### B.Sc. Honours (Mathematics)

**Course Structure & Distribution of Marks**

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

#### B.Sc. Honours 1st Year

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

#### B.Sc. Honours 2nd Year

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Internal Assessment (H.E. + Attendance)</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>201: Advanced Calculus</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+04)</td>
<td>40%</td>
</tr>
<tr>
<td>202: Differential Equations</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+04)</td>
<td>40%</td>
</tr>
<tr>
<td>203: Mechanics</td>
<td>3 Hrs.</td>
<td>68</td>
<td>54</td>
<td>14 (= 10+04)</td>
<td>40%</td>
</tr>
<tr>
<td>204: Discrete Mathematics</td>
<td>3 Hrs.</td>
<td>50</td>
<td>40</td>
<td>10 (= 08+02)</td>
<td>40%</td>
</tr>
</tbody>
</table>

#### B.Sc. Honours 3rd Year

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Internal Assessment (H.E. + Attendance)</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>301: Analysis</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+04)</td>
<td>40%</td>
</tr>
<tr>
<td>302: Abstract Algebra</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+04)</td>
<td>40%</td>
</tr>
<tr>
<td>303: Programming in C and Numerical Analysis</td>
<td>3 Hrs. (Theory) 4 Hrs. (Practical)</td>
<td>68</td>
<td>54* (Theory Exam = 30 marks + Practical exam = 24 marks)</td>
<td>14 (= 10+04)</td>
<td>40%</td>
</tr>
<tr>
<td>304: Elementary Number Theory and Abstract Algebra</td>
<td>3 Hrs.</td>
<td>50</td>
<td>40</td>
<td>10 (= 08+02)</td>
<td>40%</td>
</tr>
</tbody>
</table>

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 to 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).

****
### B.A. Pass (Mathematics) ANNEXURE-B

**Course Structure & Distribution of Marks for Private/ICDEOI Students**
**Duration: Three years w.e.f. 2007-2008 onwards**

#### B.A. Pass Course 1st Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Pass Percentage**</th>
</tr>
</thead>
<tbody>
<tr>
<td>101: Algebra and Trigonometry</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>102: Calculus</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>103: Vector Analysis and Geometry</td>
<td>3 Hrs.</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

#### B.A. Pass Course 2nd Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Pass Percentage**</th>
</tr>
</thead>
<tbody>
<tr>
<td>201: Advanced Calculus</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>202: Differential Equations</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>203: Mechanics</td>
<td>3 Hrs.</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

#### B.A. Pass Course 3rd Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Pass Percentage**</th>
</tr>
</thead>
<tbody>
<tr>
<td>301: Analysis</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>302: Abstract Algebra</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>303: Programming in C and Numerical Analysis</td>
<td>3 Hrs. (Theory) 4 Hrs. (Practical)</td>
<td>34</td>
<td>34* (Theory Exam=20 marks) + (Practical Exam=14 marks)</td>
<td></td>
</tr>
</tbody>
</table>

*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 = 15+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 = 15+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).
**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

<table>
<thead>
<tr>
<th>Course: Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Internal Assessment</th>
<th>Pass Percentage**</th>
</tr>
</thead>
<tbody>
<tr>
<td>101: Algebra and Trigonometry</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>102: Calculus</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>103: Vector Analysis and Geometry</td>
<td>3 Hrs.</td>
<td>34</td>
<td>27</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
</tbody>
</table>

### B.A. Pass Course 2nd Year

<table>
<thead>
<tr>
<th>Course: Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Internal Assessment</th>
<th>Pass Percentage**</th>
</tr>
</thead>
<tbody>
<tr>
<td>201: Advanced Calculus</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>202: Differential Equations</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>2.3: Mechanics</td>
<td>3 Hrs.</td>
<td>34</td>
<td>27</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
</tbody>
</table>

### B.A. Pass Course 3rd Year

<table>
<thead>
<tr>
<th>Course: Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Internal Assessment</th>
<th>Pass Percentage**</th>
</tr>
</thead>
<tbody>
<tr>
<td>301: Analysis</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>302: Abstract Algebra</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>303: Programming in C and Numerical Analysis</td>
<td>3 Hrs. (Theory)</td>
<td>34</td>
<td>27* (Theory Exam=15 marks)</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Practical)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 = 15 marks)+(Viva-Voce = 04 marks).

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

<table>
<thead>
<tr>
<th>Course: Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Marks</th>
<th>Internal Assessment (H.E. + Attendance)</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>101: Algebra and Trigonometry</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+4)</td>
<td>40%</td>
</tr>
<tr>
<td>102: Calculus</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+4)</td>
<td>40%</td>
</tr>
<tr>
<td>103: Vector Analysis and Geometry</td>
<td>3 Hrs.</td>
<td>68</td>
<td>54</td>
<td>14 (= 10+4)</td>
<td>40%</td>
</tr>
</tbody>
</table>

B.Sc. Pass Course 2nd Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Marks</th>
<th>Internal Assessment (H.E. + Attendance)</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>201: Advanced Calculus</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+4)</td>
<td>40%</td>
</tr>
<tr>
<td>202: Differential Equations</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (= 10+4)</td>
<td>40%</td>
</tr>
<tr>
<td>203: Mechanics</td>
<td>3 Hrs.</td>
<td>68</td>
<td>54</td>
<td>14 (= 10+4)</td>
<td>40%</td>
</tr>
</tbody>
</table>

B.Sc. Pass Course 3rd Year

<table>
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<tr>
<th>Course</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Marks</th>
<th>Internal Assessment (H.E. + Attendance)</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>301: Analysis</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (=10+4)</td>
<td>40%</td>
</tr>
<tr>
<td>302: Abstract Algebra</td>
<td>3 Hrs.</td>
<td>66</td>
<td>52</td>
<td>14 (=10+4)</td>
<td>40%</td>
</tr>
<tr>
<td>303: Programming in C and Numerical Analysis</td>
<td>3 Hrs.</td>
<td>68</td>
<td>54</td>
<td>14 (=10+4) (Practical exam=24 marks, Theory Exam=30 marks)</td>
<td>40%</td>
</tr>
</tbody>
</table>

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)

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

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

B.A. Honours 2nd Year

<table>
<thead>
<tr>
<th>Course: Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Internal Assessment (H.E.+ Attendance)</th>
<th>Pass Percentage* *</th>
</tr>
</thead>
<tbody>
<tr>
<td>201: Advanced Calculus</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>202: Differential Equations</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>203: Mechanics</td>
<td>3 Hrs.</td>
<td>34</td>
<td>27</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>204: Discrete Mathematics</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
</tbody>
</table>

B.A. Honours 3rd Year

<table>
<thead>
<tr>
<th>Course: Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Internal Assessment (H.E.+ Attendance)</th>
<th>Pass Percentage* *</th>
</tr>
</thead>
<tbody>
<tr>
<td>301: Analysis</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>302: Abstract Algebra</td>
<td>3 Hrs.</td>
<td>33</td>
<td>26</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td>303: Programming in C and Numerical Analysis</td>
<td>3 Hrs.</td>
<td>34</td>
<td>27*</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Theory)</td>
<td></td>
<td>(Theory Exam=15 marks)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Hrs. (Practical)</td>
<td></td>
<td>(Practical exam=12 marks)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>304: Elementary Number Theory and Abstract Algebra</td>
<td>3 Hrs.</td>
<td>34</td>
<td>27</td>
<td>07 (= 5+2)</td>
<td></td>
</tr>
</tbody>
</table>

H.E. stands for House examination test etc.
*C 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)

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

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>101: Algebra and Trigonometry</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>102: Calculus</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>103: Vector Analysis and Geometry</td>
<td>3 Hrs.</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>104: Probability Theory and Optimization</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

B.A. Honours Course 2nd year

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>201: Advanced Calculus</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>202: Differential Equations</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>203: Mechanics</td>
<td>3 Hrs.</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>204: Discrete Mathematics</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

B.A. Honours Course 3rd year

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Time</th>
<th>Total Marks</th>
<th>Theory Paper</th>
<th>Pass Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>301: Analysis</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>302: Abstract Algebra</td>
<td>3 Hrs.</td>
<td>33</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>303: Programming in C and Numerical Analysis</td>
<td>3 Hrs.</td>
<td>34</td>
<td>34</td>
<td>(Theory Exam=20 marks) + (Practical Exam=14 marks)</td>
</tr>
<tr>
<td>304: Elementary Number Theory and Abstract Algebra</td>
<td>3 Hrs.</td>
<td>34</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>
* 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.

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)
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

<table>
<thead>
<tr>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I) B.A. Regular College Students : 26</td>
</tr>
<tr>
<td>(II) B.Sc. Students : 52</td>
</tr>
<tr>
<td>(III) B.A. (Pvt./ICDEOL) Students: 33</td>
</tr>
</tbody>
</table>

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 distribution of marks after each question in the following format:

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

Section – I (4 Questions)

Algebra


Books Recommended


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


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 \( \theta \)). Gregory’s series. Summation of finite trigonometric series depending on a G.P.

Books Recommended


***
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.
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   (iii) For B.A. (Pvt./ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distribution 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


Books Recommended

1. Shanti Narayan. 'Differential Calculus', Shyamalal charitable trust, Ram Nagar, 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


Section-III (2 Questions)

Integral Calculus

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

Books Recommended


***
Course 103: Vector Analysis and Geometry
(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours

<table>
<thead>
<tr>
<th>Instructions to paper setter and students:</th>
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</thead>
<tbody>
<tr>
<td>(a) The question paper shall be divided into three Sections I, II &amp; III.</td>
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<tr>
<td>(b) From each of Sections I &amp; II four questions are to be set, out of which candidates shall attempt two questions. Each question from Sections I &amp; II shall have the following distribution of marks for various streams of students:</td>
</tr>
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<tr>
<td>The paper setter should clearly mention this distribution of marks after each question in the following format:</td>
</tr>
<tr>
<td>B.A. Regular (B.Sc.) [B.A./Pvt./ICDEOL] as 5 [10] [6.5]</td>
</tr>
<tr>
<td>(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:</td>
</tr>
<tr>
<td>B.A. Regular (B.Sc.) B.A. [Pvt./ICDEOL] as 7 [14] [8]</td>
</tr>
</tbody>
</table>

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

Section-II (4 Questions)

Vector Analysis

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

Books Recommended

Section-III (2 Questions)


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

15.
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 of 6.5 marks.

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

B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
5 5 (6) 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 6 (6) 7

Section – I (4 Questions)

Convex sets, convex functions.


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 measures 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
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 & 9.3.4.5.


Reference Books


Reference Books for 1st Year Courses
- D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.
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

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<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>(i) B.A. Regular College Students :</td>
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</tr>
<tr>
<td>(ii) B.Sc. Students :</td>
<td>52</td>
</tr>
<tr>
<td>(iii) B.A.(Pvt./ICDEOL) Students:</td>
<td>33</td>
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</table>

Instructions to paper setter and students:

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(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) [?]

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
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 Gausss' Green and Stokes' (Statement only) and problems based on these.

Books Recommended

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.
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(iii) For B.A. (Pvt/ICDEOL) students, each question shall be 6.5 marks.

The paper setter should clearly mention this distribution 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)

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 $R_t + S_s + T_t = V$.

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 Kehur Singh, 'Partial differential equations for engineers and scientists', Narosa Publishing house, Edition 2001, Chapter 1\textsuperscript{st} (§§ 1.1-1.7, 1.91-1.93), Chapter 2\textsuperscript{nd} (2.1 - 2.3, 2.6)


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 with Applications', Prentice Hall of India, Private Limited, New Delhi-110 001 (1997), Chapter 1\textsuperscript{st} 1.1, 1.2, 1.4, 1.5, 1.6, 1.10. Appendix-C), Chapter 2\textsuperscript{nd} (§§ 2.1 & 2.2), Chapter 3\textsuperscript{rd} (§§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 of 5 marks.

The paper setter should clearly mention this distribution of marks after each question in the following format:
B.A. Regular (B.Sc.) B.A. Pvt./ICDEOL

(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

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 to 64, 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
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 distribution of marks after each question in the following format:
   B.A. Regular (B.Sc.) [B.A.Pvt./ICDEOL] as
   \[ \begin{array}{c}
   \text{5} \\
   \text{8} \\
   \text{6.5}
   \end{array} \]

(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
   \[ \begin{array}{c}
   \text{6} \\
   \text{5} \\
   \text{7}
   \end{array} \]

Section – I (4 Questions)
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 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


Reference Book


Reference Books for 2nd year Courses

Jane Cronin, Differential equations, Marcel Dekker, 994.

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RIMACHAL 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
- (A) B.A. Regular College Students: 26
- (B) B.Sc. Students: 52
- (C) 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 distribution 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


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: Definition 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 ($$1^{st}$$ & $$2^{nd}$$).

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 Differentiation 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 12th, Chapter 14th, Chapter 15th ($§ 1$ to $6$), Chapter 16th ($§§ 1, 1, 1$).

Section-III (2 Questions)

Complex Analysis

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

Books Recommended

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 distribution of marks after each question in the following format:

B.A. Regular (B.Sc.) B.A. Pvt./ICDEOL

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

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

Chapter 1st ($§$ 1.2 & 1.3), Chapter 2nd ($§$ 2.1 to 2.11).

Section-II (4 Questions)


Books Recommended

Section-III (2 Questions)


Readings Recommended


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Course 303: Programming in C and Numerical Analysis
(A) Theory Paper
(Common to Pass & Honours Course Streams)

Time Allowed: 3 hours  Maximum Marks

<table>
<thead>
<tr>
<th>Type</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A. Regular College Students</td>
<td>15</td>
</tr>
<tr>
<td>R.Sc. Students</td>
<td>30</td>
</tr>
<tr>
<td>B.A.(Pvt./ICDEOL) Students</td>
<td>20</td>
</tr>
</tbody>
</table>

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 distribution 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


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 Formulation 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).


Section-II (4 Questions)

Numerical Differentiation


Numerical Integration

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

Books Recommended


Section-III (2 Questions)

Programming in C


Books Recommended


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Course 303: Programming in C and Numerical Analysis

(B) Practical Examination
(Common to Pass & Honours Course Streams)

Time Allowed: 4 hours

<table>
<thead>
<tr>
<th>Maximum Marks</th>
<th>Practical</th>
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</thead>
<tbody>
<tr>
<td>(i) B.A. Regular College Students : 12</td>
<td></td>
</tr>
<tr>
<td>(ii) B.Sc. Students : 24</td>
<td></td>
</tr>
<tr>
<td>(iii) B.A.(Pvt/ICDEOL) Students : 14</td>
<td></td>
</tr>
</tbody>
</table>

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. 4th order Runge – Kutta Methods of solving differential equation.

Books Recommended

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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.(Prv/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. For 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. (Prv/ICDEOL) students, each question shall be 6.5 marks.

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

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

5 5 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. [Prv/ICDEOL] as

7 8 8

Section – I (4 Questions)


Congruences: Definition and basic properties of congruences, Residue classes and complete residue system, Linear congruences, Reduced residue systems and the Euler-Phi function 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 UPD.

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, Re-Homomorphisms and quotient modules, Completely reducible modules, Free modules, Representation of Linear mappings, Principle of a linear mapping.

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Text Books


Reference Books for 3rd Year Courses