

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

Theory Paper	Course Code	Title of the Paper	Evaluation			Total
			External	Internal	Practical	
I	B.Sc.-B.Ed. 08	Gen. Hindi(Compulsory)*	100	-	-	100
II	B.Sc.-B.Ed. 09	Knowledge and curriculum	80	20	-	100
III	B.Sc.-B.Ed. 10	Learning and Teaching	80	20	-	100
IV	B.Sc.-B.Ed 11 (G-A)	Peace Education	80	20	-	100
V VI & VII	B.Sc.-B.Ed 12, 13 & 14 (G-B)	Content (PCB & PCM Group) (Select any Three) 1. Chemistry(I,II,III) 2. Botany (I,II,III) 3. Zoology(I,II,III) 4. Physics (I,II,III) 5. Mathematics(I,II,III)	50+50+50 50+50+50 50+50+50 50+50+50 66+44+68	- - - - -	50 50 50 50 22	200 200 200 200 200
VIII	B.Sc. - B.Ed 15	OPEN AIR / SUPW CAMP 1. Community Service 2. Survey (Based on social and educational events) 3. Co-Curricular Activities 4. Health and Social awareness programme (DISASTER MANAGEMENT AND CLEANNESS)		25 25 25 25		100
						900+100

*ELIGIBILITY CRITERIAN ON PASSING MARKS BUT MARKS SHALL NOT BEINCLUDED IN DIVISION.

B.Sc-B.Ed – 08

सामान्य हिन्दी परीक्षा 2018

निर्देश : इसप्रश्नपत्र के प्राप्तांक श्रेणी निर्धारणमेंसम्मिलितनहींकियेजायेंगे ।

पूर्णांक: 100	उत्तीर्ण अंक 36	अवधि 2 घण्टे
पद्य भाग	प्रश्न -25	अंक - 25
गद्य भाग	प्रश्न -25	अंक - 25
व्याकरण खंड	प्रश्न -50	अंक - 50

पद्य भाग

1. नरहो न निराशकरोमनको	मैथिलीशरणगुप्त
2. हिमालय के आंगन में	जयशंकर प्रसाद
3. जागोफिर एक बार (भाग दो)	निराला
4. दिल्ली	दिनकर
5. हम अनिकेतन	बालकृष्ण शर्मानवीन
6. झांसी की रानी	सुभद्राकुमारी चौहान
7. गीत फरोश	भवानी प्रसाद मिश्र
8. बादलकोघिरते देखाहै	नागार्जुन
9. पन्द्रह अगस्त	गिरिजा कुमार माथुर
10. मैंहारनहींमानूंगा वाजपेयी	श्री अटल बिहारी
11. शहीद की मां	रघुराज सिंह हाड़ा

गद्य भाग

1. नाखून क्यों बढ़ते हैं

हजारी प्रसाद द्विवेदी

2. राष्ट्र का स्वरूप	वासुदेव शरण अग्रवाल
3. गेहूँ बनाम गुलाब	रामवृक्ष बेनीपुरी
4. भवानी शंकरौ वंदे	रा कुबेर नाथ य
5. बड़े घर की बेटी	प्रेमचन्द
6. अदम्य जीवन	रांगेय राघव
7. उत्सर्ग	राम कुमार वर्मा
8. गांधीजी से भेंट (आत्म कथा से)	राजेन्द्र प्रसाद
9. महाराजपुर से ग्वारी घाट (सौंदर्य की नदी नर्मदा से)	अमृतलाल बेगड़
10. भक्तितन	महादेवी वर्मा
11. हिन्दी हमारी मातृ भाषा है	मनहर चौहान

व्याकरण भाग

1. संधि	2. समास	3. उपसर्ग	4.
प्रत्यय	5. विलोम		
6. पर्यायवाची	7. शुद्धिकरण शब्द	एवंवाक्य	8.
वाक्यांश	9. मुहावरे	10. कहावतें	11. शब्दयुग्म
अनेकार्थी	13. परिभाषिक	शब्दावली	12.
14. तत्सम	15. तदभव	16. देशज	

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2. प्रश्न त्र ँ कुल 100 प्रश्नपूछेजावेंगे ।
3. प्रश्नपत्र की अवधि 2 घंटे की होगी ।
4. अनिवार्य हिन्दी 2015-16 में बहुविकल्पीय होगा ।

सहायक ग्रन्थ :

आधारपुस्तक : गद्य साहित्य और पद्य साहित्य

1. हिन्दी व्याकरण : कामनाप्रसादगुरु, किताब घर, दिल्ली

2. हिन्दी व्याकरण : डॉ. नरेन्द्र भानावत

3. हिन्दी व्याकरण : डॉ. वेंकट शर्मा

B.A.-B.Ed./B.Sc-B.Ed 09

Knowledge and Curriculum

Marks-100

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 in to 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

UnitII 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

- Meaning, Nature and Objectives of Curriculum, Need for curriculum in schools.
- 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 Pedagogue.

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-

1. Aggrawal, J.C. (2008). Knowledge Commission -2006: Major Observation and Recommendations, Educational Reforms in India for the 21st Century. New Delhi, Shipra Publication.
2. Balsara, M (1999). Principles of Curriculum Reconstruction. New Delhi, Kanishka Publication.
3. Lal, R.B. and Palod S. (2015). Policy Framework and Issues in Education. New Delhi, R.Lal Book Depot.
4. Malareddy, M. and Ravishankar, S. (). Curriculum Development and Educational Technology. New Delhi, Sterling Publisher P. Ltd..

5. Mohanty, J. (2003). Modern Trends in Education Technology. (Reprint Addition 2013)
6. Prasad, Janardan and Kumar, Vijay (1997). Advanced Curriculum Construction. New Delhi, Kanishka Publication.
7. Ramesh Shukla (2005). Dictionary of Education (2005). New Delhi, A.P.H. Publishing Corporation.
8. Soti and Sharma, A. (2014). Eminent Educational Thinkers of India. Agra, R.S.A. International Publisher. Agra.
9. www.knowlwdgecommission.gov.in
10. www.ncert.nic.in
11. www.takingglobal.org/express/article.html?cid-178

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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

- Teaching: Meaning, Nature, Principle, Levels, Phases and maxims of teaching. Difference of training and instruction from teaching.
- 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:

1. Aggarwal J.C.(2004), “ Educational Psychology”, Vikas Publishing House Pvt. Ltd., New Delhi
2. Berk Laura (2007), “ Child Development”; Prentice Hall of India, New Delhi.
3. Biehler Robert and Snowman Jack(1991), “ psychology Applied to Teaching”; Houghton Mifflin company, Boston.
4. Buzan Tony (2003), “Brain Child”; Thorsons, An Imprint of Harper Collins, London.
5. Coleman Margaret (1996), “ Emotional and Behavioral Disorders”; Allyn and Bacon, Boston.
6. Erickson Marian (1967), “The Mentally Retarded Child in the classroom”; The macmillan company
7. Goleman Daniel(1995). “Emotional Intelligence”; Bantom Books, N.Y.
8. Goleman Daniel (2007), “ Social Intelligence”; Arrow Books, London.

9. Henson Kenneth (1999), "Educational Psychology For Effective Teaching"; Wadsworth Publishing Co. Belmont, California
10. Khandwala Pradip (1988), "Fourth Eye"; A. H. Wheeler, Allahabad.
11. Mangal S.K. (1993), "Advanced Educational Psychology" Prentice Hall of India Pvt. Ltd., New Delhi
12. National Curriculum Framework 2005, N.C.E.R.T, New Delhi.
13. Osborn Alex (1971), "Your Creative Power"; Saint Paul Society, Allahabad, India.
14. Pringle M.K. and Varma V.P.(Ed) (1974), "Advances in Educational Psychology" University & London Press, London
15. Shaffer David (1999), "Social and Personality Development" Wadsworth Thomson Learning, U.S.A.
16. Sharma Tara Chand (2005), "Reading Problems of Learners"; Sarup and Sons, New Delhi.
17. Sousa David (2001), "How The Brain Learns"; Cowin Press, Inc. A Sage Publication Company, California.

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PEACE EDUCATION

OBJECTIVES:-

MARKS-100

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,
- Peace Research, International classroom, International Parliament, Peace Awards, Creating Models for Peace technology - development of new tools, techniques, mechanisms and institutions for building up peace and Engaging students in Peace Process.

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.
- Role of Religion in prorogation of Peace. Nelson Mandela Mother-Theresa, Vivekananda, Gandhian Philosophy in promoting Peace Education. Role of Great personalities in promoting Peace.

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 :-

1. Adams.D (Ed) (1997) UNESCO and a culture of Peace: Promoting a Global Movement. Paris UNESCO.
2. Aber,J.L. Brown, J.L.A.Henrich, C.C.(1999) Teaching Conflict Resolution: An effective.
3. Dr.Haseen Taj (2005) National Concerns and Education, NeelkamalPublications.pvt.Ltd
4. Dr.Haseen Taj (2005) Current challeges in Education, NeelkamalPublications.pvt.Ltd
5. Mahesh Bhargava and Haseen Taj (2006) Glimpses of Higher Education. Rakhi
6. Prakashan, Agra-2 7. Wttp://www.un.org/cyberschoolbus/peace/content.htm.

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

1. CHEMISTRY

Number of Paper	Nomenclature of Paper	Duration of Exam.	Max. Marks	Min. Pass Marks
Paper-I	Inorganic Chemistry	3 Hrs.	50	54
Paper-II	Organic Chemistry	3 Hrs.	50	
Paper-III	Physical Chemistry	3 Hrs.	50	
Paper-IV	Chemistry Practical	5 Hrs.	50	18

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:

Use of redox potential data-analysis of redox cycle, redox stability in water, Frost, Latimer and Pourbaix diagrams. Principle involved in the extraction of the elements.

Books Suggested :

1. *Text book of Quantitative Inorganic Analysis* : A. I. Vogel (Chapter – I, II and XXIII)
2. *Text book of Quantitative Inorganic Analysis* : I. M. Kothoff and E. R. Sandell
3. *Concise Inorganic Chemistry* : J. D. Lee
4. *General Inorganic Chemistry* : J. A. Duffy
5. *Principle of Inorganic Chemistry* : B. R. Puri and L. R. Sharma
6. *Basic Inorganic Chemistry* : Cotton and Wilkinson and Gaus, Willey

Paper-II : Organic 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 Electromagnetic Spectrum:

Absorption Spectra:

Ultra-violet (UV) Absorption Spectroscopy: Absorption laws (Beer-Lambert's law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones.

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.

Monohydric alcohols: Nomenclature, method of preparation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols.

Dihydric alcohols: Nomenclature, methods of preparation, chemical reaction of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and 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:

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction. Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro's reaction, Meerwein-Ponndorf-Verley, Clemmensen, Wolff-Kishner, LiAlH_4 and NaBH_4 reductions. Halogenation of enolizable ketones. An introduction to α,β -unsaturated aldehydes and ketones.

Unit-IV Ethers and Epoxides:

Nomenclature of ethers and methods of preparation, physical properties. Chemical reactions: cleavage and autoxidation. Ziesel's method. Synthesis of epoxides. Acid and base catalyzed ring opening of epoxides, orientation of epoxide ring opening. Reactions of Grignard and organolithium reagents with epoxides.

Carboxylic Acids:

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effect of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reductions of carboxylic acids. Mechanism of decarboxylation. Methods of formation, chemical reactions of haloacids. Hydroxyacids: malic, tartaric and citric acids. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of synthesis and effect of heat and dehydrating agents.

Carboxylic Acid Derivatives:

Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Relative stability and reactivity of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives and chemical reactions. Mechanism of esterification and hydrolysis (acidic and basic).

Unit-V Organic Compounds of Nitrogen:

Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic, neutral and alkaline media. Picric acid. Halonitroarenes: reactivity.

Alkyl and Aryl Amines:

Reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase transfer catalysts. Preparation of alkyl and aryl amines (reduction of nitro compounds and nitriles). Reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines, electrophilic aromatic substitution in arylamines, reactions of amines with nitrous acid. Synthetic transformations of aryldiazonium salts, azo coupling.

Books Suggested :

1. *A Text Book of Organic Chemistry* : K. S. Tiwari, S. N. Mehrotra and N. K. Vishnoi
2. *Modern Principles of Organic Chemistry* : M. K. Jain & S. C. Sharma
3. *A Text Book of Organic Chemistry: (Vol. I & II)* O. P. Agarwal
4. *A Text Book of Organic Chemistry* : B. S. Bahl and ArunBahl
5. *A Text Book of Organic Chemistry* : P. L. Soni
6. *Organic Chemistry: (Vol. I, II & III)* S. M. Mukherji, S. P. Singh and R P. Kapoor

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.

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law, Joule-Thomson coefficient and inversion temperature. Calculation of w , q , dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry: Standard state, standard enthalpy of formation-Hess's law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

Unit-II Thermodynamics-II:

Second Law of Thermodynamics: Need for the law, different statements of the law.

Carnot's cycle and its efficiency, Carnot theorem.

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-Huckel-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 K_a 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.

Solubility product and activity coefficient, determination of solubility product of a sparingly soluble salt. Definition of pH and pK_a. Determination of pH using hydrogen electrode by

potentiometric titrations. Buffers: mechanism of buffer action, Henderson-Hassel equation, hydrolysis of salts.

Books Suggested :

1. *Principles of Physical Chemistry* : B. R. Puri Sharma and M. S. Pathania
2. *A Text Book of Physical Chemistry* : A. S. Negi and S. C. Anand
3. *A Text Book of Physical Chemistry* : Kundu and Jain

Paper-IV : Chemistry Practical

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

Max. Marks: 50 Marks

Distribution of Marks:

- | | |
|---|---|
| <input type="checkbox"/> Inorganic Chemistry Experiments | - |
| <input type="checkbox"/> Organic Chemistry Experiments | - |
| <input type="checkbox"/> Physical Chemistry Experiments | - |
| <input type="checkbox"/> Practical Record (for regular students only) | - |
| <input type="checkbox"/> Viva-voce (for regular students) | - |
| <input type="checkbox"/> Viva-voce (for non-collegiate students) | - |

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 permanganometry.
- 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 R_f 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.
- Separation of a mixture of D,L-alanine, glycine and L-leucine using n-butanol: acetic acid:water (4:1:5) Spray reagent-Ninhydrin.
- separation of mono saccharides-a mixture of D-galactose and D-fructose using n-butanol:acetone:water (4:5:1) spray reagent- Aniline hydrogen phthalate.

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 /dilatometric method (e.g. $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ / $\text{SrBr}_2 \cdot 2\text{H}_2\text{O}$)

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

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BOTANY

Part II (Botany) Examination -2018

Scheme:

Paper	Duration	Max. Marks	Min. Marks
Paper-I Diversity & Systematics of seed plants-Gymnosperms	3 Hrs.	50	
Paper-II Diversity & Systematics of seed plants-Angiosperms	3 Hrs.	50	54
Paper-III Structure development & Reproduction of flowering plants	3 Hrs.	50	
Practical (One)	5 Hrs.	50	18

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

Paper - I

Diversity & Systematics of Seed Plants-Gymnosperms

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 taxometrics to taxonomy.
- Unit-IV - **Diversity of flowering plants** as illustrated by members of the families Ranunculaceae, Brassicaceae, Papaveraceae CapparidaceaeMalvaceae, Rutaceae, Fabaceae, Apiaceae.
- Unit-V - **Salient features of some families** ;Asteraceae,Acanthaceae, Apocynaceae, Asclepediaceae, 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 :-

Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Limited, New Delhi.

Gifford, E.M. and Foster, A.s. 1988. Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.

Stewart, W.M. 1983. Paleobotany and the Evolution of Plants. Cambridge University Press, Cambridge.

Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy. Oliver and Boyd, London.

Heywood, V.H. and Moore, D.M. (eds) 1984. Current Concepts in Plant Taxonomy, Academic Press, London.

Jeffrey, C. 1982. An Introduction to Plant Taxonomy, Cambridge, University Press, Cambridge London.

Jones, S.B. Jr and Luchsinger, A.E. 1986 Plant Systematics (2nd edition). McGraw Hill Book Co., New York

Maheswari, J.K. 1963. Flora of Delhi. CSIR, New Delhi.

Radford, A.E. 1986. Fundamentals of Plant systematics. Harper and Row, New York.

Singh, G. 1999. Plant Systematics : Theory and Practice. Oxford and IBH Pvt. Ltd., New Delhi.

Stace, C.A. 1989 Plant Taxonomy and Biosystematics (2nd edition). Edward Arnold, London.

Sharma Niranjan 2002. The flora of Rajasthan, Aavishkar Publishers Jaipur.

Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms, 4th revised and enlarged edition. Vikas Publishing House, Delhi.

Cutter, E.G. 1969. Part I. Cells and Tissues. Edward Arnold, London.

Cutter, E.G. 1971. Plant Anatomy : Experiment and Interpretation. Part II. Organs. Edward Arnold, London.

Esau, K. 1977 Anatomy of Seed Plants. 2nd edition, John Wiley & Sons, New York.

Fageri, K. and Van der Piji 1979. The Principles of Pollination Ecology. Pergamon Press Oxford. Fahh, A. 1974. Plant Anatomy. 2nd Edition. Pergamon Press, Oxford

Hartmann, H.T. and Kestier, D.E., 1976. Plant Propagation : Principles and Practices. 3rd edition.

Prentice-Hall of India Pvt. Ltd. New Delhi.

King, J. 1997. Reaching for the Sun : How Plants Work, Cambridge University Press, Cambridge, U.K.

Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummins Publishing Company Inc., Menla Park, California, USA.

Proctor, M. and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London.

Raven, P.H. Evert, R. F. and Eichhorn, S.E. 1999. Biology of Plants. 5th edition. W.H. Freeman and Co., Worth Publishers, New York

Thomas, P. 2000. Trees. Their Natural History, Cambridge University Press Cambridge.

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)
5. Anatomy of primary and secondary growth in monocots and dicots using hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood. Microscopic study of wood in T.S., T.L.S. and R.L.S.
6. Internal structure of leaf. Structure and development of stomata (using epidermal peels of leaf)
7. Anatomy of the root. Primary and secondary structure.
8. Examination of a wide range of flowers available in the locality and methods of their pollination.
9. Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts). Pollen viability using in vitro pollen germination.

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).
13. Germination of non-dormant and dormant seeds.
14. Viability of seeds.

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Part II - Zoology

(Scheme for Examination) – 2018

Paper	Duration	Max. Marks	Min. Pass Marks
I Animal Diversity (Part-2)	3 Hours	50	18
II Endocrinology and Ethology	3 Hours	50	18
III Animal Ecology and Biostatistics	3 Hours	50	18
Practical	5 Hours	50	18

PAPER-I : ANIMAL DIVERSITY (Part-2)

Arthropoda to Protochordata

Duration : 3 Hours
: 50

Max. Marks

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 upto 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

/2

X10 = 5 marks).

(1

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

1. Glands : Exocrine and endocrine; Secretions : Autocrine and paracrine.
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 hyposecretion 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.
4. Molecular mechanism of insulin action .

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

1. Searching of food : Honey bee , rhesus monkey and langoor.
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.
4. Migration in fishes and birds. Orientation : Taxes and kinesis.

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).

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.

ZOOLOGY PRACTICAL SYLLABUS

1. Study of animal diversity through museum specimens :-

Arthropoda - *Peripatus, Limulus*, spider, *Lepas*, crab, lobster, *Balanus, Saculina, Lepisma*, moth, butterfly, rice weevil, centipede, millipede, locust, cyclops.

Mollusca - *Chiton, Neopilina, Patella, Aplysia, Dentalium, Ostrea, Terebratulina*, slug, *Loligo, Octopus, Nautilus, Mytilus*, pearl oyster.

Echinodermata - *Antedon, Cucumaria, Echinus, Astropecten, Ophiothrix, Holothuria*. **Invertebrate chordates** - *Balanoglossus, Herdmania, Doliolum, Salpa, Oikopleura, Amphioxus*.

2. Study of sections of organs and developmental stages :

Arthropoda - Larval stages of crustacea and insecta - *Nauplius, Zoea, Megalopa, Mysis, Cypris* larva, mosquito larvae and instars of flies. Book lung, trachea, malpighian tubule, pectens (scorpion),

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

Echinodermata - Pedicellaria, pluteus larva, bipinnaria larva.

Hemichordata - T.S. through proboscis, collar and trunk regions of *Balanoglossus*, tornaria 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. Phototactic 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 O₂ and free CO₂, 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	50Marks
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 ($P=p_1, b=b_1$), 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, Clausius and Kelvin's statements, partition function (Z), mean energy of an ideal gas and mean pressure, Heat engine and efficiency of the engine, Carnot's 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

Quantum Statistics, Black body radiation and failures of classical statistics, Postulates of quantum statistics, Indistinguishability, Wave function and exchange degeneracy, Priori probability, Bose-Einstein's Statistics, Planck's distribution law, Fermi-Dirac statistics, completely degenerate system, Bose-Einstein condensation, Thermionic Emission, specific heat anomaly of metals contact potential and Ortho and Para hydrogen.

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

Oscillators, Feed back 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 out put, 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 reflection 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 ($\gamma=C_p/C_v$) using Clement's and Desormes methods.
12. Determine Thermal conductivity of a bad conductor by Lee's method.
13. Determination of Ballistic constant of Ballistic galvanometer.
14. Determination of high resistance by method of leakage.
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/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

Paper	Nomenclature	Teaching Hr./Week	Exam. Duration	Max. Marks
I	Real Analysis	4	3Hrs	66
II	Differential Equations	3	3Hrs.	44
	Practical	2		22
III	Mechanics	4	3Hrs.	68

Practical Marks-22

Pt-II) (Total Marks- 22)

Record	-	05
Practical -I	-	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 \mathbb{Q} , Archimedean and denseness properties of \mathbb{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 n^{th} root, Raabe's, Gauss, Logarithmic, Demorgan and Bertand'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

Equivalent sets. Finite and infinite sets denumerable sets, Countable and uncountable sets. Interior point of a set, open set, limit point of a set, Bolzano-Weierstrass theorem. Closed set. Dense in itself and perfect sets. Cantor's ternary set.

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

Darboux sums and their properties. Riemann integral, Integrability of continuous and monotonic functions. Mean value theorems of integral calculus, The fundamental theorem of integral calculus.

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

Books recommended for reference :-

8. Shanti Narayan : Elements of real analysis, S.Chand& company Ltd., New Delhi.
9. Shanti Narayan : A Course of Mathematical Analysis, S.Chand& Company Ltd. New Delhi.
10. S.C. Malik, Mathematical Analysis, Wiley Estern Ltd. New Delhi.
11. S.C. Malik, Principles of Real Analysis, New Age International Ltd., New Delhi.
12. Hari Kishan, Real Analysis, PragatiPrakashan Meerut.
13. J.N. Sharma & A.R. Vasistha, Mathematical Analysis, Krishna PrakashanMandir, Meerut.

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

Partial differential equations of first order, Lagrange's solution. Charpit's general method of solution.

UNIT-V

Partial differential equations of second and higher orders. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's method.

Books recommended for reference :-

16. M. Ray, J.C. Chaturvedi & H.S. Sharma : A Text Book of Differential Equations, Students Friends & Company, Agra.

17. J.L. Bansal & H.S. Dhama : Differential Equations Vol. I & II, Jaipur Publishing House, Jaipur.

List of Practicals for Paper-II

Name of Practicals

6. Solution of differential equations using Picard's method and comparison with exact solution.

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

8. Formation of the ordinary differential equation.

9. Singular solution of differential equations.

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

11. Solution of partial differential equations using Charpit's 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 :-

- M.Ray & P.T. Chandi : Statics, Premier Publishing Company, Delhi.
- M. Ray : A Text Book on Dynamics, Premier Publishing Company, Delhi.
- S.M. Mathur : A New Text Book of Higher Statics, Atma Ram & sons, New Delhi.