Four Years Integrated Course  
Scheme of B.Sc.-B.Ed. II Year

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>External</td>
</tr>
<tr>
<td>I</td>
<td>B.Sc.-B.Ed. 08</td>
<td>Gen. Hindi(Compulsory)*</td>
<td>100</td>
</tr>
<tr>
<td>II</td>
<td>B.Sc.-B.Ed. 09</td>
<td>Knowledge and curriculum</td>
<td>80</td>
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<tr>
<td>III</td>
<td>B.Sc.-B.Ed. 10</td>
<td>Learning and Teaching</td>
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<td>IV</td>
<td>B.Sc.-B.Ed 11 (G-A)</td>
<td>Peace Education</td>
<td>80</td>
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<tr>
<td>V VI &amp; VII</td>
<td>B.Sc.-B.Ed 12, 13 &amp; 14 (G-B)</td>
<td>Content (PCB &amp; PCM Group) (Select any Three)</td>
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<tr>
<td></td>
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<td>1. Chemistry(I,II,III)</td>
<td>50+50+50</td>
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<tr>
<td></td>
<td></td>
<td>2. Botany (I,II,III)</td>
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<td>3. Zoology(I,II,III)</td>
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<td>4. Physics (I,II,III)</td>
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<td>5. Mathematics(I,II,III)</td>
<td>66+44+68</td>
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<td>VIII</td>
<td>B.Sc. - B.Ed 15</td>
<td>OPEN AIR / SUPW CAMP</td>
<td>-</td>
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<td></td>
<td></td>
<td>1. Community Service</td>
<td>25</td>
</tr>
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<td>2. Survey (Based on social and educational events)</td>
<td>25</td>
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<td>3. Co-Curricular Activities</td>
<td>25</td>
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<td></td>
<td></td>
<td>4. Health and Social awareness programme (DISASTER MANAGEMENT AND CLEANINESS)</td>
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</table>

**ELIGIBILITY CRITERIAN ON PASSING MARKS BUT MARKS SHALL NOT BE INCLUDED IN DIVISION.**
B.Sc-B.Ed – 08

सामान्य हिंदी परीक्षा 2018

निर्देश : इस प्रश्नपत्र के प्राप्तांक श्रेणी निर्धारित समानित ही किये जाएँगे।

पूरक : 100

पद्य भाग
प्रश्न अंक 36
अवधि 2 घण्टे
पद्य भाग
प्रश्न अंक 25
अंक 25
गद्दी भाग
प्रश्न अंक 25
अंक 25
व्याकरण खंड
प्रश्न अंक 50
अंक 50

पद्य भाग
1. नरहर न निराशकरोमनको
2. हिमालय के आगन में
3. जागोफिर एक बार (भाग दो)
4. दिल्ली
5. हम अनिकेतन
6. झांसी की रानी
7. गीत फरेश
8. बादलकोडहरस देखाएँ
9. पन्चह अगस्त
10. मैंहारनहींमानूंगा
वाजपेयी
11. शहीद की मां

गद्दी भाग
1. नाकून बयों बढ़ते हैं
हजारी प्रसाद द्विवेदी
2. राष्ट्र का स्वरूप
3. गेहूँ बनाम गुलाब
4. भवानी शंकरी वंदे
5. बड़े घर की बेटी
6. अदम्य जीवन
7. उत्सर्ग
8. गांधीजी से भेंट (आलम कथा से)
9. महाराजपुर से घासी घाट (साँदर्भ की नदी नर्मदा से) अमुतलाल शेख़ाँ
10. भविन्तन
11. हिंदी हमारी मातृ भाषाहै

व्याकरण भाग

<table>
<thead>
<tr>
<th>1. सौं</th>
<th>2. समास</th>
<th>3. उपसर्ग</th>
<th>4. प्रत्यय</th>
<th>5. विलोम</th>
</tr>
</thead>
</table>

प
2. प्रश्न त्र एकुल 100 प्रश्नपूछेजाएँगे।
3. प्रश्नपत्र की अवधि 2 घंटे की होगी।
4. अनिवार्य हिंदी 2015-16 मेंबहुविकल्पीय होगा।
Objectives

1. To create excellence in the educational system for facing the knowledge of challenges of the twenty first century.
2. To encourage the application of knowledge skills in the Indian educational institutions.

3. To enhance the quality of pre-service and in-service teacher training.

4. To realize the importance of curriculum modification.

5. To provide awareness and understanding of social environment.

6. To transform teacher-pupils into a vibrant knowledge-based society.

Unit 1: Concept of knowledge & Child’s Construction of Knowledge

- Meaning and Nature of knowledge
- Sources of attainment of knowledge in schools with special references of Society, Culture and modernity.
- Distinctions between- Knowledge and Skill, Knowledge and information, Reason and belief.
  - Sources of Knowledge: Empirical knowledge Vs Revealed knowledge.
  - Different kinds of knowledge:
    - (a) Disciplinary knowledge: Concepts and Alternative Concepts
    - (b) Course content knowledge: Criteria of Selection and Concerns
    - (c) Indigenous knowledge Vs Global knowledge
    - (d) Scientific knowledge Vs Religious knowledge
- Concepts of Belief, Information, Knowledge and Understanding
Unit II  Facts of Knowledge-

Different facts of knowledge and relationship such as-

Local and Universal
Concrete and Abstract
Theoretical and Practical
School and Out of School

(With an emphasis on understanding special attributes of school knowledge)

Unit III : Concept of curriculum


- Philosophical, Psychological, Sociological and Scientific basis of Education with reference of Gandhi, Tagore, Dewey and Plato.

- Difference between curriculum and syllabus.

- Factors Influencing curriculum.

- Various types of curriculum- Subject centered, Experience centered, Activity centered, Child centered, and Craft centered.

Unit IV Curriculum Planning and Transaction

- Construction of Curriculum
- Models of Curriculum Development given by Franklin Bobbit, Ralph Tyler, Hilda Taba and Philip Jackson.
- Curriculum Transaction: Role of a teacher in knowledge Construction through Dialogue, Challenge and Feedback as a Critical Pedagouge.

Unit-V  School: The Site of Curriculum Engagement

- Role of School Philosophy, Administration (and organization) in creating a context for transacting the curriculum effectively.
• Role of Infrastructural support in Teaching and Learning: Classroom seating Arrangement, Library, Laboratory, Playground, Canteen etc.
• School Culture and Organizational ethos as the context for Teachers’ Work.
• Teacher’s role and Support is “Developing Curriculum, Transacting Curriculum and Researching Curriculum”: Realities and expectations.

Test and Assignment:-

1. Class Test 10 Marks
2. Project (Any one of the following) 10 Marks
   - Seminars discussions, movie appraisals, group work, field works,
   - Projects and the close reading of articles, policies, documents from key practitioners in the area of Curriculum Studies in Education.

• How does school knowledge get reflected in the form of curriculum, syllabus and textbooks?
• Review of a text book of any school subject.
• Prepare a children's literature handbook.

References-

9. www.knowledgewcommission.gov.in
10. www.ncert.nic.in
11. www.takingglobal.org/exprest/article.htm1?cid-178

B.A.-B.Ed./B.Sc-B.Ed 10

Learning and Teaching

MARKS -100

Objectives:
After completing the course the students will be able:-

1. To get acquainted with the concept, principles and nature of teaching and learning.
2. To understand the different learning styles based on the difference of learners.
3. To study the relationship between teaching and learning and the factors which influence learning
4. To make use of modern information and communication technology to improve teaching-learning process.
5. To understand learning as a process of communication and be aware of various resources available for making it effective.
6. To study and analyze the socio cultural factors influencing cognition and learning.
7. To study and understand learning in constructivist perspective.
8. To get acquainted with professional ethics of teaching profession.
9. To study the new trends and innovations involved in teaching learning process with professional ethics.

Unit I – Learning and Teaching Process
- Learning: Meaning, Nature, Factors affecting learning and types of learning
- Relationship between teaching and learning, Resource and their development for promoting teaching – learning process.
- Tradition and changes in view of the learning process a shift from teaching and learning.

Unit II – Source of Effective Teaching Learning
- Effective teaching: Meaning, component and parameters of effective teaching, classroom instruction strategies, Teacher behavior and classroom climate. (Flander’s interaction analysis system)
- Instructional objectives in terms of bloom’s taxonomy.
- Programming Learning: Concept, principles and types of programme learning.
- Concept of micro teaching, various teaching skills.

Unit III – Educational Technology
- Educational Technology: Meaning, Importance and Approaches.
- Model of teaching: Meaning, Assumptions and Fundamental elements of a model of a teaching suchman’s inquiry training model.
- Communication: Concept, Elements and Communication skills, Teaching Learning process as the communication.

Unit IV – New Trends in teaching learning due to technological innovation
- Analysis and organisation learning in diverse class room: Issues and concerns.
- Team Teaching, Panel discussion, Conference, Symposium, Workshop, Cooperative learning, Group discussion, Brain storming- issues and concerns with respect to organise teaching and learning process in a classroom such as study habits, self learning, learning skills, interest, ability, giftedness with respect to socio economic background.

Unit V Teaching as profession:
- Ethics of teaching, professional growth of a teacher
Teacher as a professional practitioner, identification of the performance, competency and commitment area for teacher.

Need of Professional enrichment of teachers

Professional ethics and its development

Test and Assignment:-

1. Class Test 10 MARKS
2. Any One 10 MARKS

- Preparation and practical implication of at least two technical learning resources (transparencies, Power Point Slides, Animated Videos)

- Identify the learning need of the learner in diverse class room with regard to their abilities, learning styles, socio cultural difference, learning difficulties and their implication for class room teaching.

- Identify the professional skills for teachers and report any two programmes for professional development of teaching organized by the school/ training college/any other agencies.

- Conduct and Interview of any two students with multilingual background and face the problems in teaching learning process.

REFERENCES:


B.A.-B.Ed./B.Sc-B.Ed 11

PEACE EDUCATION

OBJECTIVES:-

The course will enable the student teachers to –

- to understand the concept of peace education.
- to acquire the knowledge about peaceful mind makes peaceful world.
- To understand the theory and practice of peace education
- To understand the philosophical thoughts for peace.
- To promote awareness about the existence of Conflicting relationships between people, within and between nations and between nature and humanity.
- To create frameworks for achieving Peaceful and Nonviolent societies.

UNIT I Concept of Peace

- Negative peace and Positive peace,
- Negative Peace - Peace as absence of war and abolition of war, as the minimization and elimination of violence, as removal of structural violence, Peace with Justice, Peace and Nonviolent liberation technique (Satyagraha) and Disarmament.
- Positive peace: Peace as Love, Mutual Aid, Positive Interpersonal relations, Peaceful resolution of Conflict, Peace and Development, Alternative defense, living with nature and preserving Life and Eco system and Holistic Inner and Outer Peace.

Unit -2: Introduction of Peace Education

- Meaning, Concept and need of Peace Education.
- As a universal value
- Aims and Objectives of Peace Education
- Role of Social Agencies: Family, Religion, Mass Media, Community, School, NGO’s, Government Agencies in promoting peace education.
- Current Status of Peace Education at Global Scenario.

Unit 3- Bases of Peace Education

- Becoming peace teacher-acquisition of knowledge, values and attitudes.
- Life Skills required for Peace Education (WHO)
Areas of Peace Education: Conflict management, Conservation of Environment
Challenges to Peace - Stress, Conflict, Crimes, Terrorism, Violence and Modernization.
Strategies and Methods of teaching Peace Education - Meditation, Yoga, Dramatization, Debate and etc.

UNIT 4. Effective Teaching of Peace
Peace Education for Life and Lifelong education, Peace Education and Removing the Bias towards Violence – Correcting Distortions.
Model of integrated Learning – Transactional Modalities - Cooperative Learning, Group Discussion, Project Work, Role Play, Story Telling, Rational Analytic Method – Case Analysis and Situation analysis,

Unit 5- Transacting Peace Education & Role of Social Agencies:
Integration of Peace Education through curricular and co-curricular activities
Role of mass media in Peace Education
Programmers’ for Promoting Peace Education – UNESCO
Addressing challenges to peace in Multicultural Society.

Tasks and Assignments
1. Class Test 10 marks
2. Any one 10 Marks

- Prepare a Role Play of Great Personalities who worked/ contributed towards Peace.
- Organize an activity in schools to promote Peace.
- Write a report on Gandhi and Peace.
- Write about the contribution of any two Noble prize winners for Peace.
• Prepare an album of Indian Philosophers and write their thoughts on peace.

REFERENCES :


B.Sc.- B.Ed. 12,13,14

1. CHEMISTRY

<table>
<thead>
<tr>
<th>Number of Paper</th>
<th>Nomenclature of Paper</th>
<th>Duration of Exam.</th>
<th>Max. Marks</th>
<th>Min. Pass Marks</th>
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<tbody>
<tr>
<td>Paper-I</td>
<td>Inorganic Chemistry</td>
<td>3 Hrs.</td>
<td>50</td>
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</tr>
<tr>
<td>Paper-II</td>
<td>Organic Chemistry</td>
<td>3 Hrs.</td>
<td>50</td>
<td>54</td>
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<tr>
<td>Paper-III</td>
<td>Physical Chemistry</td>
<td>3 Hrs.</td>
<td>50</td>
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<tr>
<td>Paper-IV</td>
<td>Chemistry Practical</td>
<td>5 Hrs.</td>
<td>50</td>
<td>18</td>
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</table>
Paper-I : Inorganic Chemistry

Duration: 3 Hrs. Max. Marks: 50

Note: The question paper will contain three sections as under –

Section-A : One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part.

Total marks : 05

Section-B : 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words.

Total marks : 25

Section-C : 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted.

Total marks : 20

Unit-I Chemistry of Elements of First Transition Series:

Characteristics properties of d-block elements, properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Unit-II Chemistry of Elements of Second and Third Transition Series:

General characteristics, comparative treatment with their 3d-analogues in respect to ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry

Unit-III Coordination Compounds:

Werner’s coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

Unit-IV Chemistry of Lanthanides:

Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.
Chemistry of Actinides:

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and later lanthanides.

Unit-V Acids and Bases:

Arrhenius, Bronsted-Lowry, the Lux-Flood solvent system and Lewis concept of acids and bases.

Non-aqueous Solvents:

Physical properties of solvents, type of solvents and their general characteristics, reactions in liquid NH$_3$ and Liquid SO$_2$.

Oxidation and Reduction:


Books Suggested:

3. Concise Inorganic Chemistry : J. D. Lee
6. Basic Inorganic Chemistry : Cotton and Wilkinson and Gaus, Willey
Note: The question paper will contain three sections as under –
Section-A: One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part.

Total marks: 05

Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words.

Total marks: 25

Section-C: 04 questions (question may have sub-division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted.

Total marks: 20

Unit-I Electromagnetic Spectrum: Absorption Spectra:


Infrared (IR) Absorption Spectroscopy: Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Unit-II Alcohols:

Classification and nomenclature.


Dihydric alcohols: Nomenclature, methods of preparation, chemical reaction of vicinal glycols, oxidative cleavage \([\text{Pb(OAc)}_4\text{ and } \text{HIO}_4]\) and pinacol-pinacolone rearrangement. Trihydric alcohols: Nomenclature and methods of preparation, chemical reactions of glycerol.

Phenols:

Nomenclature, structure and bonding, preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: electrophilic aromatic substitution, acylation and carboxylation. Mechanism of Fries
rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit-III Aldehydes and Ketones:


Unit-IV Ethers and Epoxides:


Carboxylic Acids:


Carboxylic Acid Derivatives:


Unit-V Organic Compounds of Nitrogen:

Alkyl and Aryl Amines:


Books Suggested:


Paper-III : Physical Chemistry

Duration: 3 Hrs. Max. Marks: 50

Note: The question paper will contain three sections as under –
Section-A: One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part.

Total marks: 05

Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words.

Total marks: 25

Section-C: 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted.

Total marks: 20

Unit-I Thermodynamics-I:

Definition of thermodynamic terms: System, surroundings, etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process, concept of heat and work.


Unit-II Thermodynamics-II:


Concept of Entropy: Entropy as a state function, entropy as a function of V&T, Entropy as a function of P&T, entropy change in physical change, Clausius inequality and entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Third Law of Thermodynamics: Nernst’s heat theorem. Statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz function: Gibbs function (G) & Helmholtz function (A) as thermodynamic quantities, A&G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G & A with P, V & T.
Unit-III Chemical Equilibrium:

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le chatelier’s principle. Reaction isotherm and reaction isochores, isochore-Clapeyron equation and Clausius-Clapeyron equation. Applications.

Phase Equilibrium:

Statement and meaning of the terms: Phase, component and degree of freedom. Derivation of Gibbs phase rule, phase equilibria of one component system-water, CO₂ and S systems. Phase equilibria of two component system-solid-liquid equilibria, simple eutectic Pb-Ag system. Solid solutions-compound formation with congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H₂O) system. Freezing mixtures: acetone-dry ice. Partially miscible liquids: Phenol-water and nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature.

Unit-IV Electrochemistry-I:

Electrical transport: conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald dilution law its uses and limitations. Debye-Hückel-Onsager’s equation for strong electrolytes (elementary treatment only). Transport number: definition and determination by Hittorf's method and moving boundary method. Applications of conductivity measurements: Determination of degree of dissociation, determination of Kₐ of acids, conductometric titrations.

Unit-V Electrochemistry-II:

Types of reversible electrodes: Gas-metal ion, metal-metal ion, metal-insoluble salt anion and redox electrodes. Electrode reactions, Nernst’s equation, derivation of cell EMF and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolyte and Galvanic Cells: Reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic quantities of cell reactions

(G, H and K), polarization, over-potential and hydrogen over-voltage. Concentration cell with and without transport, liquid-junction potential, application of concentration cells, valency of ions.


**Books Suggested:**

3. *A Text Book of Physical Chemistry*: Kundu and Jain

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**Paper-IV : Chemistry Practical**

Laboratory Course: 4 Hrs. /Week  
Duration of Practical Examination: 5 Hrs.

Max. Marks: 50 Marks

**Distribution of Marks:**

- Inorganic Chemistry Experiments
- Organic Chemistry Experiments
- Physical Chemistry Experiments
- Practical Record (for regular students only)
- Viva-voce (for regular students)
- Viva-voce (for non-collegiate students)

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**Inorganic Chemistry:**

**Section-A**

Calibration of fractional weights, pipettes and burettes. Preparation of standard solution. Dilution-0.1M to 0.001M solutions.

**Section-B**

**Quantitative Analysis:**

**Volumetric analysis**

- Determination of acetic acid in commercial vinegar using NaOH
- Determination of alkali content in antacid tablet using HCl.
- Estimation of calcium content in chalk as calcium oxalate by permangano-metry.
- Estimation of hardness of water by EDTA.
- Estimation of ferrous and ferric by dichromate method.
Estimation of copper using thiosulphate.

**Gravimetric analysis**

Analysis of Cu as CuSCN and Ni as Nickel dimethylglyoxime.

**Organic Chemistry**

**Laboratory techniques:**

**A Thin Layer Chromatography:** Determination of Rf values and identification of organic compounds.

- Separation of green leaf pigments (spinach leaves may be used)
- Preparation and separation of 2,4-Dinitrophenyl hydrazones of acetone, 2-butanone, hexan-2 and 3-one using toluene and light petroleum (40:60)
- Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5)

**B Paper Chromatography-Ascending and Circular:** Determination of values and identification of organic compounds.

- Separation of a mixture of phenyl alanine and glycine. Alanine and aspartic acid. leucine and glutamic acid. Spray reagent-Ninhydrin.

**Qualitative Analysis:**

Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

**Physical Chemistry:**

**Transition temperature:**

- Determination of the transition temperature of the given substance by thermometric / dialometric method (e.g. MnCl$_2$.4H$_2$O / SrBr$_2$.2H$_2$O)

**Phase Equilibrium**

- To study the effect of a solute (e.g. NaCl, succinic acid ) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system)
- To construct the phase diagram of two component (e.g. diphenyl-benzophenone) system by cooling curve method.

**Thermochemistry:**
To determine the solubilities of benzoic acid at different temperatures and to determine $H$ of the dissolution process.

To determine the enthalpy of neutralization of a weak acid weak base versus strong acid and strong base and determine the enthalpy of ionisation of the weak acid/weak base.

To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born-Haber cycle.

**Books Suggested:**

1. Practical Chemistry: Giri Bajpai and Pandey, S. Chand & Co. Ltd., New Delhi
2. Practical Chemistry (Hindi Ed.): Suresh Ameta & P. B. Punjabi, Himanshu Publication

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**B.Sc. – B.Ed. -12, 13, 14**

**BOTANY**

**Part II (Botany) Examination -2018**

**Scheme:**

<table>
<thead>
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<th>Paper</th>
<th>Duration</th>
<th>Max. Marks</th>
<th>Min. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I</td>
<td>Diversity &amp; Systematics of seed plants-Gymnosperms</td>
<td>3 Hrs.</td>
<td>50</td>
</tr>
<tr>
<td>Paper-II</td>
<td>Diversity &amp; Systematics of seed plants-Angiosperms</td>
<td>3 Hrs.</td>
<td>50</td>
</tr>
<tr>
<td>Paper-III</td>
<td>Structure development &amp; Reproduction of flowering plants</td>
<td>3 Hrs.</td>
<td>50</td>
</tr>
<tr>
<td>Practical (One)</td>
<td></td>
<td>5 Hrs.</td>
<td>50</td>
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</tbody>
</table>

Botanical excursion to be arranged. Students should visit the local sites.

**Paper - I**

**Diversity & Systematics of Seed Plants-Gymnosperms**

Duration 3 hrs. Max. Marks 50
Note: The question paper will contain three sections as under –

**Section-A:** One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks: 05

**Section-B:** 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words. Total marks: 25

**Section-C:** 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted.

**Unit-I** - **Characteristics of seed plants:** Evolution of the seed habit; seed plants with fruits (Angiosperms) and without fruits (Gymnosperms); fossil and living seed plants.

**Unit-II** - **General features of Gymnosperms** and their classification; evolution and diversity of gymnosperms.

**Unit-III** - **Fossil Gymnosperms**: Comparative account and salient features of Cycadofilicales, Cordaitales, Bennettitales

**Unit-IV** - **Morphology of Vegetative and Reproductive parts**: Anatomy of root, stem and leaf; reproduction and life cycle of *Cycas, Pinus* and *Ephedra.*

**Unit-V** - **Morphology of Vegetative and reproductive parts**: Anatomy of root, stem and leaf; reproduction and life cycle of *Ginkgo, Taxus* and *Gnetum.*

### Paper - II

**Diversity & Systematics of Seed Plants-Angiosperms**

Duration 3 hrs. Max. Marks 50

Note: The question paper will contain three sections as under –
Section-A: One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks: 05

Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words. Total marks: 25

Section-C: 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks: 20

Unit-I - Origin and Evolution of Angiosperms: Some examples of primitive Angiosperms and Ranales.

Unit-II - Angiosperm taxonomy; Brief history; aims and fundamental components; Alpha taxonomy, omega-taxonomy, keys, taxonomic literature, Botanical nomenclature; principles and rules; taxonomic ranks; type concept, principle of priority.

Unit-III - Classification of Angiosperms; Salient features of the systems proposed by Bentham and Hooker and Engler&Prantl. Major contributions of cytology, phytochemistry and taximetrics to taxonomy.

Unit-IV - Diversity of flowering plants as illustrated by members of the families Ranunculaceae, Brassicaceae, Papaveraceae Capparidaceae, Malvaceae, Rutaceae, Fabaceae, Apiaceae.

Unit-V - Salient features of some families; Asteraceae, Acanthaceae, Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Liliaceae and Poaceae.

Paper - III

Structure Development and Reproduction of Flowering Plants

Duration 3 hrs. Max. Marks 50

Note: The question paper will contain three sections as under –
Section-A: One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks: 05

Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words. Total marks: 25

Section-C: 04 questions (question may have sub-division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks: 20

Unit-I - The basic body plan of flowering plant, modular type of growth,
Diversity in plant form in annuals, biennials and perennials, Convergence and evolution of tree habit in gymnosperms, monocotyledons and dicotyledons, trees-largest and longest lived organisms.

Unit-II - The shoot system: The shoot apical meristem and its histological organization, vascularization of primary shoot in monocotyledons and dicotyledons; formation of internodes, branching pattern, monopodial and sympodial growth, canopy architecture, cambium and its function, formation of Secondary Xylem; a general account of wood structure in relation to conduction of water and minerals, characteristics of growth rings, sapwood and heart wood, role of wood skeleton, secondary phloem, structure, function, relationships; periderm.

Unit-III - Leaf: Origin, development arrangement and diversity in size and shape, internal structure in relation to photosynthesis and water loss; adaptation to water stress, senescence and abscission.
The root system: The root apical meristem; differentiation of primary and secondary tissues and their roles; structural modification for storage, respiration, reproduction and for interaction with microbes.

Unit-IV - Flower: A modified shoot, structure, development and varieties of flower, functions, structure of anther and pistil, the male and female gametophytes, types of pollination, attractions and rewards for pollinators, pollen pistil interaction, self incompatibility, double fertilization; formation of seed-endosperm and embryo, fruit development and maturation.
Unit-V - Significance of seed: Suspended animation, ecological adaptation, unit of genetic recombination and replenishment, dispersal strategies, vegetative reproduction, vegetative propagation, grafting, economic aspects.

SUGGESTED READINGS: -


SUGGESTED PRACTICAL EXERCISES :-

Gymnosperms

_Cycas_.

- Habit, armour of leaf bases on the stem (if specimen is not available show photograph), very young leaf (circinate venation) and old foliage leaves, scale leaf, bulbils, male cone (specimen); microsporophyll, megasporophyll, mature seed.

- Study through permanent slides - normal root (T.S.), stem (T.S.) (if sections are not available show photographs), ovule (L.S.).
• Study through hand sections or dissections - coralloid root (T.S.), rachis (T.S.), leaflet (T.S.), microsporophyll (T.S.), pollen grains (W.M.)

**Pinus**

• Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1st year, 2nd year and 3rd year female cones, winged seeds.

• Study through permanent slides - root (T.S.), female cone (L.S.), ovule (L.S.), embryo (W.M.) showing polycotyledonous condition.

• Study through hand sections or dissections - young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S.), male cone (L.S.), male cone (T.S.), pollen grains (W.M.)

**Ephedra**

• Habit and structure of whole male and female cones.

• Permanent slides - female cone (L.S.).

• Hand sections/dissections - node (T.S.), internode (T.S.), male cone (T.S. and L.S.), pollen grains.

**Ginkgo, Taxus & Gnetum** - Study of morphology and anatomy of vegetative and reproductive parts.

**Angiosperms**

• The following species are suitable for study. This list is only indicative. Teachers may select plants available in their locality.

3. **Ranunculaceae**: *Ranunculus, Delphinium*

4. **Brassicaceae**: *Brassica, Iberis*  
   
   **Papaveraceae**: *Argemone / Papaver*.

3. **Malvaceae**: *Hibiscus, Abutilon*

4. **Rutaceae**: *Murraya, Citrus*

5. **Fabaceae**: *Faboideae*: *Lathyrus, Cajanus, Melilotus, Trigonella*,  
   **Caesalpinioideae**: *Cassia, Caesalpinia*  
   **Mimosoideae**: *Acacia, Prosopis, Mimosa*
6. **Apiaceae**: Coriandrum, Foeniculum, Anethum

7. **Asteraceae**: Helianthus, Ageratum, Sonchus, Tridax

8. **Acanthaceae**: Adhatoda, Peristrophe

9. **Apocynaceae**: Vinca, Thevetia, Nerium

10. **Asclepiadaceae**: Calotropis

11. **Solanaceae**: Solanum, Withania, Datura

12. **Euphorbiaceae**: Euphorbia, Phyllanthus, Ricinus

13. **Lamiaceae**: Ocimum, Salvia

14. **Amaranthaceae**: Amaranthus, Achyranthus

15. **Liliaceae**: Asphodelus, Asparagus

16. **Poaceae**: Avena, Triticum, Hordeum.

(B)

1. Study of any commonly occurring dicotyledonous plant (for example *Solanum nigrum* or *Kalanchoe*) to understand the body plan and modular type of growth.

2. Life forms exhibited by flowering plants (by a visit to a forest or a garden).

3. L.S. shoot tip to study the cytohistological zonation and origin of leaf primordia.

4. Monopodial and sympodial types of branching in stems (especially rhizomes)


8. Examination of a wide range of flowers available in the locality and methods of their pollination.

10. Structure of ovule and embryo sac development (using serial sections).

11. Nuclear and cellular endosperm. Embryo development in monocots and dicots (using slides/dissections)

12. Simple experiments to show vegetative, propagation. (leaf cuttings in Bryophyllum, Sansevieria, Begonia; stem cuttings in rose, salix, money plant, sugarcane and Bougainvillea).


PAPER-I : ANIMAL DIVERSITY (Part-2)

Arthropoda to Protochordata

Duration : 3 Hours
Max. Marks : 50

The question paper comprises of three sections , 'A' , 'B' and 'C'

Section-A: The candidates will attempt all the ten parts of Q. No.1 (consisting of two questions from each unit) in about 20 words ( 1/2 X10 = 5 marks).

Section- B: The candidates will attempt five questions, selecting one question from each unit, answer in about 250 words (5 X 5 = 25 marks).

Section-C: The candidates will attempt any two questions out of four, answer in 500 words (10 X 2 = 20 marks).

Unit – I - Arthropoda
• General characters and classification of phylum - Arthropoda up to subclass.

• Habit, habitat, external features, appendages, digestive, respiratory, circulatory, excretory, reproductive and nervous system and sense organs of scorpion & prawn (Palaemon).

• Larval forms of Crustacea.

• Metamorphosis in Insects.

**Unit – II- Mollusca**

• General characters and classification phylum - Mollusca upto subclass.

• Habit, habitat, external features, coelom, general anatomy, digestive, respiratory, circulatory, excretory, reproductive systems, of snail (Pila) and unio.

• Torsion in Gastropoda.

• Larval forms of Mollusca.

**Unit – III - Echinodermata**

5. General characters and classification of phylum- Echinodermata upto subclass.

6. Habit, habitat, symmetry, external features, coelom, general anatomy, digestive, respiratory, circulatory, excretory, water vascular, reproductive, nervous system and sense organs of star fish (Asterias).

7. Larval forms of Echinodermata.

8. Autotomy and regeneration in Echinoderms.

**Chordata** : Primary chordate characters, invertebrate chordates (Protochordata), concept of invertebrate and nonchordates.

**Hemichordata** :

1. General characters and classification of Hemichordata.

17. Habit, habitat, external features, coelom, body wall, digestive, skeletal, respiratory, circulatory, excretory, nervous and reproductive system and sense organs of Balanoglossus.

18. Tornaria larva.

19. Affinities of Hemichordata.

**Unit - IV**

**Urochordata** and
15. General characters and classification up to class level.

16. Habit, habitat, general anatomy and various systems, including sense organs of *Herdmania*.

   Ascidian tadpole and its metamorphosis; affinities of Urochordata.

**Cephalochordata:**

17. Habit, habitat, general anatomy and various systems, including sense organs of *Branchiostoma* (Amphioxus).

18. Affinities of Cephalochordata.

**Unit - V**

**Applied Animal Science:**

1. Harmful and beneficial insects.

2. Apiculture, lac-culture and sericulture.

3. Aquaculture: Prawn and molluscan fisheries; pearl culture.

4. Frontier areas of animal cell, tissue and organ culture; cloning and tissue engineering.

**PAPER-II : ENDOCRINOLOGY AND ETHOLOGY**

**Duration : 3 Hours**

**Maximum Marks: 50**

The question paper comprises of three sections, 'A', 'B' and 'C'

**Section-A:** The candidates will attempt all the ten parts of Q. No.1 (consisting of two questions from each unit) in about 20 words

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&\text{\(X10 = 5\) marks).}
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**Section-B:** The candidates will attempt five questions, selecting one question from each unit, answer in about 250 words (5 X 5 = 25 marks).

**Section-C:** The candidates will attempt any two questions out of four, answer in 500 words (10 X 2 = 20 marks).
UNIT : I

Endocrinology : Introduction, basics and functions

2. Hormones: Chemical nature and properties, role in homeostasis.
3. Structure and functions of major endocrine glands: Pituitary, thyroid, parathyroid, adrenal gland, pancreas; their hormones, role and abnormalities due to hyposcretion and hypersecretion.
4. Structure and functions of minor endocrine glands: Thymus, pineal, GIT, kidney, heart; endocrine glands in insects; their hormones and role.

UNIT : II

Endocrinology: Control and regulation of secretion and molecular mechanism

1. Regulation of hormone secretion; positive and negative feedback control mechanism.
2. Extra cellular and intracellular receptors.
3. Second messengers: Cyclic AMP, PIP2, IP3, DG, G-protein, protein kinase and role of Ca++ as messenger; cell signalling; amplification of signal.

UNIT : III

Endocrinology: Role in reproduction

1. Hormones from testis, ovary and placenta, their structure and functions.
2. Importance of hormones in sexual differentiation in embryo.
3. Hormonal control of menstrual cycle, implantation, pregnancy, parturition and lactation.
4. Different types of contraceptives, their composition and effects.

UNIT : IV

Ethology: Introduction and basics
1. Introduction and history of behaviour, approaches and study of animal behaviour (ecological, physiological, evolutionary and neural methods) MRI and CAT scan.

2. Genetic basic of animal behaviour and evolution of ethology.
3. Biological clock; circadian and circannual rhythms.

4. Learning and imprinting, instinct behaviour.

**UNIT : V**

**Ethology : Areas of behaviour**


2. Social behaviour and organization : Honey bee, termite, mammals (black-buck and monkeys).

3. Communication, fights and alarm call : Vocal, visual, tactile, olfactory and acoustic; honey bee language; pheromonal and hormonal basis of aggression, brain hormone relation in sexual behaviour.


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**PAPER - III : ANIMAL ECOLOGY AND BIOSTATISTICS**

**Duration : 3 Hours**

**Maximum Marks : 50**

The question paper comprises of three sections , 'A', 'B' and 'C'

**Section-A:** The candidates will attempt all the ten parts of Q. No.1 (consisting of two questions from each unit) in about 20 words (1/2 X10 = 5 marks).

**Section-B:** The candidates will attempt five questions, selecting one question from each unit, answer in about 250 words (5 X 5 = 25 marks).

**Section-C:** The candidates will attempt any two questions out of four, answer in 500 words (10 X 2 = 20 marks).

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**UNIT - I**
'Ecology' as a science, its meaning and history. Modern concept, scope, components of ecosystem, abiotic physical factors: temperature, light, water, soil and soil profile, current, pressure, gravity, biotic factors, intraspecific and interspecific relation, concept of limiting factors; Liebig's law of minimum, Shelford's law of tolerance, modern concept, importance.

UNIT - II

Population ecology: Determination of population density, factors affecting population density, demography, community ecology, characteristics of bio-community, interdependence for reproduction and protection, ecosystem homeostasis, ecosystem and productivity concept, its types and methods, energy flow, food chain and food web in ecosystem, ecological pyramids, ecological niche.

UNIT - III

Aquatic ecology, fresh water lotic and lentic fresh water habitat, fresh water biota, marine habitat, zonation, marine water biota, ecology and biota of deep sea zone, estuarine habitat and biota, terrestrial habitat, forest and desert ecosystem and biomes, ecology and human future, growth rate, role of man in modification of natural communities.

UNIT - IV

Natural resources, renewable resources (forest/wild life), non-renewable resources (water, mineral resources), aqua-culture and Mariculture, conservation, management of natural resources

- renewable resources, non-renewable resources, environmental pollution, types (water, air, soil, pollution by insecticides, noise). Basic concepts of bioaccumulation, biomagnification, and biodegradation of pollutants, impact of urbanization, characteristics of urbanization in India, urban problems.

UNIT - V

Functions and importance of biostatistics, frequency - distribution, presentation of data, mean, mode, median, deviation, error, probability-distribution, correlation, significance-tests, biostatistical analysis of gene distribution in populations.

ZOOTOLOGY PRACTICAL SYLLABUS

1. Study of animal diversity through museum specimens :-


2. Study of sections of organs and developmental stages:


Mollusca - Veliger and glochidium larvae. Sections of *unio* through different regions, uniogill T.S.

Echinodermata - Pedicellaria, pluteus larva, bipinnaria larva.

Hemichordata - T.S. through proboscis, collar and trunk regions of *Balanoglossus*, tornarial larva.

Urochordata: Pharyngeal wall, spicules and tadpole larva of *Herdmania*.

Cephalochordata: T.S. of *Branchiostoma* through oral hood, pharynx, gonads and caudal region.

3. Dissections: Through Chart / Model / Photograph / CD
   a. Major -
      - *Palaemon* - digestive and nervous system.
      - *Scorpion* - digestive, reproductive and nervous system.
      - *Pila* - general anatomy, nervous system.
      - *Unio* - nervous system.
   b. Minor -
      - *Palaemon* - hastate plate, appendages, alimentary canal and statocyst.
      - *Scorpion* - appendages, book lungs.
**Pila** - gill lamella, radula, osphradium and pallial complex.

**Unio** - gill lamella and pallial complex.

4. Permanent slide preparation/mounting:

Daphnia, cyclops, crustacean larvae, book lung of scorpion, statocyst and hastate plate of prawn, Mouth parts, wings, appendages and salivary glands of cockroach and wasp gill lamella, radula and osphradium of *Pila*, gill lamella of unio, glochidium larva; spicules and pharyngeal wall of *Herdmania*, W.M. of *Branchiostoma*.

5. Endocrinology:

a. Demonstration of major endocrine glands using models/charts/computer software.

b. Histological slides of major endocrine glands (pituitary, thyroid, parathyroid, adrenal glands, testes, ovary, pancreas), kidney, insect endocrine glands.

6. Ethology:

a. Thigmotactic, phototactic and chemotactic response of Paramecium.

b. Antennal grooming in cockroach.

c. Phototatic response in *Triboleum* and earthworm.

d. Chemotactic response of Cockroach and Ant. (using synthetic pheromone)

7. Ecology (Environment):

a. Water analysis, pH, acidity, alkalinity, dissolved O$_2$ and free CO$_2$, chloride (salinity)

b. Soil analysis - pH.

c. Qualitative estimation of zooplanktons in a given sample of water (permanent slide preparation of zooplanktons).

8. Biostatistics:

a. Frequency tables, bar diagrams, histograms, polygons, pie charts.

b. Exercises on mean, median and mode.

c. Standard error of mean and standard deviation.

Note: Animals used for practical work must not be banned under the wild life protection act.
B.Sc. – B.Ed. – 12, 13, 14

B.Sc. – B.Ed. PART II (PHYSICS) 2018

Scheme:

Three Papers Min. Pass Marks 54 Max. Marks 150
Paper-I 3hrs. Duration 50 Marks
Paper-II 3hrs. Duration 50 Marks
Paper-III 3hrs. Duration 50 Marks
Practical 5 hrs. Duration Min. Pass Marks 18 Max. Marks 50

Paper I- Thermal and Statistical Physics

Duration: 3 hrs. Max. Marks: 50

Note: The question paper will contain three sections as under –

Section-A: One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks: 05
Section-B : 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words. Total marks: 25

Section-C :04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks : 20

Unit-I
General Thermodynamical interaction, Dependence of the number of states of external parameters, General relations in equilibrium, equilibrium conditions(P=p1,b=b 1), infinitesimal quasistatic process, Entropy of an ideal gas, Equilibrium of an isolated system, Equilibrium of a system in contact with reservoir (Gibb’s free energy), equilibrium between phases, Clausius-Clapeyron equation, Triple point, Vapour in equilibrium with liquid or solid, equilibrium conditions for a system of fixed volume in contact with heat reservoir (Helmholtz free energy), Equilibrium between phases and condition of chemical equilibrium and equilibrium condition for a system at constant pressure in contact with a heat reservoir (Enthalpy), Maxwell’s relations.

Unit-II
Thermal interactions of macroscopic Systems, system in contact with a heat reservoir, first law of thermodynamics and infinitesimal general interaction, Concept of temperature and quantitative idea of temperature scale (thermodynamical parameter), Distribution of energy, second law of thermodynamics, Claussius and Kelvin’s statements, partition function (Z), mean energy of an ideal gas and mean pressure, Heat engine and efficiency of the engine, Carnots cycle, thermodynamical scale as an absolute scale.

Unit-III
Production of Low Temperatures and Application, Joule Thomson expansion and J.T.coefficients for ideal as well as Van-der Waal’s gas, Temperature inversions, Regenerative cooling and cooling by adiabatic expansion and demagnetization, Liquid He, He –I and He-II, superfluidity, quest for absolute zero, Nernst heat theorem.

Unit-IV
Classical Statistics, Phase space, micro and macro states, Thermodynamic probability, Entropy and probability, Partition function (Z), The monatomic ideal gas, The principle of equipartition of
energy, most probable, average and rms velocity, Specific heat capacity of diatomic gas, Specific heat capacity of solids.

The Distribution of Molecular Velocities, the energy distribution, Transport phenomenon, mean free path, distribution of free path, coefficients of viscosity, thermal conductivity diffusion.

**Unit-V**


**Paper –II ELECTRONICS**

Duration: 3 hrs. 

Max. Marks: 50

Note: The question paper will contain three sections as under –

Section-A : One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks : 05
Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words. Total marks: 25

Section-C: 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks: 20

Unit-I

Circuit Analysis, Network—some important definitions, loop and nodal equation, Kirchhoff’s Laws, driving point and transfer impedances, four terminal network parameters, Open circuit, short circuit and hybrid network theorems, Superposition, Thevenin, Norton, Reciprocity, Compensation and maximum power transfer.

Unit-II

Semiconductors, Intrinsic and extrinsic semiconductors, charge densities in N and P materials, conduction by drift and diffusion of charge, Formation of PN junction, PN diode equation, capacitance effect of diode.

Rectification and power Supply, Half-wave and full wave rectifiers, calculation of Ripple factor, efficiency and regulation, bridge rectifier, Filters: shunt capacitor, L and π filters, Voltage regulation and voltage stabilization, Zener diode, Voltage multiplier circuits.

Unit-III

Transistor and Transistor Amplifiers, Notations and volt ampere relations for bipolar junction transistor, CB, CE, CC configurations, characteristic curves and their equivalent circuits, Biasing of transistors, Fixed and emitter bias, bias stability in transistor circuits, concept of load line and operating point, hybrid parameters, Field effect transistor (JFET and MOSFET) and its circuit characteristics, Analysis of transistor amplifiers using hybrid parameters and its frequency response.
Unit-IV

Amplifiers with feedback, Concept of feedback, Positive and negative feedback advantage of negative feedback, stabilization of gain by negative feedback, Effect of feedback on output and input resistance, Reduction of nonlinear distortion by negative feedback, frequency response, Voltage and current feedback circuit.

Oscillators, Feedback requirements for oscillations, circuit requirement for oscillation, basic oscillator analysis, Colpitt and Hartley oscillators, R-C Phase shift oscillator, Piezoelectric frequency control oscillations.

Unit-V

Operational amplifier (OP-AMP), Differential amplifier, DC levels shifter, operational amplifier, input and output impedances, input offset current, Application of OP-AMP, Unity gain buffer, Adder, Subtractor, Integrator and Differentiator, Comparator, Waveform generator, Voltage regulator using integrated amplifiers.

Digital Circuits: Binary, Hexadecimal and Octal number systems, Binary arithmetic, Logic fundamentals, AND, OR, NOT, NOR, NAND, XOR gates, Boolean theorems, transistor as a switch, circuit realization of logic functions.

Paper-III Relativity and Mathematical Physics

Duration: 3 hrs. Max. Marks: 50

Note: The question paper will contain three sections as under –

Section-A : One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks: 05

Section-B : 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words. Total marks: 25

Section-C : 04 questions (question may have sub-division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted. Total marks: 20
Unit-I

Orthogonal Curvilinear coordinate system, scale factors, expression for gradient, divergence and curl and their applications to Cartesian, cylindrical and spherical polar coordinate systems, Coordinate transformation and Jacobian, Transformation of covariant, contravariant and mixed tensor, Addition, Multiplication and contraction of tensors, Quotient law, pseudo tensor, Metric tensor, transformation of Tensors.

Unit-II

Dirac-Delta Function and its properties, Fourier series, computation of Fourier coefficients, applications to simple periodic functions like square wave, sawtooth wave and rectifier output, Postulates of special theory of relativity and observational evidence, Lorentz transformation and rotation in space time, time like and space like vectors, length contraction, time dilation, worldline, mass-energy relation, energy-momentum relation.

Unit-III

Four vector formulation, energy-momentum four vectors, relativistic equation of motion, Orthogonality of four forces and four velocities, transformation of four wave vector, longitudinal and transverse Doppler’s effect, Transformation between laboratory and center of mass systems, four momentum conservation, Kinematics of decay products of an unstable particle and reaction thresholds, pair production, inelastic collision of two particles, Compton effect. Electromagnetic field tensor, transformation of four potentials, four currents, electric and magnetic field between two inertial frames of reference, Lorentz force, equation of continuity, conservation of charge, tensor description of Maxwell’s equations.

Unit-IV

The second order linear differential equation with variable coefficient and singular points, series solution method and its application in the Bessel’s, Hermite’s, Legendre’s and Laguerre’s differential equations, Basic properties like orthogonality, recurrence relations, graphical representation and generating function of Bessel, Hermite, Legendre Laguerre and Associated Legendre functions.
Unit-V

Technique of separation of variables and its application to following boundary value problems: (i) Laplace equation in three dimension Cartesian, Coordinate system-line charge between two earthed parallel plates, (ii) wave equation in spherical polar coordinates the vibration of circular membrane,

7. Diffusion equation in two dimensional Cartesian coordinate system-heat conduction in thin rectangular plate, (iv) Laplace equation in spherical coordinate system-Electric Potential about a spherical surface.

PHYSICS PRACTICAL

Duration 5 hrs. Min. Pass Marks 27 Max. Marks 75 Note-Total number of experiments to be performed by the students during the session should be 16 selecting any eight from each section.

Section –A

7. Study of dependence of velocity of wave propagation on line parameters using torsional wave apparatus.

8. Study of variation of refection coefficient with nature of termination using torsional wave apparatus.

9. Using platinum resistance thermometer to find the melting point of a given substance.

10. Using Michelson’s interferometer: Find out the wavelength of a given monochromatic source (sodium light); Determine difference in wave length of D1 and D2 lines.

11. Determine the thermodynamic constant \( r = \frac{C_p}{C_v} \) using Clement’s and Desormes methods.

12. Determine Thermal conductivity of a bad conductor by Lee’s method.


15. Study the variation of total thermal radiation with temperature.

Section-B

4. Plot thermoemf versus temperature and find the neutral temperature.

5. Study of power supply using two diodes/ bridge rectifier using various filter circuits.

3. Study of half wave rectifier using L and pi section filters.

• Characteristics of given transistor PNP/ NPN (common emitter, common base and common collector configurations).
- Determination of band gap using a junction diode.
- Determination of power factor of a given coil using CRO.
- Study of single stage transistor audio amplifier (variation of gain with frequency)
- Study of diode as integrator with different voltage wave forms.
- Determination of $e\text{\textit{m}}$ of electron by Thomson’s method.

- Determination of velocity of sound using CRO, microphone and speaker by standing wave method.
- Determination of self inductance of a coil by Anderson’s bridge method.
- Determination of unknown capacity by De’sauty-bridge method and to determine dielectric constant of a liquid.

**B.Sc. – B.Ed. 12,13,14**

**MATHEMATICS**

**B.Sc. – B.Ed. Part-II Exam. – 2018**

<table>
<thead>
<tr>
<th>Paper</th>
<th>Nomenclature</th>
<th>Teaching Hr./Week</th>
<th>Exam. Duration</th>
<th>Max. Marks</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>Real Analysis</td>
<td>4</td>
<td>3Hrs</td>
<td>66</td>
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<td>II</td>
<td>Differential Equations</td>
<td>3</td>
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<td>Practical</td>
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<td>III</td>
<td>Mechanics</td>
<td>4</td>
<td>3Hrs.</td>
<td>68</td>
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Practical Marks-22

**Pt-II) (Total Marks- 22)**

- Record - 05
- Practical -1 - 06
- Practical -II - 06
- Viva-Voce - 05
Paper – I Real Analysis

Time duration : 3 Hrs Max Marks : Science : 75 / Arts : 66 Note : Each question paper will contain three sections as under– Section-A : One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part.

Total marks : 5

Section-B :

10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words.

Total marks : 35

Section-C :

04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted.

Total marks : 26

UNIT – I
The set of real numbers as a complete ordered field, incompleteness of Q, Archimedean and denseness properties of R, Modulus, Intervals, Definition of a sequence, Theorems on limit of sequence, bounded and monotonic sequences, nested interval theorem, Cauchy’s sequence, Cauchy’s convergence criterion.

UNIT – II

Convergence of series of non-negative terms, their various tests (Comparison; D’Alembert’s ratio, Cauchy’s nth root, Raabe’s, Gauss, Logarithmic, Demorgan and Bertrand’s, Cauchy’s condensation, proof of tests not required) for convergence, Alternating series, Leibnitz’s test, Series of arbitrary terms, absolute and conditional convergence, Abel’s and Dirichlet’s tests.

UNIT-III


UNIT-IV

Definition of limit of a function. Continuity of a function - Cauchy’s and Heine’s definitions with their equivalence. Types of discontinuities. Properties of continuous functions defined on closed intervals. Uniform continuity. Differentiability, Rolle’s theorem, Lagrange’s and Cauchy’s mean
value theorems and their geometrical interpretations. Taylor’s theorem with various forms of remainders. Darboux’s intermediate value theorem for derivatives.

UNIT - V


Improper integrals and their convergence comparison tests. Abel’s and Dirichlet’s tests.

Books recommended for reference :-


Paper - II DIFFERENTIAL EQUATIONS

Time duration : 3 Hrs Max Marks : Science : 50 / Arts : 44 Note : Each question paper will contain three sections as under–Section-A : One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part. Total marks :05
Section-B: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words.

Total marks: 25

Section-C: 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted.

Total marks: 14

UNIT-I

Order and Degree of a differential equation. Differential equations of first order and first degree, variables separable, homogeneous equations. Linear equations and equations reducible to linear form. Exact differential equations and equations reducible to exact forms.

Differential equations of first order but not of first degree. Solvable for x, y, p Clairaut’s form, singular solutions. Geometrical meaning of a differential equation, orthogonal trajectories.

UNIT-II

Linear differential equations with constant coefficients, Homogeneous linear differential
equations, Total differential equations.

UNIT-III

Linear differential equations of second order. Transformation by changing the dependent / independent variable. Method of variation of parameters, Exact differential equations and certain particular forms of equations.

UNIT-IV


UNIT-V

Books recommended for reference:


List of Practicals for Paper-II

Name of Practicals


7. Solution of differential equations using Euler's method and comparison with exact solution.


10. Solution of differential equations using variation of parameters method.

   • Application of differential equations to solve LCR-circuits and harmonic motions.
   • Find convexity and concavity of the plane curves.
   • Find the singular points and their nature of the plane curves.
• Formation of partial differential equations.

**Paper- III Mechanics**

Time duration : 3 Hrs Max Marks : Science : 75 / Arts : 66  
*Note*: Each question paper will contain three sections as under—

**Section-A**: One compulsory question with 10 parts, having 2 parts from each unit, short answer in 20 words for each part.

Total marks : 5

**Section-B**: 10 questions, 2 questions from each unit, 5 questions to be attempted, taking one from each unit, answer approximately in 250 words.

Total marks : 35

**Section-C**: 04 questions (question may have sub division) covering all units but not more than one question from each unit, descriptive type, answer in about 500 words, 2 questions to be attempted.

Total marks : 26

**UNIT-I**

Analytical Conditions of equilibrium of a rigid body under coplanar forces. Friction.
UNIT-II

Center of Gravity, Common Catenary
UNIT-III

Simple harmonic motion. Motion under repulsion varying as the distance from a point, motion
under inverse square law. Motion under earth’s attraction. Hooke’s Law, Horizontal and vertical
elastic strings Rectilinear motion in a resisting medium.
UNIT- IV

Velocity and acceleration along radial and transverse directions and along tangential and normal directions. Projectiles : Motion on horizontal and inclined planes.

UNIT-V

Direct and oblique impact. Constrained Motion- Circular and Cycloidal.

Books recommended for reference :-

The four-year B.Ed courses are B.A. B.Ed, B.Sc-B.Ed and B.Com-B.Ed. The Ministry of Human Resource Development (MHRD) has scrapped the two-year Bachelor of Education programme (B. Ed) which was introduced three years ago. In the place of the popular education-related course, HRD has introduced a four-year integrated teacher training B. Ed course. Anil Swarup, School Education Secretary was in talks with the National Council for Teacher Education (NCTE) to rework on the syllabus for the new 4-year integrated B.A.- B.Ed, B.Com-B.Ed and B.Sc - B.Ed courses, which has finally paid off. This ruling "All preparations for introducing the four-year integrated B Ed course have been done and a notification has been issued. The course will start from this session itself," the minister informed the house. He said the course will be of three types and students can undertake either BA-B Ed, BSc-BEd or BCom-BEd courses. Pokhriyal said institutions desirous of starting the course can do so and admissions will be done from this session itself. He also said that after amendments in the Right to Education Act, ensuring training of teachers, all teachers left out can avail the training till O