

PET – AGRICULTURE

AGRONOMY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Scientific principles of crop production. Integrated farming, organic farming, resource conservation technologies. Climate change mitigation and conservation agriculture, carbon sequestration. Modern concepts of tillage. Dry land farming. Physiology of grain yield in cereals. Soil fertility and productivity. Commercial fertilizers, organic manures, fertilizer use efficiency, nutrient interactions, concept of balance nutrition and integrated nutrient management. Soil less cultivation, aeroponics, hydroponics, robotics and terrace farming. Use of GIS, GPS and remote sensing in modern agriculture. Precision farming and protected agriculture. Agronomic bio-fortification of food crops. Remote sensing for yield forecasting. Weed biology, ecology, crop weed competition. Classification of herbicides, their selectivity and mode of action. Weed management in major field crops. Herbicide resistance. Integrated weed management; recent development in weed management-robotics, use of drones, etc. Water management of crop and cropping system. Soil-water-plant relationship. Factors determining water needs, scheduling and methods of irrigation. Drainage. Excess water and water stress, their effect on plant growth. Micro-irrigation systems; deficit irrigation; fertigation; management of water in controlled environments and polyhouses. Irrigation efficiency and water use efficiency. Use of Internet of things (IoT) in agriculture. Quality of irrigation water.

3. Model Questions

- 1. Which of these is mitotic inhibitor?
 - (A) Clodinafop
 - (B) Sulfosulfuron
 - (C) Pendimethalin
 - (D) Glyphosate
- 2. Real-time status of the plant, soil, and weather for efficient irrigation management is possible with the use of:
 - (A) Internet of Things (IoT)
 - (B) Tensiometer
 - (C) Time domain reflectometer
 - (D) None of these

PET – AGRICULTURE

AGRICULTURAL EXTENSION EDUCATION

1. Test Structure

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- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Extension Education- concept, objectives, principles and philosophy. Analysis of Indian agricultural extension systems and Pluralism in Extension delivery- Role of ICAR, SAU, State departments, private sector, Non-Governmental Organizations, Producer Organizations, (National/International)/Civil Society Organizations (CSOs). Extension experiences from India and other countries. Challenges in Extension and Advisory Services. Models, barriers and feedback in Communication. Role of Media and ICT in extension and advisory services. Agricultural Knowledge and Information System (AKIS)- strengths and limitations. Agricultural Innovation Systems (AIS)-concepts and elements. Evolving Extension Approaches- Transfer of technology approach, farmer participatory extension approach, demand-driven extension, market led extension (value chain extension), extension for climate smart agriculture, gender sensitive extension, extension for entrepreneurship. Diffusion and adoption of innovations. Human behaviour– Meaning, importance and factors influencing human behavior. Behavioural concepts- intelligence, personality and temperament, motivation, emotions, cognitive process– attention, perception, learning – foundations, approaches and theories. Decision-making, attitudes and influence, social judgement, social identity and inter-group relations. Leadership- different methods of identification of leaders and their training. Organisational behaviour - scope, importance and models, Group behaviour, productive behaviour and occupational stress in an organization, organisational development- concept, importance and characteristics, scientific methods in extension education, selection and formulation of research problem, hypotheses, constructs and variables, levels of measurement. Research designs in extension education, Sampling and data collection techniques, reliability and validity of scales, knowledge test, qualitative research methods, Methods of data processing in quantitative and qualitative studies. Training, capacity building and HRD-Meaning and differences; need assessment, planning and organization methods and tools, Impact Assessment- meaning, need, features, benefits, concepts; indicators for impact assessment. Evaluation- concept, theories, steps in programme evaluation, SWOT Analysis, PERT & CPM, Logical framework approach, Bennett's Hierarchy of Evaluation. Management and extension management – meaning, concept, nature, importance and theories of management. Gender mainstreaming- concepts importance in national and global agriculture-key gender issues and challenges in agriculture. Women empowerment- concept, importance and approaches, Women entrepreneurship development, gender mainstreaming models and frameworks for addressing gender concerns in agriculture.

3. Model Questions

1. Set of roles, activities, expectations and behaviours assigned to males and females by society is called:
 - (A) Gender role
 - (B) Gender issues
 - (C) Gender idea
 - (D) Gender equity
2. Training approach where the trainer serves as a catalyst is known as:
 - (A) Traditional
 - (B) Performance based
 - (C) Skill based
 - (D) Experiential

PET – AGRICULTURE

ENTOMOLOGY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Evolution of insect body form. Morphological characteristics of insects and their bearing in insect classification. Insect sense organs. Mechanism of flight. Insect systematics - history and importance. Zoo-geographical regions of world. Taxonomic keys and categories. Rules of zoological nomenclature. Classification of super class Hexapoda with emphasis on class Insecta up to economically important families along with their distinctive and ecological characteristics. Concept of phylocode and alternative naming systems for animals, molecular taxonomy. Structure and physiology of insect integument. Anatomy and physiology of insect's digestive, circulatory, respiratory, excretory, reproductive, nervous, sensory, endocrine and exocrine systems. Embryonic and post-embryonic developments. Diapause. Insect nutrition. Artificial diets. Ecology, organization levels, ecosystem concept, food chain. Characteristics of insect populations. Intrinsic rate of increase. Biotic factors, intraspecific competition, logistic theory. Interspecific relationships, prey/predator models, effect of food and space on insects. Natural balance, population dynamics and regulation. Life tables, system approach to ecology. Pest survey and surveillance. Sampling considerations for population estimates. Pest outbreaks and forecasting. Pest management as applied ecology. Principles of insecticide toxicology. Structure and mode of action of organochlorines, organophosphates, carbamates, synthetic pyrethroids, neonicotinoids, oxadiazines, phenyl pyrazoles and other newer molecules and, botanicals. Newer insecticides. Bioassay, joint action, synergism, potentiation and antagonism. Insecticide metabolism. Pest resistance to insecticides. Insecticide Act. Safe use of insecticides, diagnosis and treatment of poisoning. Concepts of pesticide residues. Techniques in biological control. Biology and host seeking behaviour of predatory and parasitic groups of insects. Insect pathogens and their mode of action. Mass production of biocontrol agents. Importation of natural enemies and quarantine regulations. Biotechnology in biological control. Semiochemicals in biological control. Host plant resistance. Screening techniques. Breeding crops for insect resistance. Exploitation of wild plant species and gene transfer. Induced resistance. Determination of crop losses and economic thresholds. Integration of different pest management methods. Comparative morphology of acari, phylogeny of higher categories of mites and ticks, their management, predatory mites, their mass production and utilization. Advanced pest management strategies. Silkworms and their rearing and management. Pests and diseases of silkworms. Lac insect's management. Insect-pests of stored grains and agricultural products, identification, distribution, host range, biology, ecology, nature and extent of damage and management. Type of storage structures. Ideal storage conditions. Classification of bees and distribution of genus *Apis*, morphological adaptations. Behaviour and activities of honey bees. Honey bee nutrition. Artificial queen bee rearing and bee breeding. Sex and caste determination. Honey bee ecology. Bee pheromones. Pests and diseases of honey bees. Hive products. Planned crop pollination using bees. Scope of other non-*Apis* pollinators, conservation, mass rearing and multiplication, Impact of agricultural and industrial practices on pollinators diversity and intensity.

3. Model Questions

1. Which of the following orders are absent in India:
 - (A) Zoraptera & Grylloblattoidea
 - (B) Zoraptera & Embioptera
 - (C) Zoraptera & Collembola
 - (D) Zoraptera & Trichoptera
2. Reversal of wing pads occurs in:
 - (A) Aeshnidae
 - (B) Schizopdactylidae
 - (C) Culicidae
 - (D) Anobiidae
3. In physiological considerations the resistance to insecticide may be developed due to:
 - (A) Excretion of toxicant
 - (B) Conversion of toxicant to non-toxic metabolites
 - (C) Storage of the toxicant
 - (D) All of the above
4. Which of the following aphid feeds on pulses?
 - (A) *Rhopalosiphum maidis*
 - (B) *Aphis craccivora*
 - (C) *Myzus persicae*
 - (D) *Lipaphis erysimi*

PET – AGRICULTURE

FOOD PROCESSING TECHNOLOGY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas **1/4 mark** will be **deducted** for every wrong answer. Further, this Part will be divided into two Sections: Section-I: Food Biochemistry, Food Engineering and Food Microbiology; and Section-II: Food Technology. There will be 38 MCQs from Section-I and 112 MCQs from Section-II.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Section-I: Physico-chemical, functional and nutritional characteristics of carbohydrates, proteins, fats and their interactions. Biochemical and nutritional aspects of vitamins, minerals, nutraceuticals and antinutritional factors. Techniques in food analysis – Principles and significance. Engineering properties of food materials. Unit operations in food processing. Microbiology of plant and animal foods. Spoilage of food, food pathogens and their toxins in relation to human health.

Section-II: Principles of food processing and preservation – Conventional and novel techniques. Food ingredients and additives – Classification and functionality. Techniques for sensory evaluation of foods. Nutraceuticals, functional and convenience foods. Quality attributes of raw and processed foods. Food safety and quality management systems, National and International food laws & standards, statistical quality control. Enzymes in food processing - Sources, significance and applications. Processing technology of food grains (cereals, legumes, oilseeds), horticulture crops (fruits and vegetables), animal produce (milk, meat, poultry, seafood, fish) and other agricultural produce. Beverages – Production technology of alcoholic and non-alcoholic beverages. Functions of packaging, classification of packages and novel packaging techniques.

3. Model Questions

1. Which non-thermal processing method is used to inactivate enzymes and microorganisms in liquid foods without compromising sensory and nutritional qualities?
- (A) Ultraviolet (UV) irradiation
(B) High-Pressure Processing (HPP)
(C) Shrinkage
(D) Premature setting
2. Which enzyme is commonly used in the modification of starch to produce resistant starch with potential health benefits?
- (A) Amylase
(B) Lipase
(C) Protease
(D) Cellulase

PET – AGRICULTURE

HORTICULTURE (FRUIT SCIENCE)

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Area and production of fruits, origin, distribution, commercial importance, export potential, species, varieties, ecophysiological requirement and cultivation practices of major fruit crops like mango, citrus, banana, grape, papaya, guava, pineapple, litchi, loquat, phalsa, jackfruit, mangosteen, sapota, cashewnut, ber, pomegranate, date palm, aonla and temperate fruits like apple, pear, peach, almond, plum, apricot and cherry.

Canopy management, weed control, modern methods of propagation including micropropagation and use of growth regulators in fruit crops, nutrient and water management, organic farming systems, use of biofertilizers, rootstocks, stock scion relationship, incompatibility, high density orcharding, major pests & diseases, physiological disorders and their control measures.

Crop improvement, Biotechnological interventions, Good agricultural practices (GAP), quality improvement, maturity indices, harvesting practices, storage and ripening techniques.

3. Model Questions

1. The largest producer of pear in the world is:
(A) USA (B) Italy
(C) China (D) France
2. Major bottleneck in banana breeding is:
(A) Incompatibility (B) Parthenocarpy
(C) Non-receptivity of stigma (D) All of the above
3. The highest papian yielding papaya selection is:
(A) Co 5 (B) Co 6
(C) Co 2 (D) Honey Dew
4. Clonal rootstocks can be easily propagated through:
(A) Stooling (B) Grafting
(C) Cutting (D) Air layering
5. Bronzing in litchi is due to:
(A) Zn (B) Mn
(C) Cu (D) Mg

PET – AGRICULTURE

HORTICULTURE (VEGETABLE SCIENCE)

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Cultural and climatic requirement for cultivation of vegetables i.e. potato, tomato, chilli, brinjal, cole crops, okra, peas, beans and cucurbitaceous crops. Forcing techniques of vegetable production, organic farming, post-harvest handling, physiological disorders, breeding methods of self and cross pollinated vegetable crops, micro-propagation techniques, hybrid seed production of vegetable crops, crop systems, multiple cropping, nursery raising techniques, protected cultivation, low tunnel technology, statistical tools for field experimentation, disease management in nursery and fields, determination of biochemical constituents i.e. ascorbic acid, sugars, protein, capsaicin, carotene.

3. Model Questions

- 1. Pusa summer prolific long is an important cultivar of:
 - (A) Cucumber
 - (B) Bottle gourd
 - (C) Longmelon
 - (D) Snake gourd
- 2. Brinjal originated in:
 - (A) India
 - (B) Netherlands
 - (C) Russia
 - (D) China
- 3. Purple blotch is a serious disease of:
 - (A) Tomato
 - (B) Brinjal
 - (C) Onion
 - (D) None of these
- 4. Little leaf disease is associated with the deficiency of:
 - (A) Molybdenum
 - (B) Copper
 - (C) Nitrogen
 - (D) Zinc
- 5. Among the vegetable crops listed below, following is the climacteric vegetable:
 - (A) Onion
 - (B) Muskmelon
 - (C) Brinjal
 - (D) None of these

PET – AGRICULTURE

HORTICULTURE (FLORICULTURE & LANDSCAPING)

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Status of Floriculture in India and global trade, Production technology of flowers (rose, chrysanthemum, carnation, gerbera, gladiolus, tuberose, orchids, anthurium, aster, lilliums, tulip, bird of paradise, alstroemeria, dahlia, gypsophilla, limonium, stock, Jasmine, marigold, geranium, crossandra, nerium, hibiscus, barleria, celosia, gomphrena, and cut foliage). Use of plant growth regulators (PGRs). Breeding of ornamental crops, mutation breeding, heterosis breeding, polyploidy, *In vitro* breeding. Role of genetic engineering in improvement of ornamentals, Patents and plant variety protection in India. Protected cultivation of flowers. Flower seed production. Post-harvest handling of flowers. Techniques in dry flower. Flower forcing and year round flowering through physiological interventions, chemical regulation and environmental manipulations. Physiological disorders and control. Plant protection measures in ornamentals, IPM, IDM. Classification of plant material and their use in landscaping, waterscaping, xeriscaping. Nursery production of ornamentals, propagation structures, media for nursery, special nursery practices. Landscape principles and their application. Turfing and Turf Management. Terrace and roof gardening. Master plan of cities in relation to open spaces. Value addition in flowers, selection of species and varieties for pigment extraction. Types of pigments- carotenoids, anthocyanin, chlorophyll, betalains, significance of natural pigments.

3. Model Questions

1. Indian Floribunda rose cultivar patented in USA:
(A) Fugitive (B) Mohini
(C) Sindhoor (D) Banjaran
2. Inheritance of pigments is controlled by which gene action:
(A) Additive (B) Epistasis
(C) Dominance (D) None of these
3. Change from mutant allele to wild type is known as:
(A) Somatic mutation (B) Reverse mutation
(C) Nuclear mutation (D) None of these
4. Which of the following is not a warm orchid?
(A) *Phalaenopsis* (B) *Vanda*
(C) *Dendrobium* (D) *Cymbidium*
5. Pyrethrum is extracted from which *Chrysanthemum* species?
(A) *C. indicum* (B) *C. morifolium*
(C) *C. cinerariifolium* (D) *C. sinense*

PET – AGRICULTURE

GENETICS & PLANT BREEDING

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
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- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Early concepts of inheritance. Mendel's laws. Chromosomal theory of inheritance. Cell structure and cell division. Gene interactions. Linkage-detection methods and estimation. Extra chromosomal inheritance. Nature, structure and organization of DNA in chromosomes. Replication of the genetic material in prokaryotes and eukaryotes. Transcription and RNA processing. Genetic code. Protein biosynthesis and post translational modifications. Gene regulation in prokaryotes and eukaryotes. RNA editing. Molecular mechanisms of mutation, repair and suppression. Genetics of mitochondria and chloroplasts. Construction of genomic and cDNA libraries. History, objectives and achievements of plant breeding. Reproduction and pollination systems in plants. Centres of origin. Pre-breeding. Genetic basis and breeding methods in self, cross pollinated and asexually propagated crops. Development of synthetics and composites. Hybrid breeding. Genetic and physiological basis of heterosis and inbreeding. Prediction of hybrid performance. Self-incompatibility, male sterility and apomixes in crop plants and their commercial exploitation. Mutation breeding. Breeding for abiotic and biotic stresses. Concept of plant ideotype and its role in crop improvement. Polyploidy and wide hybridization. Doubled haploidy. Cultivar development - Testing, release and notification. Maintenance breeding. Seed production of hybrids and their parent varieties/inbreds. Participatory Plant Breeding. Plant breeders' and farmers' Rights. History of quantitative genetics. Qualitative and quantitative characters. Analysis of continuous variation. Components of variation. Nature of gene action. Designs for plant breeding experiments. Concept of selection. Simultaneous selection methods. Correlation and path analysis. Discriminant function and principal component analysis. Genetic divergence analysis. Generation mean analysis. Parent progeny regression analysis. Mating designs. Concept of combining ability and gene action. Genotype x Environment interaction. Methods and models of stability analysis. Bi-plot analysis. AMMI. Morphological, biochemical and DNA-based markers. Mapping populations. Concept of Bulk-Segregant analysis. Estimation of recombination frequency and mapping functions. Development of molecular linkage maps. Molecular mapping of a gene/QTL. Allele mining. Tilling and Ecotilling. Marker-assisted selection for qualitative and quantitative traits. Gene pyramiding. Genomics-assisted breeding. Large scale genome sequencing strategies. Human, Arabidopsis and rice genome projects. Comparative genomics tools. 2D gel electrophoresis and mass spectrometry. Recombinant DNA technology. Transgenes. Methods of transformation. Selectable markers and clean transformation techniques. Vector-mediated gene transfer. Physical methods of gene transfer. Production of transgenic plants in important field crops and commercial releases. Barnase/Barstar system for hybrid seed production. Application of tissue culture in molecular breeding. International regulations and biosafety issues of GMOs. Regulatory procedures in major countries including India. Introduction to bioinformatics - bioinformatics tools and biological databases.

3. Model Questions

1. In which stage of meiosis, crossing over takes place?
(A) Diplotene (B) Zygotene (C) Pachytene (D) Diakinesis
2. In case of ear to row method, each selection cycle requires
(A) One year (B) Two year (C) Three year (D) Four year
3. When a single cross hybrid is crossed with an open-pollinated variety, it is termed as?
(A) Top cross (B) Test cross (C) Double top cross (D) Three-way cross
4. Line X tester analysis is a good approach for screening germplasm on the basis of:
(A) GCA and SCA variances (B) GCA and SCA effects
(C) GCA and SCA variances and effects (D) *per se* performance of hybrids
5. Among the following, which is a co-dominant marker?
(A) RAPD (B) SSR (C) SCAR (D) Both (B) and (C)
6. Which rice genotype was chosen for developing the first reference genome sequence?
(A) IR8 (B) IR36 (C) TN1 (D) Nipponbare

PET – AGRICULTURE PLANT PATHOLOGY

1. Test Structure

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- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Historical development and milestones in the field of Plant Pathology in India and the world. Economic importance of plant diseases. Major epidemics and their social impacts. Classification of plant diseases. Physiological specialization. Koch's postulates. Variability in plant pathogens. Growth, reproduction, survival and dispersal of important plant pathogens, role of environment and host nutrition on disease development. Host parasite interaction, recognition concept and infection, symptomatology, disease development- role of enzymes, toxins, growth regulators. Defense strategies- Oxidative burst, phenolics, phytoalexins, PR proteins, elicitors. Altered plant metabolism as affected by plant pathogens. Genetics of resistance, 'R' genes, mechanism of genetic variation in pathogens, molecular basis for resistance, marker-assisted selection, genetic engineering for disease resistance. Epidemiology and forecasting of plant diseases. Modelling, system approaches and expert systems in plant pathology. Remote sensing techniques and image analysis. Principles of plant disease management by cultural, physical, biological, chemical, organic amendments and botanicals methods. Integrated control measures of plant diseases. Types of biocontrol agents, inoculum potential and density in relation to host and soil variables, competition, predation, antibiosis & fungistasis, concept of conducive and suppressive soils. Disease resistance and molecular approach for disease management. Plant quarantine. Organizational set up of plant quarantine in India. Relative importance of quarantine – domestic and international. Acts related to registration of pesticides and transgenics. History of quarantine legislations, Salient features of PQ Order 2003. Environmental Acts, Industrial registration, APEDA. WTO regulations, non-tariff barriers, Pest risk analysis. Sanitary and Phytosanitary measures, Post Entry Quarantine. Preparation and sterilization of common media. Methods of isolation of pathogens and their identification. Preservation of microorganisms in pure culture. Methods of inoculation. Measurement of plant diseases/phyto-pathometry. Laboratory equipment and their use. Detection of plant pathogens. Nucleic acid based techniques (Non-PCR– LAMP, lateral flow assay, microarray & PCR based- Multiplex, nested, qPCR, immuno-capture PCR, etc.). Phenotypic and genotypic tests for identification of plant pathogens. Molecular identification (16S rDNA and 16s-23S rDNA intergenic spacer region sequences-prokaryotic organisms, and eukaryotic organism by ITS region) and whole genome sequencing. Classification of fungi and their identification upto genus level. Importance of mycology in agriculture, relation of fungi to human affairs. Morphology, ultra structure and chemical composition of prokaryotic cell in relation to function. Growth curve, nutrition and auxotrophic mutants. Infection mechanism, role of virulence factors in expression of symptoms. Identification, classification and nomenclature of bacteria, phytoplasma and spiroplasma. The codes of nomenclature and characteristics. Biochemical and molecular characterization of phytopathogenic prokaryotes. Bacteriophages, L-form of bacteria, plasmids and bdellovibrios. Strategies for management of diseases caused by phytopathogenic prokaryotes. Nature, composition and architecture of viruses and viroids. Properties of viruses. Nomenclature and classification of viruses. Satellite viruses and satellite RNA. Conventional and biotechnological techniques used in detection and diagnosis of viruses and viroids. Behavior of viruses in plants including infection, replication and movement. Response of the host to virus infection-Biochemical, physiological, and symptomatic changes. Transmission of viruses and virus-vector relationship. Isolation and purification of viruses. Natural (R-genes) and engineering resistance to plant viruses. Economic importance of nematodes to agriculture, horticulture and forestry. Plant nematode relationships, cellular responses to infection by important phytonematodes, physiological specialization among phytonematodes. Principles and practices of nematode management. Diseases of cereals, millets, pulses, oilseeds, fibre crops, vegetables, fruits, spices, plantation and ornamental crops caused by fungi, bacteria, nematodes, viruses, viroids, phytoplasmas and other fastidious prokaryotes with special reference to symptomatology, etiology, disease cycle, perpetuation, epidemiology and management. Post harvest diseases in transit and storage, aflatoxins and their integrated management.

3. Model Questions

1. Nova Plantarum Genera was written by:
 - (A) E.J. Butler
 - (B) P.A. Micheli
 - (C) H.A. deBary
 - (D) P.M. A. Millardet
2. The anastomosis groups are common in:
 - (A) *Fusarium solani*
 - (B) *Phytophthora infestans*
 - (C) *Rhizoctonia solani*
 - (D) *Puccinia graminis tritici*

PET – AGRICULTURE

SOIL SCIENCE

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Physical behaviour: Soil consistence. Soil compaction and consolidation. Soil crusting. Puddling. Energy state of soil water, moisture characteristics. Water flow in saturated and unsaturated soils. Soil water movement, infiltration, redistribution, drainage and evaporation. Soil aeration. Modes of energy transfer in soils. Soil chemistry: Chemistry of acid, salt affected and submerged soils and management aspects. Equilibrium thermodynamics, chemical equilibria, electrochemistry and chemical kinetics. Inorganic and organic colloids. Cation exchange. Potassium, phosphate and ammonium fixation in soils and management aspects. Soil fertility and fertilizer use: Nutrient sources-fertilizers and manures. Soil N-sources and N transformations and biological nitrogen fixation. Nitrogenous fertilizers – their fate in soils and enhancing N use efficiency. Soil phosphorus and potassium forms. Management of P and K fertilizers. Sulphur, Ca and Mg-source, forms, fertilizers and their behavior in soils and management. Micronutrients-critical limits in soils and plants, factors affecting their availability. Integrated nutrient management. Soil mineralogy, genesis, classification and survey: Genesis and transformation of crystalline clay minerals. Clay minerals in Indian soils. Soil formation-factors, models, processes. Weathering of rocks and mineral transformations. Soil profile. Soil survey-characterization, bench mark soils and correlation. Soil classification systems. Soil survey-types, techniques and interpretations. Landform, evaluation and land use type. Soil biology and biochemistry: Soil biota, microbial ecology and types of organisms. Soil enzymes and soil characteristics influencing growth and activity of micro-flora. Microbial transformations of N, P, S, Fe and Mn in soil. Humus formation- biochemical composition and biodegradation. Biodegradation of pesticides, organic wastes and their use for production of biogas and manures. Biotic factors and bio-fertilizers in soils.

3. Model Questions

- 1. Solubility of CaCO_3 in soils increases with:
 - (A) Decrease in pH
 - (B) Increase in partial pressure of CO_2
 - (C) Both (A) and (B)
 - (D) None of these
- 2. Dominant micro-flora of soil is:
 - (A) Bacteria
 - (B) Actinomycetes
 - (C) Fungi
 - (D) Algae
- 3. Glacial parent material is:
 - (A) Stratified
 - (B) Well sorted
 - (C) Ill-sorted
 - (D) None of these
- 4. Size range of colloidal particle is:
 - (A) <0.002 mm
 - (B) <0.001 mm
 - (C) >0.002 mm
 - (D) None of these
- 5. Wetting of water unstable aggregates causes:
 - (A) Slaking
 - (B) Compaction
 - (C) Slaking and compaction
 - (D) No effect

PET – AGROMET

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Solar radiation & basic Laws of radiation, radiation interactions with plant environment. Radiation distribution in plant communities. Energy balance in atmosphere and crop canopy. General circulation of atmosphere. Stability and instability. Lapse rates-ascent of dry and moist air, condensation. Clouds. Hydrological cycle. Air masses and fronts. Zonal distribution of radiation, rainfall, temperature, and wind. SE Asian monsoon. Weather forecasting importance, types and techniques of weather forecasting. Climatic statistics. Measures of central tendency and dispersion, correlation, regression, moving average probability and their distribution function. Analysis of weather systems. Importance of meteorological parameters in agriculture. Basic principles of water balance, soil-water balance models. Crop weather calendars. Agromet advisories. Natural hazards. Drought- concepts and types. Crop-weather-pest interactions. Crop modeling. Climate classifications- agro-climatic zones of Punjab & India. Variations in microclimate under different canopies. Richardson number and Reynolds analogy. Weather and climate modification. Modification of microclimate. Leaf temperature and its biological effects. Agromet instruments - theory and working principles of different instruments. Effects of ambient weather conditions on growth, development and yield of crops. Energy balance over crops. Remote sensing - fundamentals of measurement techniques. Theories and methods of ET estimation. Concepts of potential, reference and actual evapotranspiration - modified techniques. Climatic change and agriculture.

3. Model Questions

1. The tropical / sub-tropical hot deserts are found between:
 - (A) 15° to 35° N and S
 - (B) 35° to 45° N and S
 - (C) 50° to 60° N
 - (D) 5° to 15° N and S
2. La Nina condition indicates:
 - (A) Drop in the temperature of Indian ocean
 - (B) Drop in temperature in Atlantic ocean
 - (C) Drop in the temperature in the Pacific ocean
 - (D) Drop in temperature in the Mediterranean
3. In a tropical cyclone the pattern of isobars is:
 - (A) Elliptical
 - (B) Circular
 - (C) Oval
 - (D) Semi-circular

PET – MOLECULAR BIOLOGY & BIOTECHNOLOGY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas **1/4 mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Plant Biotechnology and its scope. Various aspects of plant tissue culture, micropropagation, anther and microspore culture, somaclonal variation, embryo rescue, *in vitro* fertilization and *in vitro* germplasm conservation, Synthetic seeds, Protoplast culture and regeneration, Somatic hybridization. Cell membrane and transport system, signal transduction (G-protein coupled receptors), Cell cycle. Chromatin and chromosome structure, structure of centromere and telomere, Genome organization in eukaryotes, DNA replication, transcription, translation, Gene regulation in prokaryotes and eukaryotes, transcription factors in eukaryotes, operon concept in prokaryotes, miRNAs, siRNAs, knock down (RNA interference, VIGS), gene knock outs (e.g. T-DNA insertion, TILLING, EcoTILLING etc.), History and advances in genome editing (Meganucleases, ZFNs, TALENs, CRISPR/Cas), Base/Prime editing. Recombinant DNA technology, Enzymes in recombinant DNA technology, Genetic transformation, Vector and vector less methods of plant transformation, Genetic and molecular analysis of transgenics, target traits and transgenic crops, Biosafety issues of transgenics, Construction and uses of genomic and cDNA libraries, library screening, Hybridization techniques, Identification, isolation and characterization of genes, Application of gene cloning, Northern, Southern principles and applications, DNA-protein interactions, protein-protein interactions, chromatin immunoprecipitation, yeast one and two hybrids, chromatography, mass spectrophotometry etc. Molecular markers and their applications, RFLP, PCR based markers and SNP markers. Construction of molecular maps, Marker Assisted Selection, Genome wide association mapping, Physical maps, QTL mapping, Fine mapping, Comparative genomics. Advances in DNA sequencing using next generation technologies (Illumina, SOLiD, Ion-Torrent, PacBio, Nanopore), Genotyping by sequencing, Proteomics. Allele mining by deep sequencing, Functional genomics: DNA chips and their use in transcriptome analysis. Applications of genomics in agriculture. Introductory bioinformatics and databases, phylogenetic analysis, computer aided drug designing, sequence assembly and genome annotation. History of IPR in India, General principles of biosafety and its regulation in India, Biohazard disposal, bioethics, Intellectual Property Rights in biotechnology and bioentrepreneurship.

3. Model Questions

1. Southern blotting technique is used to separate:
 - (A) RNA fragments
 - (B) DNA fragments
 - (C) Proteins
 - (D) Carbohydrates
2. Blast can be used for alignment of:
 - (A) DNA
 - (B) RNA
 - (C) Protein
 - (D) All of the above
3. *In vitro* regeneration can be obtained by addition of:
 - (A) Auxin in the medium
 - (B) Cytokinin in the medium
 - (C) Gibberellins
 - (D) None of these
4. Molecular markers have found utility in:
 - (A) Genetic transformation
 - (B) Genome mapping
 - (C) Gene sequencing
 - (D) Gene annotation
5. Restriction endonucleases are used in molecular biology for:
 - (A) DNA ligation
 - (B) Gene amplification
 - (C) DNA cutting
 - (D) End filling

PET – AGRICULTURAL ENGINEERING

FARM MACHINERY & POWER ENGINEERING

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Development of tractor and farm machines. Dynamic properties of soil related to tillage and traction, measurement of soil resistance, soil behaviour considerations, critical state soil mechanics, soil cutting forces, shape of failure surfaces, soil loosening and manipulation, traction devices, tyre selection, soil compaction by agricultural machinery. Importance and significance of testing, types of testing, test equipment, test procedures and various test codes, approximation, round off errors, truncation errors, review and interpretation of test reports, importance and need of standardization of components of agricultural equipment. Description of man machine system, human factors in system development, anthropometry, man-machine system concept, human postures, postural stress and its role in role in design, human factors in tractor seat design, psychological and mental stress, calibration of subjects, safety considerations, standards at workplace. Mathematical modelling and system simulation. Need and functional requirements of precision agriculture, equipment for precision agriculture. Geographical concept of precision agriculture. Environment benefits of precision agriculture. Importance and objectives of farm mechanization in Indian agriculture, estimation of operating cost of tractors and farm machinery, management and performance of power, operator, labour. Economic performance of machinery, tractor performance, selection of farm machinery, reliability of agricultural machinery, replacement of farm machinery and inventory control of spare parts, systems approach to farm machinery management, network analysis.

3. Model Questions

1. Traction in sandy soil is affected by:
 - (A) Dynamic weight on tyres
 - (B) Area of contact
 - (C) Cohesion
 - (D) Combination of (A) and (B)
2. Safe limit of 8 hours exposure to noise at workplace is:
 - (A) 90 dB (A)
 - (B) 85 dB (A)
 - (C) 95 dB (A)
 - (D) None of the above
3. Future price of farm equipment in the nth year at constant rate of inflation can be calculated by:
 - (A) $F = P (1+i)^n$
 - (B) $F = P In$
 - (C) $F = P (1+i)^{-n}$
 - (D) $F = P (1 + (1+i)^{-1/n})$
4. Operational cost of equipment is inversely proportional to:
 - (A) Initial cost of equipment
 - (B) Annual usage of equipment
 - (C) Capacity of equipment
 - (D) All of the above
5. How much area can be harvested in 2 days of 5-h each with a 4.0 m combine at a forward speed of 5.0 km/h and field efficiency of 80%?
 - (A) 6 ha
 - (B) 26 ha
 - (C) 16 ha
 - (D) 36 ha

PET – AGRICULTURAL ENGINEERING

PROCESSING & FOOD ENGINEERING

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Transport Phenomena in Food Processing, applications in various unit operations of food processing. Unsteady state heat transfer, mass transfer applications in food processing. Engineering Properties of Biological Material, Physical characteristics of different food grains, fruits and vegetables; Shape and size, description of shape and size, volume and density, porosity, surface area.; Application of engineering properties in design and operation of agricultural equipment and structures. Processing of Cereals, Pulses and Oilseeds, Production and utilization of cereals, pulses and oilseeds, grain quality standards, Pre-milling treatments, conventional, modern and integrated milling operations;; BIS standards for various processed products. Advanced Food Process Engineering. Microwave, irradiation, ohmic heating, pulsed electric field preservation, hydrostatic pressure technique, principles, equipments and applications. Extrusion, Cold storage, controlled atmosphere packaging of fruits and vegetables. Osmotic dehydration, foam mat drying, freeze drying, general principles of quality standards and control, FPO, quality attributes. Food Packaging. Storage Engineering and Handling of Agricultural Products. Storage of grains, biochemical changes during storage, storage capacity models, Grain markets, storage of dehydrated products. Mass and energy balance. Food plant hygiene-waste disposal methods.

3. Model Questions

- 1. The moisture content on dry basis in comparison with wet basis can be:
 - (A) 50%
 - (B) More than 100%
 - (C) Less than or equal to 100%
 - (D) None of these
- 2. Food properties like chewiness, gumminess, springiness and adhesiveness are measured by:
 - (A) Spectronic-20
 - (B) Instron
 - (C) Instron and Texture analyzer
 - (D) Texture analyzer
- 3. Process of reducing fat droplet size in milk to prevent cream separation is known as:
 - (A) Pasteurization
 - (B) Centrifugation
 - (C) Crystallization
 - (D) Homogenization
- 4. The process of removal of field heat from fruits and vegetables is known as:
 - (A) Cold storage
 - (B) CA storage
 - (C) Hypobaric storage
 - (D) Pre-cooling
- 5. The most efficient oil extraction process is:
 - (A) Hydraulic press
 - (B) Mechanical expression
 - (C) Solvent extraction
 - (D) None of these

PET – AGRICULTURAL ENGINEERING

SOIL & WATER CONSERVATION ENGINEERING, IRRIGATION & DRAINAGE ENGINEERING

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Section I: Watershed characteristics, hydrologic parameters, frequency analysis. Hydrograph analysis, theory of unit hydrograph, synthetic hydrograph, S-hydrograph and instantaneous unit hydrograph. Flood routing methods. Reservoir sedimentation. Hydrologic modeling.

Section II: Irrigation water requirement, conveyance, distribution, application, water budgeting, irrigation efficiencies, water quality and salinity management. Hydraulics, design, operation and evaluation of border, check basin, furrow, sprinkler and trickle irrigation systems, protected cultivation.

Section III: Design of surface and subsurface drainage. multiple well point system. Steady and unsteady state drainage equations for layered and non-layered soils. Principle and applications of Hooghoudt, Kirkham, Earnst, Glover Dumm, Kraijenhoff-van-de-leur equations. Salt balance, leaching requirement and management practices.

Section IV: Groundwater occurrence and movement. Water balance. Aquifer and fluid properties. Hydraulics of fully and partially penetrating wells in confined, leaky and unconfined aquifers. differential equations of saturated and unsaturated flow. Dupuit and Boussinesq approximations and linearization techniques. Flow analysis in interfering wells. Pumping tests. Groundwater recharge. Groundwater modeling, stream functions, potential functions and flow net theory. Hydro-dynamic dispersion in soil-aquifer system.

Section V: Soil erosion and its types, quantitative soil loss estimation, universal soil equation, and its subsequent modification, in-situ measurement of soil loss, field practices in controlling erosion by wind and water, conservation structures and their design, Land leveling and grading. Application of RS and GIS in soil and water conservation.

3. Model Questions

- 1. The equation for unsteady radial flow in leaky aquifer was developed by:
 - (A) Thesis
 - (B) Theim
 - (C) Dupuit
 - (D) Hantush and Jacob
- 2. Spacing between the drains under unsteady condition is determined by the equation:
 - (A) Hooghoudt
 - (B) Earnst
 - (C) Glover-Dumm
 - (D) Kirkham
- 3. The most important parameter for designing sub-surface drainage system is:
 - (A) Hydraulic conductivity
 - (B) Drain depth
 - (C) Drain spacing
 - (D) Drain layout
- 4. In small watersheds, the following process dominate:
 - (A) Channel flow
 - (B) River flow
 - (C) Overland flow
 - (D) Both (A) & (C)
- 5. Aquifer diffusivity is:
 - (A) S/T
 - (B) T/S
 - (C) $(T/C)^{1/2}$
 - (D) b/k

PET – REE

RENEWABLE ENERGY ENGINEERING

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas **1/4 mark** will be **deducted** for every wrong answer. Further, this Part will be divided into two sections: Section-I and Section-II. The weightage for Section-I and Section-II will be 40% and 60%, respectively. Section-I will have 60 MCQs whereas Section-II will have 90 MCQs. Candidate will have an option to answer questions from any one of the specializations in Agricultural Engineering viz. Farm Machinery & Power Engineering, Processing & Food Engineering, Soil & Water Conservation Engineering, Irrigation & Drainage Engineering.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Section I: Energy sources and their classification, Energy conservation; Biomass: resources, fuel related properties and techniques for biomass collection, handling and pre-conditioning processes such as cutting, grinding, bailing, briquetting, densification etc, Principles of combustion, pyrolysis and gasification; furnaces for biomass combustion, gasifiers, operating parameters of gasifiers, design of gasifiers, utilization of producer gas for thermal application and electricity generation. Biogas plants, working, performance and maintenance, design of different biogas plants, application of biogas for thermal, lighting and engine operation. Basics of solar radiation, design and performance of flat plate and concentrating solar collectors, solar devices, principle and applications of solar photovoltaic cells as well as systems, solar pond. Principles, types and working of wind mills, utilization of wind energy, biodiesel and ethanol preparation principles and utilization, Energy auditing and conservation etc.

Section II: Candidate can choose to answer questions from anyone of the three specializations in Agricultural Engineering viz. Farm Machinery & Power Engineering, Processing & Food Engineering or Soil & Water Conservation Engineering or Irrigation & Drainage Engineering. For each specialization, the syllabus is same as that for entrance tests for Ph.D. programme of that specialization.

3. Model Questions

- Khadi village industries type biogas plant is example of:
(A) Flexible bag biogas plant
(B) Fixed dome biogas plant
(C) Floating drum biogas plant
(D) Semi batch type
- Biodiesel is produced by the process of:
(A) Fermentation
(B) Distillation
(C) Transesterification
(D) Catalytic cracking
- The value of Zenith angle at the time of sunset or sunrise is:
(A) 0°
(B) 30°
(C) 60°
(D) 90°
- Pyrolysis process is:
(A) Oxygen deficient
(B) Oxygen rich
(C) Both (A) and (B)
(D) None of these
- Which of the following is not a type of wind mill?
(A) Multi blade type
(B) Sail type
(C) Shell type
(D) Propeller type
- The conventional energy can be conserved by:
(A) Renewable energy utilization
(B) Proper greasing of moving machine parts
(C) Replacing wear out machine parts
(D) All of these

PET – BASIC SCIENCES

BIOCHEMISTRY

1. Test Structure

- The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- Merit list will be prepared on the basis of:
 - Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - Master's Research by Thesis & Quality of Thesis (no marks permissible for any project report) 10%
 - Interview 10%

2. Syllabus

General Biochemistry: Principles governing life. Structure and biological function of water. Acid base concept, buffers, pH and pKa. Hydrogen bonding and other non-covalent interactions. Classification, structure and functions of carbohydrates, lipids, and nucleic acids. Primary, secondary, and tertiary structure of proteins. Protein folding and stability. Protein sequencing. Hormones and their mode of action. Vitamins. Bioenergetics, oxidative phosphorylation. Immunoglobulins and PR proteins.

Intermediary metabolism: Methods of studying metabolism, transport mechanism, biological oxidation, signal transduction. Catabolic and anabolic pathways of carbohydrates, lipids, regulation, and their metabolic disorders. Energy transduction and oxidative phosphorylation. General reactions of amino acid metabolism, and their metabolic disorders. Nucleic acid biosynthesis, degradation, and regulation. Sulphur metabolism. Regulation of metabolic pathways. Integration of metabolism. Metabolic pathway engineering.

Enzymology: Enzyme nomenclature and classification. Isolation and purification of enzymes. Ribozymes, isozymes, abzymes, pseudoenzymes, enzyme promiscuity. Enzyme structure, enzyme specificity, active site, active site mapping. Mechanism of enzyme catalysis. Cofactors, coenzymes, their structures, and roles. Enzyme kinetics, enzyme inhibition and activation. Multienzyme complexes, allosteric enzymes, and their kinetics. Regulation of enzyme activity. Applications of enzymes in chemical and food industry, enzyme immobilization, biosensors, and clinical applications of enzymes. Biotechnological application of enzymes.

Molecular Biology: Historical development of Molecular Biology. Genome organization in prokaryotes and eukaryotes, DNA super coiling, repetitive and non-repetitive DNA, satellite DNA, concept of genes and genome, genome complexity, and genome editing. DNA replication, DNA repair, and DNA recombination. Transcription in prokaryotes and eukaryotes, reverse transcription, RNA processing, RNA interference, siRNAs, miRNAs and other ncRNAs, RNA editing. Genetic code, ribosome structure and function, post translational modifications and protein targeting. Inhibitors of transcription and translation. Regulation of gene expression. Molecular mechanism of mutations. DNA sequencing. Recombinant DNA technology, different types of vectors, genomic and cDNA library, and expression cloning. PCR. In-vitro mutagenesis, site directed mutagenesis. Molecular markers. Macromolecule blotting and probing. DNA and protein arrays.

Techniques & Plant Biochemistry: Chromatographic and electrophoretic methods of separation: Principles and applications of paper, thin layer and HPTLC, gas- liquid chromatography, HPLC and FPLC; paper and gel electrophoresis, different variants of polyacrylamide gel electrophoresis. Spectrophotometry: Principles and applications of UV-Visible, fluorescence, IR and FTIR, Raman, NMR and FTNMR, ESR and X-Ray spectroscopy, mass spectroscopy, atomic absorption spectrophotometry. Microscopy: Principles and applications, light, UV, phase contrast, fluorescence and electron microscopy, flow cytometry. Viscosity and sedimentation-their principles, variants, and applications. Radio tracer techniques in biology: radioactivity counting methods with principles of different types of counters, autoradiography. Imaging techniques: Principles and applications of phosphor imager, MRI, and CT scan. Immunochemical techniques: Production of antibodies, immunoprecipitation, immunoblotting, immunoassays, RIA, and ELISA. Other techniques: Cryopreservation, and FACS. Plant cell organelles and their separation, structure, and functions. Photosynthetic pigments in relation to their functions, photosynthesis, C3, C4 and CAM pathways, photorespiration. Synthesis and transport of sucrose, phloem loading and unloading, sucrose-starch interconversion, biosynthesis of structural carbohydrates, storage proteins and lipids. Biochemistry of nitrogen fixation and nitrate assimilation. Biochemistry of seed germination and development, biochemistry of fruit ripening, phytohormones and their mode of action. Biochemistry and significance of secondary metabolites.

3. Model questions:

- The primary structure of proteins have
 - Peptide bonds
 - Hydrogen bonds
 - Ionic bonds
 - Disulphide bonds
- Different codons that specify the same amino acid are called
 - Degenerate
 - Universal
 - Synonymous
 - None of these
- Visible light has wavelength range of
 - 200-400 nm
 - 400-700 nm
 - 700-900 nm
 - Lesser than 200 nm
- Reversible inhibition of enzyme can be reversed by
 - Filtering the inhibitor from the assay system
 - dialysis
 - centrifugation
 - None of these
- Which one of the following is non-saponifiable lipid?
 - Cholesterol
 - Diglyceride
 - Triglyceride
 - Phosphatidic acid

PET – BASIC SCIENCES

BOTANY

1. Test Structure

- The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- Merit list will be prepared on the basis of:
 - Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - Interview 10%

2. Syllabus

Nomenclature, classical & quantitative methods of taxonomy of plants, structural, biochemical and molecular systematic. Levels of organization of tissues, organs & systems. Comparative anatomy and adaptive modifications, tissue ontogeny in relation to functional specialization, transfer cells. Embryogenesis, polyembryony, parthenogenesis and parthenocarpy; pollen pistil interactions; fertilization, establishment of symmetry in plants; seed formation and germination. Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development.

Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO₂ fixation- C₃, C₄ and CAM pathways, importance of photosynthesis in bioproductivity. Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway. Nitrate and ammonium assimilation; amino acid biosynthesis. Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action; signal transduction in plant cells.

Structure, function and mechanism of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks; vernalization. Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photo-assimilates. Secondary metabolites. Nutrient deficiency and toxicity, N, P and S metabolism. Response of plants to biotic and abiotic (water, temperature, salt, anoxic and radiation) stress, adaptation mechanisms of plants.

Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N, P); primary production and decomposition; structure and function of some Indian ecosystems; terrestrial and aquatic. Agro biodiversity, its missions and concerns; Environmental pollution; global environmental change; biodiversity status; major drivers of biodiversity change; biodiversity management approaches, Environmental monitoring, impact assessment.

Biosynthesis, regulation, metabolism, physiological functions of Phytohormones viz., Auxins, Gibberellic acid, Cytokinins, Abscisic acid, Ethylene, Salicylic acid, Jasmonic acid and Brassinosteroids.

3. Model questions:

- Classification based on chromosome number is
 - Cytotaxonomy
 - Numerical taxonomy
 - Karyotaxonomy
 - Biochemical taxonomy
- The transfer of electrons through cytochrome b₆f complex involves:
 - One cyt b, one quinone oxidation reduction site and two Rieske Fe-S proteins
 - Two cyt b, one cyt c, a Rieske Fe-S protein and two quinone oxidation – reduction sites
 - One cyt c, two Rieske Fe-S proteins and two cyt. B
 - Two cyt.b, one cyt, c, two Rieske Fe-S proteins and one quinone oxidation reduction site
- The internal rotenone-insensitive NADH dehydrogenase in mitochondria works as:
 - Non proton pumping bypass when complex-II is overloaded
 - Non proton pumping bypass when complex-I is overloaded
 - Proton pumping channel when complex-I is unloaded
 - None of these
- A conservation ecologist will study
 - Adaptation of organisms to particular substance
 - Population, community and ecosystem ecology
 - Remote sensing
 - Flow of energy within ecosystem
- The protected areas have been categorized on the basis of GIS by
 - UNEP
 - IUCN
 - SAARC
 - CBD

PET – BASIC SCIENCES

BUSINESS ADMINISTRATION

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling/ Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Research Aptitude and General Awareness: Research methodology, research process, research designs, quantitative and qualitative data, measurement and scaling techniques, questionnaire design, sampling design and procedures, analysis of collected data, hypothesis testing, parametric and non-parametric statistics, factor analysis, cluster analysis and discriminant analysis, report writing. Effective communication, logical and analytical reasoning, data interpretation.

Management: Principles of management and organizational behaviour, development of management thought, organization structure, role of behavioural sciences in organization, organizational development and change. Business Environment: economic, socio-cultural, political & legal and technological environment. Managerial economics, pricing theories, national income concepts, demand theory, theory of production, theory of costs, theories of distribution.

Managerial accounting and control, financial accounting, cost accounting, budget and budgetary control. Financial management, capital budgeting, capital structure and cost of capital, dividend policy, mergers and acquisitions. Marketing management, market segmentation, targeting and positioning, marketing mix, buyer behaviour, marketing potential and forecasting, marketing of services, customer relationship management. Human resource management, recruitment and selection process, training and development, performance appraisal, industrial relations and trade unions.

Production and operations management, production functions, work and job design, facilities planning, product and process selection, facilities location, production planning and control. Strategic management, corporate governance and social responsibility, environmental scanning and industry analysis, strategy formulation, evaluation and control. Management Information System, design and implementation of MIS, Enterprise Resource Planning (ERP). Quantitative and optimization techniques, probability and decision making under risk and uncertainty, optimization models, linear programming, game theory, queuing models.

Project management, formulation of projects, technical and financial feasibility, preparation of feasibility report, implementation of project. Concept and theories of entrepreneurship, entrepreneurship development programmes and role of various institutions in developing entrepreneurship.

3. Model Questions:

1. One of the essential characteristics of research is:
 - (A) Replicability
 - (B) Generalizability
 - (C) Usability
 - (D) Objectivity
2. ICT stands for
 - (A) Information common technology
 - (B) Information and communication technology
 - (C) Information and computer technology
 - (D) Inter connected technology
3. What is the basis of monopolistic competition?
 - (A) Product differentiation
 - (B) Agreement among producers
 - (C) Cost of production
 - (D) None of these
4. Out of the following, which one is a source of internal recruitment?
 - (A) Casual Caller
 - (B) Hiring agency
 - (C) Promotion
 - (D) Campus placement
5. Which one of the following is a sales promotion method?
 - (A) Advertising
 - (B) Discount offers
 - (C) Word of mouth
 - (D) Publicity

PET-BASIC SCIENCES

CHEMISTRY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Physical Chemistry: Free energy, entropy and laws of thermodynamics. Partial molar properties. Thermodynamics of ideal and real gases. Thermodynamics of living systems; Concept of flux and gradient, Phenomenological equations, Coupled reactions. Activity, activity coefficients of electrolytes and their determination. Transport number. Ionic equilibrium. Debye-Huckel theory; Debye-Onsager theory of conductance. Theories of electrical double layer. Overvoltage potential, Derivation of Butler-Volmer equation, Tafel Plot. Electrocatalysis. Electrokinetic processes. Electrochemical series and reference electrodes. Polarography; half wave potential and its significance. Introduction to Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics.

Techniques and Spectroscopy: Types of chromatography; Methods of extraction of organic compounds; Principles of commonly used Instruments; Application of UV, FT-IR, Nuclear Magnetic Resonance spectroscopy NMR (^1H , ^{13}C) and Mass spectrometry for structural Elucidation. GC-MS and LC-MS Techniques; rotational spectroscopy, Raman Spectroscopy; Laser Raman Spectroscopy, Mössbauer spectroscopy. Organic Chemistry: Heterocyclic Chemistry, Stereochemistry and conformational analysis; Chirality; Asymmetric synthesis; Selective organic transformations – chemoselectivity, regioselectivity, stereoselectivity, enantioselectivity. Protecting groups. Pericyclic reactions. $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$, E_1 and E_2 , Addition reactions. Molecular rearrangements. Photochemistry. modern name reactions and reagents.

Agrochemicals and Natural Products: Some important terms used in study of agrochemicals; Synthesis, mode of action, metabolism and structure activity relationship of some common pesticides like insecticides and fungicides. Isolation, structure elucidation, synthesis of common terpenes, steroids, alkaloids and flavonoids.

Inorganic Chemistry: Application of Valence bond, Molecular orbital and VSEPR theories; Group theory. Bioinorganic Chemistry ; Photosynthesis; Metalloenzymes; Natural oxygen carriers; Nitrogen fixation, Role of metal ions in Biological systems. Hard and soft acids and bases. Supramolecular chemistry.

3. Model Questions:

- H_2 gas is not liberated when the following metal is added to dilute HCl:
(A) Mg (C) Ag
(B) Sn (D) Zn
- Which is a Supramolecule?
(A) 18-Crown 6 (C) Chlorophyll
(B) Haemoglobin (D) Both (B) and (C)
- Which of the following is not an electrophile?
(A) CH_4 (C) Br^+
(B) SO_3 (D) BF_3
- How many signals in the NMR spectrum are expected from the compound with structure $\text{CH}_3\text{-O-CH}_2\text{-CH}_3$?
(A) 3 (C) 5
(B) 4 (D) 8
- Which of the following is not an insecticide?
(A) Warfarin (C) Methyl parathion
(B) Endosulfan (D) Triazofos

PET – BASIC SCIENCES

MICROBIOLOGY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Historical developments of Microbiology. Sterilization, isolation, identification, maintenance, preservation of microorganisms and their common techniques used in microbiology. Systematic position of microorganisms. Prokaryotic and Eukaryotic microorganisms. Brief discussion on fungi, algae and protozoa. Nutrition and growth in bacteria. Biology of viruses. Microbial ecology. Immune response and immunization. Important human diseases.

Microbial growth, Cell membrane structure, permeability and mechanism of nutrient transport. Bacterial endospores. Bioenergetics. Microbial metabolism.

Nature of genetic material in cellular and acellular microorganisms. Microbial mutations. Transformation, Transduction, Conjugation, Bacterial plasmids. Recombinant DNA technology and its application. Strain improvement.

Concept of industrial fermentations. Microbial production of ethanol, beer and wine, enzymes, growth factors and vitamins (B2 and B12). Production of antibiotics. Food preservation, Fermented foods. Single Cell Protein. Food infections and food poisoning.

Plant growth regulators and phytotoxin production by microorganisms. Biofertilizers. Waste treatment and disposal. Cultivation technology of mushrooms. Role of microorganisms in biogeochemical cycles. Microbial transformation of phosphorus, iron, sulfur and micronutrients in soil concept of Rhizosphere. Microbial interferences and extramicrobial relationships. Biodegradation of pesticides and agrochemicals.

3. Model Questions:

- Recombinant DNA is:
(A) A type of DNA in bacteria
(B) The study of how genes work
(C) The DNA resulting when DNA of two different organisms are manipulated to produce hybrid DNA
(D) The use of bacteria in the production of foods
- Which of the following is not distinguishing characteristic of prokaryotic cells?
(A) They have a single, circular chromosome
(B) They lack membrane enclosed organelles
(C) They have cell walls containing peptidoglycan
(D) They lack a plasma membrane
- Which of the following reactions produces the maximum number of molecules of ATP during aerobic metabolism?
(A) Glucose \longrightarrow Glucose-6-P
(B) Phosphoenolpyruvic acid \longrightarrow Pyruvic acid
(C) Glucose \longrightarrow Pyruvic acid
(D) Acetyl CoA \longrightarrow CO₂ + H₂O
- Isolation of *E.coli* from a stool sample is diagnostic proof that the patient has:
(A) Cholera
(B) *E. coli* gastroenteritis
(C) Salmonellosis
(D) Typhoid fever
- Which of the following reactions is undesirable in wine making?
(A) Sucrose \longrightarrow Ethanol
(B) Ethanol \longrightarrow Acetic acid
(B) Malic acid \longrightarrow Lactic acid
(D) Glucose \longrightarrow Pyruvic acid

PET – BASIC SCIENCES

ZOOLOGY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Evolution and Taxonomy: Evolution, Mendelian laws of inheritance, gene-chromosomal organization, genetic code and gene expression, mutations and recombination. Faunal diversity, nomenclature, classical and quantitative methods of taxonomy.

Cell Biology: Organization and functions of cell membrane and intracellular organelles. Cell division and cell cycle, cell communication and cell signalling.

Anatomy, Physiology and Development: Structural and functional anatomy of different systems of vertebrates and invertebrates. Basic concepts of development, gametes, fertilization, cleavage, early development, differentiation, morphogenesis and organogenesis.

Ecology and Animal Behaviour: Ecological principles, concept of habitat and niche, ecotones, energy flow in ecosystem, food chain, food webs, population and community ecology, ecological succession, environmental pollution. Behaviour, biological rhythms, mimicry, dispersal and migration. Wildlife management and conservation.

Human Welfare: Important organisms in human health and agriculture. Innate and adaptive immune system vaccines and vaccination.

3. Model questions

1. Different concentrations of Na^+ , K^+ and organic molecules during resting potential are maintained by an interplay of factor(s):
 - (A) Electrical attractions and repulsions
 - (B) Active transport across the cell membrane
 - (C) Selective permeability of the axon membrane
 - (D) All of these
2. Receptors which transduce sound, touch and pressure are the:
 - (A) Mechanoreceptors
 - (B) Chemoreceptors
 - (C) Thermoreceptors
 - (D) Electromagnetic receptors
3. The inner ear and eye lens are formed from:
 - (A) Mesoderm
 - (B) Ectoderm
 - (C) Endoderm
 - (D) Dorsal mesoderm
4. Carrying capacity of a population is determined by its:
 - (A) Birth rate
 - (B) Death rate
 - (C) Resource limit
 - (D) Growth rate
5. A modification of behaviour towards a stimulus is called:
 - (A) Inherited
 - (B) Learned
 - (C) Intrinsic
 - (D) Innate

PET – AGRICULTURE

AGRICULTURAL ECONOMICS

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling/Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Theory of consumer behavior, Theory of the firm. Theory of production. Costs. Forms of markets. Factor pricing, General equilibrium and welfare economics. National income accounting. Consumption function. Investment and savings. Output and employment, Inflation and deflation, Monetary and fiscal policy, Central banking. Business cycles. Theories of International Trade & WTO, Theories and models of economic growth. Basic Econometrics and statistics, Linear and non-linear economic models, Ordinary least squares, Maximum likelihood estimation, dummy variable regression models. Multicollinearity, heteroscedasticity and autocorrelation. Principal component analysis. Linear programming, Simplex method, Extension of linear programming models, Game theory. Agricultural production functions, Factors of production, Economies and diseconomies of scale, Agricultural marketing, Market intermediaries, Marketing efficiency. Vertical and horizontal integration, Marketing co-operatives direct marketing, Contract farming and retailing. Supply chain management, Market infrastructure. Agricultural price policy. Commodities markets and future trading, hedging. Market intelligence, agricultural price analysis, spatial, temporal price analysis. Agricultural finance. Financial institutions, Preparation of financial statements. Identification, preparation, appraisal, financing and implementation of projects. Project appraisal techniques. Classification and problems of natural resource economics, Externalities, Market failures. Research in social sciences, Types of research. Research prioritization, Research process. Sampling design, Sampling error and methods of sampling. Research design and techniques. Types of data collection tools. Scaling techniques. Coding, Editing, Tabulation and Validation of data. Statistical package for social sciences. Interpretation of results and report writing.

3. Model Questions

- 1. Fiscal Policy is connected with:
 - (A) Issue of currency
 - (B) Exports and imports
 - (C) Public revenue and expenditure
 - (D) None of these
- 2. A firm is in equilibrium if:
 - (A) $MR < MC$
 - (B) $MR = MC$
 - (C) $MR > MC$
 - (D) None of these
- 3. In classical production function, rational zone is always:
 - (A) First zone
 - (B) Third zone
 - (C) Second zone
 - (D) None of these
- 4. World trade organization (WTO) came into existence on:
 - (A) 1st January 1948
 - (B) 1st January 1995
 - (C) 30th October 1947
 - (D) 15th April 1994
- 5. Which of the following is not a type of non-probability sampling?
 - (A) Snowball sampling
 - (B) Stratified random sampling
 - (C) Quota sampling
 - (D) Convenience sampling

PET-AGRICULTURE SOCIOLOGY

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas **1/4 mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Origin, nature, scope and importance of rural sociology. Basic concepts of rural sociology. Rural social structure. Rural-Urban continuum. Rural family. Rural economy. Caste system. Jajmani system. Panchayati raj institution. Religion. Diffusion of innovations. Rural development programmes. Rural social problems, indebtedness, poverty, declining sex ratio, dowry and labour shortage. Social and cultural change, Factors of social change, demographic, economic, technological and legislative. Processes of social change, sanskritization and de-sanskritization, westernization, secularization, industrialization, urbanization, modernization and globalization. Theories of social change, cyclic theories, ancient theories and evolutionary theories. Sociological theories: Functionalism, Conflict theory, Symbolic interactionism, Phenomenology and Ethno-methodology. Scientific research, Characteristics, types and methods. Concept, construct and variables. Hypothesis, Logic of enquiry. Research design, Sampling, Data collection: Observation, Interview, Case study, Questionnaire and Interview schedule. Data processing: coding, tabulation and diagrammatic presentation. Statistical analysis: Measures of Central tendencies, Dispersions and Associations. Scaling techniques. Report writing.

3. Model questions

1. Which of the following is not rural social problem?
 - (A) Slums
 - (B) Drug addiction
 - (C) Declining sex ratio
 - (D) Poverty
2. Who said that mode of production determines culture?
 - (A) Karl marx
 - (B) Hegel
 - (C) Lundberg
 - (D) Maciver
3. What ended the feudal culture?
 - (A) Growth of International commerce
 - (B) Discovery of sea routes
 - (C) Wars
 - (D) All of these
4. Herbert Spencer's contribution to sociology is:
 - (A) Cultural evolution
 - (B) Organic analogy
 - (C) Social contract
 - (D) Neo-positivism
5. Tentative generalization the validity of which is yet to be tested is called:
 - (A) Proposition
 - (B) Hypothesis
 - (C) Scientific report
 - (D) Synopsis

PET - COMMUNITY SCIENCE

APPAREL & TEXTILE SCIENCE

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Polymerization. Structure of textile fibers, molecular bonding, length, orientation and requirements of fiber forming substances. Structure- property relations of the fibers- repeating units, bonds, reactive groups and reactions of natural, synthetic, spandex and minor fibers. Action of heat, light, bleach and microorganisms on different fibers. Commercial processes of fibers. Types and characteristics of bi- component and bi-constituent fibers. New fibers. Blending of fibers. Importance of textile testing, standardization and quality control. Functions of BIS and other standards. Effect of moisture and humidity on properties of textiles. Standard conditions of textile testing. Testing of various textile properties and assessment of other safety aspects in textiles. Water permeability, water repellency, wicking, dimensional stability, comfort and fabric handle measurement. Fabric defects. Quality control in spreading, cutting and bundling of products. Draping, trueing and surplice. Custom Clothing. Fitting problems related to wrinkles/ creases and pulls of fabric and their remedial measures. Origin of clothing, use of clothing among primitive people. Theories of clothing. Clothing symbolism in relation to customs, traditions, cultural contacts, status, education and role of legislation. Understanding the consumer demand. Consumer resources. Individual differences in consumer behavior. Psychological processes involved in selection of textiles and apparel products. Consumer decision processes and behavior. Consumer analysis and marketing strategies. Market segmentation. Innovation. Counterfeit textiles and consumer protection measures. Global consumer markets. Status of textile and apparel industry in India- cotton, silk, wool, rayon, jute, handloom, hosiery and apparel industry. Government policies on textiles and clothing. Textile Research Associations and Export Promotion Councils. Apparel Parks, Globalization, TUFFS, ISO 9000 and 14000 standards, SWOT Analysis.

3. Model Questions

- Static electricity is built up in:
(A) Hydrophobic
(B) Highly Reactive
(C) Hydrophilic
(D) Coarse
- Maximum number of jute mills are found in:
(A) Rajasthan
(B) West Bengal
(C) Uttar Pradesh
(D) Punjab
- Bow and skew defects are:
(A) Fabric
(B) Yarn
(C) Fibre
(D) None of these
- Following is not a direct system of yarn numbering:
(A) Cotton Count
(B) Metric Count
(C) Denier
(D) Tex
- The coherence of polymer system is not due to:
(A) Vander Waals' forces
(B) Hydroxyl group
(C) Salt linkage
(D) Cross links

PET - COMMUNITY SCIENCE

RESOURCE MANAGEMENT & CONSUMER SCIENCE

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Significance and scope of resource management. Management process. Leadership, motivation, organization, supervision and communication. Housing problems. Role of government and non-government organizations in providing and regulating housing needs. Emerging techniques in the house construction. Low-cost building materials and fabrication techniques. Trends in thermal, acoustics and safety mechanisms. Role and importance of consumer in economy. Buying behavior: types and factors. Savings, investments and taxes. Man, Machine and Environment system interactions. Anthropometric measurements and their application. Work postures, postural variations and discomfort. Fatigue. Environmental parameters. Green building design evaluation systems – GRIHA and LEED. ECBC by BEE. Green Building Council of India. Green strategies. Colour and lighting in interiors. Colour systems/theories. Colour – properties, harmony, mixing, schemes and colour interactions. Psychological effects of colour. Types of lighting and its effects. Lighting economy. Consumer education. Rights and responsibilities of consumer. Consumer cooperatives. Consumer organizations. Role of voluntary organizations for consumer protection. Consumer Protection Act, 1986.

3. Model Questions

- 1. When two identical houses are attached by a common entrance and staircase, it is called:
 - (A) Semi-detached house
 - (B) Apartment
 - (C) Detached house
 - (D) Terrace housing
- 2. The diastolic pressure of healthy human being is:
 - (A) 40 mm Hg
 - (B) 80 mm Hg
 - (C) 120 mm Hg
 - (D) 160 mm Hg
- 3. According to Munsell's colour system, 5Y 8/12 means:
 - (A) Less pure yellow, light and bright
 - (B) Pure yellow, dark and bright
 - (C) Pure yellow, light and dull
 - (D) Pure yellow, light and bright
- 4. The father of scientific management is:
 - (A) C. Babbage
 - (B) Chris Argyris
 - (C) C. Mayo
 - (D) Fredric W. Taylor
- 5. Patent is a contract between:
 - (A) Inventor and consumer
 - (B) Inventor, consumer and government
 - (C) Consumer and government
 - (D) Inventor and government

PET - COMMUNITY SCIENCE

FOOD & NUTRITION

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
- | | |
|--|--------------------------------|
| i) Performance in the Entrance Examination | 80% (60% MCQ + 20% subjective) |
| ii) Master's Research by Thesis & Quality of Thesis
(no marks permissible for any project report) | 10% |
| iii) Interview | 10% |

2. Syllabus

Nutritional requirements and dietary allowances. Factors affecting requirements. Recommended allowances and estimated average requirements of energy, protein, fat, minerals and vitamins for different age and activity groups. Classification, functions, sources, digestion and absorption of carbohydrates, proteins, lipids, essential fatty acids, minerals and vitamins. Composition, functions and role of dietary fibre in various physiological disorders. Methods of assessing protein quality. Deficiency and toxicity of vitamins and minerals. Inter-relationship between vitamins, minerals and hormones. Water and electrolyte balance in human body. Calculations used in preparation of various standard solutions. Sample and sampling techniques. Principles, techniques and applications of colorimeter, spectrophotometer, atomic absorption spectrophotometer, fluorimetry, flame photometry, electrophoresis and chromatography. Introduction to animal assay. Assessment of the nutritional status at individual, household and institutional level using direct and indirect methods. Major nutritional problems of the state, nation and world. Prevalence, etiology, biochemical and metabolic changes in PEM, vitamin A deficiency, iron deficiency anemia and IDD. National nutrition programmes and policies. Nutritional surveillance. Body composition in different physiological conditions and factors affecting it. Importance and factors influencing energy metabolism and physical fitness. Techniques to measure energy expenditure and energy intake. Techniques to assess physical fitness. Aging theories, physiology, mechanism and role of nutrients in arresting aging process. Classification of immunity and immunological responses. Regulation of immunity. Role of carbohydrates, fats, proteins, minerals and vitamins on immune system. Factors affecting acquired immunity. Role of immunization. Effect of probiotics, prebiotics and antioxidants on immune function. Interaction between nutrients, infections and drugs.

3. Model Questions:

1. Vitamin A deficiency leads to:
- | | |
|--------------------|-------------------|
| (A) Osteomalacia | (B) Keratomalacia |
| (C) Encephalopathy | (D) Neuropathy |
2. Iodine is an important part of:
- | | |
|----------------|----------------|
| (A) Thyroxine | (B) Thiamine |
| (C) Tocopherol | (D) Polyphenol |
3. Substance used for primary standards must have high:
- | | |
|----------------------|-----------------------|
| (A) Atomic weight | (B) Equivalent weight |
| (C) Molecular weight | (D) Molar ratio |
4. Immunoglobins present during allergies:
- | | |
|---------|---------|
| (A) IgE | (B) IgG |
| (C) IgM | (D) IgA |
5. Low weight for height is known as:
- | | |
|---------------------|--------------------|
| (A) Under nutrition | (B) Stunting |
| (C) Wasting | (D) Over nutrition |

PET - COMMUNITY SCIENCE

EXTENSION EDUCATION & COMMUNICATION MANAGEMENT

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas **1/4 mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Indian extension systems: ICAR extension systems, Comparative analysis of extension system of India with USA, UK, Israel, China and Philippines; Privatization of extension services - introduction, scope, advantages, limitations; Information communication technology - components of ICT, role of ICT in community education; Knowledge management and archiving; Networks, Social Media - advantages and limitations, Multimedia - concept, evolution and components; Web and blog designing: Hosting; introduction of HTML and basic tags and HTML document structure; Transfer of Technology; Models of technology transfer, Technological change, Technology life cycle; Technology transformation, Technology assessment and refinement. Technology assessment process; Technology adoption, diffusion and absorption; Communication skills - verbal, non-verbal and written communication; Types of corporate and business communication skills; Hard and soft skills; Fora of scientific writing - conference, seminar, symposium, workshop and colloquia; Writing for scientific journals and their ratings; NAAS rating; Impact factor and h-index; Public speaking; Types and structuring of the speech; Effective delivery - voice modulation, appearance during speeches and delivery; Platform performance - posture, gesture, eye contact, emphasis, pause, voice pitch, overcoming fear and anxiety of public speaking; Listening styles - active & passive and direct & indirect listening; Educational technology; Instructional design models, Curriculum design and development; Lesson planning; Maxims of teaching - stages, forms and levels of teaching and learning; Vocationalization of education; Innovative instructional aids - web instruction, e-learning, virtual laboratories; Natural and manmade causes of climate change; Global warming effect and causes; Impacts of climate change on biodiversity - wetland, forest, agriculture, transportation, coastal area, water resources; Global, National and regional impacts; Vulnerability assessment; Climate modeling; Climate change communication; National international advocacy groups and organisations for global climate action; Gender sensitization; Gender and empowerment; Gender perspectives in development of women - roles, responsibilities, access and control over resources, constraints and opportunities; Gender budgeting and gender analysis framework - context, activities, resources and programme action profile; Concept of GDI, GEM, GSI; National and regional indicators.

3. Model Questions

- 1. In which country, the first 4-H Clubs were started?
 - (A) USA
 - (B) UK
 - (C) Australia
 - (D) India
- 2. Technology transfer is:
 - (A) Process oriented
 - (B) Purpose oriented
 - (C) Technology oriented
 - (D) Commercial oriented
- 3. Which of the following activities contributed maximum to global warming:
 - (A) Industrial process
 - (B) Deforestation
 - (C) Agriculture
 - (D) Fossil fuel combustion
- 4. Making children aware of their gender through passage of social and cultural value system is called:
 - (A) Gendering
 - (B) Engendering
 - (C) Rendering
 - (D) Transcendence
- 5. Job related skills necessary to complete work are known as:
 - (A) Soft skills
 - (B) Hard skills
 - (C) Life skills
 - (D) Managerial skills

PET - COMMUNITY SCIENCE

HUMAN DEVELOPMENT & FAMILY STUDIES

1. Test Structure

- (a) The question booklet will have two parts: **Part-A** and **Part-B** to be attempted in 3 hours. Weightage for Part-A and Part-B will be 60% and 20%, respectively.
- (b) Part-A will carry 150 multiple choice questions (MCQs) to be attempted on the OMR sheet. Each correct answer will **carry one mark** whereas 1/4 **mark** will be **deducted** for every wrong answer.
- (c) Part-B will contain two subjective type questions to be attempted in the space provided along with the questions in the question booklet.
- (d) Minimum 20% marks are required in the Entrance Test to be called for Counselling / Interview in Part-A and Part-B, individually.
- (e) Merit list will be prepared on the basis of:
 - i) Performance in the Entrance Examination 80% (60% MCQ + 20% subjective)
 - ii) Master's Research by Thesis & Quality of Thesis 10%
(no marks permissible for any project report)
 - iii) Interview 10%

2. Syllabus

Theories of Human Development: Psychoanalytic Theory of Sigmund Freud, Psycho-Social Theory of Erikson, Stimulus Response Theories, Piaget's Theory of Cognitive Development, Moral Development Theory of Kohlberg and Piaget, Bronfenbrenner's Ecological Systems Theory, Attachment Theory of Bowlby and Ainsworth. Chomsky's Language Development Theory, Socio-Cultural Theory by Vygotsky. Life Span Development: Physical and psycho-motor development, brain development, perceptual development, cognition and metacognition, models of intelligence, culture and its impact, emotional maturity, stability and catharsis, vulnerability and resilience, seminal work of Margaret Mead, design and field work of "Six Cultures Project". Methods and Techniques of Assessment in Human Development : Anthropometry, sociometry, psychometry, psychological tests, projective techniques, reliability and validity, individual and group test. Human Development Index-Gender Issues and Family Relations: concept of gender, gender theories - Gender orientation theory of Sandra Bem, gender schema theory, theory of ego development and gender, family solidarity and values, demographic challenges to family ecology. Innovative pedagogical approaches in childhood development and education, Current innovative early childhood development education programmes at state, national and international development.

3. Model Questions

1. Which of the following works on reality principle?
(A) The Id (B) The Ego
(C) The Superego (D) Instincts
2. Metacognitive knowledge refers to acquired knowledge about:
(A) Social processes (B) Physiological processes
(C) Cognitive processes (D) Emotional processes
3. The macro system layer in the child's environment comprises of:
(A) Family (B) Friends
(C) School and health services (D) Customs and cultural values
4. The part of the brain specialized in Language processing:
(A) Corpus callosum (B) Right hemisphere
(C) Left hemisphere (D) Cortex
5. Which out of these is a client-centered counselling technique used:
(A) Directive Counselling (B) Electric Counselling
(C) Non-Directive Counselling (D) All of these