc., New York, 1999, Chapter 4th ($$ 4.1 – 4.9).

3. Shapley,L..Ross , 'Differential equation' , John Wiley & sons , Third Edition , 1984 Chapter 9th ($$9.1 - 9.4)

Section-III (2 Questions)

Calculus of Variations-Variational problems with fixed boundaries-Euler's equation for functionals containing first order derivative and one independent variable. Extremals. Functionals dependent on higher order derivatives. Functionals dependent on more than one independent variable. Variational problems in parametric form. Invariance of Euler's equation under coordinates transformation.

Variational Problems with Moving Boundaries-Functionals dependent on one and two functions.

Sufficient conditions for an Extremum-Jacobi and Legendre conditions. Second Variation. Variational principle of least action (Statement only).

Books Recommended

1. A.S. Gupta, 'Calculus of Variations wi. pplications' ,Prentice Hall of India, Private Limited, New Delhi-110 001 (1997). Chapter 1st 1.1, 1.2, 1.4, 1.5, 1.6, 1.10. Appendix-C), Chapter 2nd ($$ 2.1 & 2.2), Chapter 3rd ($$ 3.2 &

Course 203: Mechanics

(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours **Maximum Marks**

(I) B.A. Regular College Students :	27
(ii) B.Sc. Students :	54
(iii) B.A.(Pvt./ICDEOL) Students:	34

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students.

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (10) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
7 (14) [8]

Section-I (4 Questions)

Statics

Analytical conditions of equilibrium of Coplanar forces, Virtual work.

Forces in three dimensions, Poinsot's central axis, Wrenches, Null lines and planes, Stable and unstable equilibrium.

Books Recommended

S.L. Loney, 'An Elementary Treatise as Statics' Maxford Books (A.I.T.S. Pub.) Delhi, 2003, Chapter 3 ($$ 54 to64, 68 & 69), Chapter X and Chapter XI ($$ 184 to 192, 206 to 209).

Section-II (4 Questions)

Dynamics

Simple Harmonic Motion, Motion on Rough Curve, Tangential & Normal Accelerations, Motion in a Resisting Medium, Motion when the mass varies, Velocity along Radial and transverse directions, central orbits.

Section-III (2 Questions)

Kepler's laws of motion, Motion of a particle in three dimensions, Acceleration in terms of Polar and Cartesian co-ordinate systems.

Books Recommended for Section II & III

S.L. Loney, 'An Elementary Treatise on the Dynamics of a particle & of Rigid bodies', AITBS Publishers & Distributors, 2003, Chapter 2nd ($$ 23-28), Chapter 4th, Chapter 5th, Chapter 6th, Chapter 7th and Chapter 9th.

Course 204: Discrete Mathematics
(For Honours Stream only)

Time Allowed: 3 hours **Maximum Marks**

(i) B.A. Regular College Students :	26
(ii) B.Sc. Students :	40
(iii) B.A.(Pvt./ICDEOL) Students:	33

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of eight marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (8) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (8) [7]

Section –I (4 Questions)

Boolean Algebras: Lattices and Algebraic Systems, Principle of Duality, Basic Properties of Algebraic Systems defined by Lattices, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algebras, Uniqueness of Finite Boolean Algebras, Boolean Functions and Boolean Expressions.

Permutations and Combinations: Two basic counting principles, Permutations of sets, Combinations of Sets, Permutations of multisets, Combinations of multisets.

Generating Permutations and Combinations: Generating permutations, Inversions in permutations, Generating combinations, Partial orders and equivalence relations.

Section – II (4 Questions)

The Binomial Coefficients: Pascal's formula, The binomial theorem, Identities, Unimodality of binomial coefficients, The multinomial theorem, Newton's binomial theorem.

The Pigeonhole Principle: Pigeonhole principle: Simple form, Pigeonhole principle: Strong form, A theorem of Ramsey (without proof).

The Inclusion-Exclusion Principle and Applications: The inclusion-exclusion principle, Combinations with repetition, Derangements.

Recurrence Relations and Generating Functions: Some number sequences, Linear homogeneous recurrence relations, Non-homogeneous recurrence relations, Generating functions, Recurrences and generating functions, Exponential generating functions.

Section – III (2 Questions)

Introduction to Graph Theory: Basic properties, Eulerian trails, Hamilton chains and cycles, Bipartite multigraphs, Trees.

Diagraphs and Networks: Diagraphs and Networks.

Text Books

1. C.L. Liu, 'Elements of Discrete Mathematics', Tata McGraw-Hill, Second Edition, (§§ 12.1 to 12.7)
2. Richard A. Brualdi, Introductory Combinatorics, third Edition, (Chapter 2 & 3, Chapter 4 §§ 4.1 to 4.3. §§ 4.5. Chapter 5 §§ 5.1. to 5.6 Chapter 6 §§ 6.1 to 6.3 Chapter 7 §§ 7.1 to 7.5 & §§ 7.7, Chapter 11 §§ 11.1 to 11.5, Chapter 12).

Reference book

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Tata McGraw-Hill, Fourth Edition.

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Reference Books for 2nd year Courses

Goarkh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad.

Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Co., New York.

Goarkh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.

O.E. Stanaitis, An Introduction to Sequences, Series and Improper Integrals, Holden-Dey, Inc., San Francisco, California.

Earl D. Rainville, Infinite Series, The Macmillan Company, New York.

Chandrika Prasad, Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad.

Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc., New York, 1999

D.A. Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1967

A.R.Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd. London.

Ian N. Sneddon, Elements of partial Differential Equations, McGraw-Hill Book Company, 1988.

Francis B. Hilderbrand, Advanced Calculus for Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 1977.

Jane Cronin, Differential equations, Marcel Dekkar, 994.

Frank Ayres, Theory and Problems of Differential Equations, McGraw-Hill Book Company, 1972.

Richard Bronson, Theory and Problems of Differential Equations, McGraw-Hill, Inc. 1973.

A.M.Arthurs, Complementary Variational Principles, Clarendon Press, Oxford, 1970.

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HIMACHAL PRADESH UNIVERSITY
B.A./B.Sc.(Mathematics) 3rd Year Examination

Course 301: Analysis
(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours

Maximum Marks

(i) B.A. Regular College Students :	26
(ii) B.Sc. Students :	52
(iii) B.A.(Pvt./ICDEOL) Students:	33

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (10) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (12) [7]

Section-I (4 Questions)

Metric Spaces

Definition and examples of metric spaces. Limits in metric spaces. Functions continuous on a metric spaces. Open sets. Closed sets. More about open sets. Connected sets. Complete metric spaces. Compact metric spaces. Continuous functions on compact metric spaces, Uniform continuity.

Books Recommended

1. R.R. Goldberg, 'Method of Real Analysis', Oxford and IBH Publishing Co., New Delhi, 1970, Chapter 4th (\$\$ 4.2-4.3), Chapter 5th (\$\$ 5.3 – 5.5), Chapter 6th (\$\$ 6.1 – 6.8).

Real Analysis

The Riemann integral: Defination and existence of integral, refinement of Partitions, Darboux's theorem, condition of integrability, Integrability of the sum and difference of integrable functions. The fundamental theorem of calculus, Mean value theorem of calculus (1st & 2nd).

Improper integrals their convergence, Comparison tests, Abel's and Dirichlet's tests.

Book Recommended

1. S.C. Malik and Savita Arora, 'Mathematical Analysis'. New Age International (P) Ltd. Publishers, 1997, Second edition, Chapter 9th (\$\$ 1 to 5, 9 & 10). Chapter 11th (\$\$ 1 to 4, 5.2).

Section-II (4 Questions)

Series of arbitrary terms, Convergence and divergence. Abel's and Dirichlet's tests.

Partial derivation and differentiability of real-valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem (case of two variables), Fourier series. Euler's formula, even and odd functions, half range expansions.

Books Recommended

S.C. Malik and Savita Arora, 'Mathematical Analysis', New Age International (P) Ltd. Publishers, 1997, Second edition, Chapter 12^{th}, Chapter 14^{th}, Chapter 15^{th} (\$\$ 1 to 6), Chapter 16^{th} (\$\$ 1.1).

Section-III (2 Questions)

Complex Analysis

Complex numbers, Geometric representation of Complex numbers analytic function, Bilinear Transformation (Mobius transformation).

Books Recommended

1. Shanti Narayan,' Theory of Function of a Complex Variable', S. Chand & Co. Ltd., New Delhi, 2001,Chapter 1^{st}, 2^{nd} & 5^{th}.

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Course 302: Abstract Algebra

(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours **Maximum Marks**

(I) B.A. Regular College Students :	26
(ii) B.Sc. Students :	52
(iii) B.A.(Pvt./ICDEOL) Students:	33

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of 10 marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 (10) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as
6 (12) [7]

Section-I (4 Questions)

Mappings, Elementary properties of integers, definition of a group with examples and simple properties, subgroups. A Counting Principle, Normal subgroups, Quotient groups. Homomorphism, Group-Automorphisms, Cayley's theorem, permutation groups, another counting principle.

Books Recommended

1 I.N. Herstein, Topics in Algebra, 2nd Edition, John Wiley & sons(Asia), New Delhi, 2004. Chapter 1st (\$\$ 1.2 & 1.3), Chapter 2nd (\$\$ 2.1 to 2.11).

Section-II (4 Questions)

Fields, Vector Spaces, Subspaces, Bases and Dimension, Linear Transformations, The Algebra of Linear Transformations, Isomorphism, Representation of Transformations by Matrices, Linear Functionals, The Double Dual and The Transpose of a Linear Transformation.

Books Recommended

1. K. Hoffman and R. Kunze, Linear Algebra, 2nd Edition, Prentice Hall, Englewood Cliffs, New Jersey, 1971, Chapter 1st (\$\$ 1.1), Chapter 2ud (\$\$ 2.1 – 2.4), Chapter 3rd (\$\$ 3.1 – 3.7), Prentice – Hall of India, Pvt. New Delhi, 2001.

Section-III (2 Questions)

Inner Product Spaces-Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal complements. Orthonormal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process. Linear functionals adjoints.

Books Recommended

1. K. Hoffman and R. Kunze, Linear Algebra, 2nd Edition, Prentice Hall, Englewood Cliffs, New Jersey, 1971., Chapter 8th (SS 8.1 – 8.3).

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Course 303: Propramming in C and Numerical Analysis

(A) Theory Paper

(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours

Maximum Marks Theory

(i) B.A. Regular College Students : 15
(ii) B.Sc. Students : 30
(iii) B.A.(Pvt./ICDEOL) Students: 20

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I & II shall have the following distribution of marks for various streams of students.

(i) For B.A.(Regular) students, each question shall be of three marks.
(ii) For B.Sc. students each question shall be of six marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be four marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
3 (6) [4]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows for:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL.] as
3 (6) [4]

Use of scientific non programmable calculators shall be allowed.

Section-I (4 Questions)

Numerical Analysis

Solution of Equations: Bisection, Secant, Regula Falsi. Newton's Method, Roots of Polynomials.

Linear Equations

Direct Methods for Solving Systems of Linear Equations (Gauss Elimination), Iterative Methods (Jacobi Gauss-Seidel, Relaxation Methods).

Approximation

Different types of approximation, Least Square Polynomial Approximation, Polynomial Approximation using Orthogonal Polynomials, Approximation with Trigonometric Functions, Exponential Functions, Chebychev Polynomials.

Interpolation

Lagrange and Newton Interpolation, Divided Differences, Difference Schemes, Interpolation Formulas using Differences.

Books Recommended

1. E. Balagurusamy, 'Numerical Methods', Chapter 6th ($$ 6.6 – 6.9, 6.13), Chapter 7th ($$7.4) Chapter 8th ($$ 8.2 to 8.4) & Chapter 9th ($$ 9.4 to 9.7).

2. C.F. Froberg, Introduction to Numerical Analysis, Chapter 17th ($$ 17.0 to 17.5) Addison – Wesley, Publishing Company, 1981.

Section-II (4 Questions)

Numerical Differentiation

Ordinary Differential Equations: Euler's Method, Single-Step Methods, Runge-Kutta's II and IV order Method, Multi step Methods, Milne – Simpson Method. Boundary Value Problems and Eigenvalue Problem.

Numerical Integration

Newton-Cote's, Simpson's 1/3 rule, Simpson's 3/8 rule, Gauss Quadrature Formulas.

Books Recommended

1. E. Balagurusamy, 'Numerical Methods', Chapter 12th ($$ 12.2, 12.4, 12.5 & 12.8), Chapter 13th (13.3, 13.6, 13.8 & 13.9) & Chapter 14th Tata Mc-Graw-Hill Pub. C. Ltd. New Delhi, 1999.

Section-III (2 Questions)

Programming in C

Constants, variables and Data Types. Operators and Expressions, Managing Input and Output Operations, Decision Making and Branching if statement, if – else statement, nesting of if - else, statements switch statement, go to statement. Decision making and looping statements while statement, do statement, for statement. Arrays: Declaration, initialization of one dimensional, two dimensional arrays. User defined functions. Structures and unions, Pointers. File Management in C.

Books Recommended

1. Programming in C by E. Balagurusamy, 3rd Edition, Tata McGraw Hill Co. New Delhi, 2004 (Chapters 2, 3, 4, 5, 6, 7, 9, 10, 11 & 12).

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Course 303: Propramming in C and Numerical Analysis

(B) Practical Examination

(Common to Pass & Honours Course Streams)

Time Allowed: 4 hours **Maximum Marks** **Practical**

(i) B.A. Regular College Students : 12
(ii) B.Sc. Students : 24
(iii) B.A.(Pvt./ICDEOL) Students: 14

The practical examination shall consist of practical and viva-voce components

In practical examination, four questions shall be set (of equal marks) and candidates shall be required to do any two

The appointment of examiners for the practical examinations will be according to the practice followed in science subjects.

The distribution of practical examination marks between practical and written examination and viva-voce shall be as under.

(i) B.A. Regular College Students : 12 marks (Practical and written examination of 8 marks + viva voce of 4 marks)
(ii) B.Sc. Students : 24 marks (Practical and written examination of 16 marks + viva voce of 8 marks)
(iii) B.A.(Pvt./ICDEOL) Students: 14 marks (Practical and written examination of 9 marks + viva-voce of 5 marks)
(iv) At least two practical classes in computer lab. per week be held for the implementation of the practicals listed in the course.

List of Programme (Practicals) in C to be developed in Computer Lab.

1. Bisection Method
2. Regula Falsi Method
3. Newton Raphson Method
4. Secant Method
5. Gauss elimination Method
6. Gauss – Seidal Method
7. Jacobi method
8. Difference table generation
9. Trapezoidal rule
10. 1/3 Simpson rule
11. Newton – forward methods of interpolation
12. Lagrange's method of interpolation
13. Least square method of curve-fitting
14. Euler Method of Solving Differential equation
15. 4^{th} order Runge – Kutta Methods of solving differential equation.

Books Recommended

1. E. Balagurusamy, 'Numerical Methods' Tata McGraw Hill Co. New Delhi, 2004 (Appendix 1), pages 531 to 599).

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Course 304: Elementary Number Theory and Abstract Algebra
(For Honours Stream only)

Time Allowed: 3 hours

Maximum Marks

(i) B.A. Regular College Students :	27
(ii) B.Sc. Students :	40
(iii) B.A.(Pvt./ICDEOL) Students:	34

Instructions to paper setter and students:

(a) The question paper shall be divided into three Sections I, II & III.

(b) From each of Sections I & II four questions are to be set, out of which candidates shall attempt two questions. Ea question from Sections I & II shall have the following distribution of marks for various streams of students:

(i) For B.A.(Regular) students, each question shall be of five marks.
(ii) For B.Sc. students each question shall be of eight marks
(iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distributions of marks after each question in the following format:

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as

5 (8) [6.5]

(c) From Section III, two questions are to be set, out of which students shall attempt one question only. The distribution of marks for each question for various streams shall be as follows:

B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as

7 (8) [8]

Section – I (4 Questions)

The Fundamental Theorem of Arithmetic: Introduction, Divisibility, Greatest common divisor, Prime numbers, The fundamental theorem of arithmetic, The series of reciprocals of the primes, The Euclidean algorithm, The greatest common divisor of more than two numbers.

Congruences: Definition and basic properties of congruences, Residue classes and complete residue system, Linear congruences, Reduced residue systems and the Euler-Fermat theorem, Polynomial congruences modulo p. Lagrange's theorem, Applications of Lagrange's theorem, Simultaneous linear congruences. The Chinese remainder theorem, Applications of the Chinese remainder theorem, Polynomial congruences with prime power moduli.

Section – II (4 Questions)

Rings: Definition and examples, Elementary properties of rings, Types of rings, Subrings and characteristic of a ring, Additional examples of rings.

Ideals and Homomorphisms: Ideals, Homomorphisms, Sum and direct sum of ideals, Maximal and Prime ideals, Nilpotent and nil ideals, Zorn's lemma.

Unique Factorization Domains and Euclidean Domains: Unique factorization domains, Principal ideal domains, Euclidean domains, Polynomial rings over UFD.

Rings of Fractions: Rings of fractions, Rings with Ore condition.

Section – III (2 Questions)

Modules and Vector Spaces: Definition and examples, Submodules and direct sums, R-homomorphisms and quotient modules, Completely reducible modules, Free modules, Representation of Linear mappings, Rank of a linear mapping.

Text Books

1. Bhattacharya, P.B., Jain, S.K. and Nagpaul, S.R., "**Basic Abstract Algebra**", Chapter 9: §§ 1 to 5, Chapter 10, Chapter 11: §§ 1 to 4, Chapter 12: §§ 1 to 2 & Chapter 14: §§ 1 to 3, Narosa Publishing House, New Delhi.

2. Tom M. Apostol, "**Introduction to Analytic Number Theory**", Chapter 1: §§ 1.1 to 1.[illegible] and §§ 1.7, Chapter 5: §§ 5.1 to 5.9, Springer International Student Edition, (Second Edition) Cambridge University Press, Printed in India at Replika Press Pvt. Ltd.

Reference Books for 3rd Year Courses

1. Shanti Narayan, A Course of Mathematical Analysis, S.Chand & Co. New Delhi.
2. R.V.Churchil & J.W.Brown, Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990.
3. Mark J.Ablowitz & A.S.Fokas, Complex Variables: Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
4. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
5. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill, 1963.
6. N.Jacobson, Basic Algebra, Vols I & II. W.H.Freeman, 1980 (also published by Hindustan Publishing Company).
7. Shanti Narayan, A Text Book of Modern Abstract Algebra, S.Chand & Co. New Delhi.
8. P.B.Bhattacharya, S.K.Jain and S.R.Nagpaul, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1997.
9. S.K.Jain, A Gunawardena & P.B.Bhattacharya, Basic Linear Algebra with MATLAB, Key College Publishing (Springer-Verlag) 2001.
10. Vivek Sahai and Vikas Bist, Algebra. Narosa Publishing House, 1997.
11. I.S.Luther and I.B.S.Passi, Algebra Vol. I-Groups, Vol. II-Rings, Narosa Publishing House (Vol. I-1996, Vol. II-1999).
12. D.S.Malik. J.N.Mordeson, and M.K.Sen, Fundamentals of Abstract Algebra, McGraw-Hill International Edition, 1997.
13. James B. Scarborough, Numerical Mathematical Analysis, Oxford and IBH Publishing Co. Pvt. Ltd. 1966.
14. Melvin J. Maron, Numerical Analysis A Practical Approach, Macmillan publishing Co. Inc. New York, 1982.
15. M.K.Jain, S.R.K.Iyengar, R.K.Jain. Numerical Methods Problems and Solutions, New Age International (P) Ltd. 1996.
16. M.K.Jain, S.R.K.Iyengar, R.K.Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd. 1999.
17. R.Y. Rubistein, Simulation and the Monte Carlo Methods, John Wiley. 1981.
18. D.I.Yakowitz, Computational Probability and Simulation, Addison-Wesley, 1977.

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