

Syllabus for Entrance of Master of Business Administration (MBA)

S.No	Type of questions	No. of questions	Maximum Marks
1.	Quantitative Techniques and Data Interpretation	25	25
2.	Logical Reasoning	25	25
3.	English Language Comprehension	25	25
4.	General Awareness	25	25
Total		100	100

Quantitative Techniques and Data Interpretation:

Arithmetic: Time and Work, Percentages, Simple Interest and Compound Interest, Averages, Speed, Time, and Distance, Ratios and Proportion, Profit, Loss, and Discount Unitary Method

Algebra: Logarithms, Progression, Linear Equations and Quadratic Equations

Number System: HCF and LCM, Indices and surds, Divisibility Rules, Remainders and Last Digit

Modern Math: Set Theory, Permutation and Combination, Probability

Geometry and Mensuration: Mensuration Lines and Angles, Triangles, Circles, Polygons and Trigonometry

Logical Reasoning:

Analytical Reasoning: Linear Arrangements, Circular Arrangements, Matrix Arrangements Blood Relationship, Coding and decoding, Numerical puzzles, Number and Alphabet Series, Direction and Distance, Analogy, Order and Ranking, Tables - Pie Charts - Bar Graphs

Verbal Reasoning: Syllogism, Course of Action, Inference, Statement Assumptions, Statements and Conclusion, Statements and Arguments, Cause and Effects, Strong and Weak arguments

Non-Verbal Reasoning: Visual Reasoning

English Language Comprehension

Synonyms and Antonyms , One-word substitution , Reading Comprehension , Idioms and phrases, Grammar/Vocabulary based fill in the blanks, Sentence correction, Error Spotting, Para jumbles, English usage errors, Para Completion - Statements & Assumptions

General Awareness:

Current Affairs of National and International Business & Economy, Geography, Politics, Culture, History, Sports News, Trade Awareness, Personalities in News, Indian Constitution.

AGRI. ENGINEERING

UNIT-I Agriculture: Importance of Agriculture/Forestry/Livestock in national economy. Basic principles of crop production. Major diseases and pests of crops. Elementary principles of economics and agri-extension. Important rural development programmes in India. Organizational set up of Agricultural research, education and extension in India. **(5 QUESTIONS)**

UNIT II Elementary Statistics and theory of probability, differential and integral calculus, linear algebra and Fourier series, differential equations, vector algebra & vector calculus, elementary numerical analysis. **(5 QUESTIONS)**

UNIT-III: Electric motors: Types, performance, selection, installation and maintenance, measuring instruments, fundamentals of computers, power distribution. **(5 QUESTIONS)**

UNIT-IV: Thermodynamic principles; fluid mechanics, theory of machines. **(5 QUESTIONS)**

UNIT-V: Soil mechanics, soil classification, compaction & shear strength of soils, engineering mechanics, strength of materials. **(10 QUESTIONS)**

UNIT-VI: Importance of farm equipment and role of mechanization in enhancing productivity & profitability of Indian agriculture; analysis of forces, design and production of farm machinery and power units; mechanics of tillage & traction operation, repair and maintenance of farm machines and equipment, farm engines; tractors and power tillers; tractor stability and operators comfort; field capacity and cost analysis; test codes and procedure; safety and ergonomic principles. Role of energy in economic development; solar, wind and bio-energy; biogas plants & gasifiers; biofuels from biomass; collection, characterization and storage of biomass, solar cookers & solar refrigerators. **(25 QUESTIONS)**

UNIT-VII:- Biochemical and engineering properties of biological materials; quality control & safety of raw and finished products. Principles, practices and equipments for drying, milling, separation and storage of agricultural produce and by-products; material handling equipment and operations; farmstead planning; heating & cooling load calculation; seed processing practices and equipments; food preservation methods and products development; refrigeration and air conditioning; cold stores; waste management, cost analysis & food processing plants layout, feasibility reports. **(25 QUESTIONS)**

UNIT-VIII: Surveying and leveling; hydrology, water resources in India; efficiency in water use; irrigation system and equipment; water conveyances and associated efficiency; soil-plant-water relationship; estimation of evaporation and water requirements of crop; water harvesting and use, farm ponds and reservoirs, command area development, land use capability classification, ground water development, wells and pumping equipment, soil erosion and its control, land shaping and grading equipment and practices, hydraulic structures, drainage of irrigated and humid areas; salt balance and reclamation of saline and alkali soils. **(20 QUESTIONS)**

Agriculture and Horticulture

Total marks = 100

AGRONOMY (15 Questions)

Agricultural heritage: Development of human culture, Revolutions in agriculture, Importance of Agriculture in national and global perspective; Basic principles of crop production: Tillage, crop establishment and planting geometry and their effect on crop growth and yield, Principle of nutrient and water management. Roles of essential plant nutrients, deficiency symptoms and their management. Principles of weed management: Classification, biology and ecology of weeds, crop weed competition and allelopathy, concepts and methods of weed control, Integrated weed management, Classification, formulations, selectivity and resistance of herbicides, Application methods and equipments. Modern concepts in crop production: Organic farming, Precision farming, Conservation agriculture, Crop diversification, Integrated farming systems, Nanotechnology (definition, concepts and techniques), Principles of crop ecology and crop adaptation. Agronomy of major field crops: Origin, distribution, economic importance, soil and climatic requirements and agro-techniques of major field crops (Rice, wheat, maize, rajmash, rapeseed and mustard, Moong bean)

Agricultural meteorology: Agro-climatic and Agro-ecological zones of India, Elements of weather & climate, Earth's atmosphere, Solar radiation, atmospheric temperature, and humidity. Climate change, greenhouse effect and global warming. Climate resilient crops. Weather forecasting, Rainfed agriculture: Problems and prospects, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management.

Horticulture (15 Questions)

Importance and scope of horticulture crops in human nutrition and national economy, Classification of Horticulture crops. Climate and soil for Horticultural crops. Propagation and nursery management of Horticultural crops. Nutrient, weed, water and pest management of Horticultural crops. Protected cultivation. Precision farming. Organic farming and integrated nutrient management for sustainable horticulture. Importance of plant bioregulators in horticulture. Effects of environmental factors on crop growth and development.

Production technology of Fruit crops; Mango, Banana, Citrus, Grapes, apple, pear, peach, Vegetable crops: Tomato Brinjal, Kale Chillies, Capsicum, Knol Khol, Turnip, Carrot, Radish, and ornamentals: Rose, Carnation, Gerbera, Orchids, Chrysanthemum, China Aster, Tulip, Liliun, Tuberoase, Dahlia, Gladiolus and Jasmine.

Breeding methods for Horticulture crop improvement. Establishment and maintenance of lawns, trees, shrubs, creepers, climbers, hedges and annuals. Maturity and ripening process and maturity indices Physiological and biochemical changes – hardening and delaying ripening process; Post harvest treatments of horticultural crops, physiological disorders. Preharvest treatments; Precooling; Pre-storage treatments; Different systems of storage. Grading, packing and preservation methods. Marketing of horticulture produce.

Entomology (8 Questions)

Importance of Class Insecta; Comparative account of external morphology. Structure, Function of cuticle and Moulting and Body Segmentation. Types of-insect mouth parts, Insect Antennae, Insect Legs, Insect Wings, Insect Genitalia.

Anatomy of Digestive System, Circulatory System, Sensory System, Respiratory System, Excretory System, Glandular System, Nervous System, Reproductive system, Types of reproduction. Post embryonic development & eclosion. Metamorphosis Classification of insects up to orders, sub orders and families of economic importance and their distinguished characters. Economic classification of insects. Pest Survey and Surveillance, Pest Forecasting.

Beneficial insects like honey bee, Lac insect, Silk worm. Pollination, Types of insect pollinators. Toxicology- insecticide residue problems, Maximum Residue Limits (MRL) values, Insecticide classification, Insecticide resistance management, Insect protective transgenic crops. Important insect pest of Agricultural and Horticultural crops- Helicoverpa armigera, White grubs, Aphids, White flies, Fruit flies, Cutworm, Plant mites.

PLANT PATHOLOGY (8 Questions)

History of Plant Pathology, Concept of Plant Diseases, Biotic and Abiotic Causes of Plant Diseases, Characteristics and Classification of Biotic Causes of Plant Diseases, Pathogenesis, Symptomatology, Defense Mechanism in Plants, Host Pathogen Interaction, Plant Disease Epidemiology and Forecasting, Principles and Methods of Plant Diseases Management, Integrated Disease Management.

AGRICULTURAL ECONOMICS (8 Questions)

Economics: Definition, Scope, branches of economic analysis, Inductive & deductive approaches, Role of economic liberalization in agriculture. Importance of agriculture in Indian economy. **Macro-economics:** Concept, National income accounting. Money and banking, Pricing of factors of production, inflation. **Micro-economics:** Theory of consumer behaviour, theory of demand, elasticity of demand, indifference curve analysis, theory of firm, cost curves, theory of supply, price determination. **Markets & Marketing:** Concept, classification of markets, Market functions and institutions, Agricultural marketing—role, practice, institutions, problems and reforms, Market structures & price formation in monopoly and perfect market structure. **Agricultural cooperatives:** Cooperatives movement in India, principles and role of agricultural cooperatives. Structure of cooperative credit. **Finance:** History of financing agriculture in India, Agricultural finance: definition, needs & classification. Cooperatives credit, Credit institutions: Commercial banks, nationalization of commercial banks. Lead bank scheme, regional rural banks, scale of finance. Higher financing agencies, RBI, NABARD, AFC, Asian Development Bank, World Bank, Classification of credit, Credit analysis: 4R's, 5C's and 7 P's of credit, crop insurance.

Farm management: Typical decisions and principles of farm management. Farm business & Efficiency measures. Records and business accounting. Farm planning & Budgeting. Factor-factor, factor-product and product-product relationships. Concept of farming system and farm business, agribusiness institutions & entrepreneurship development in India.

EXTENSION EDUCATION (6 Questions)

Extension Education- Concept, Meaning, Objective, Principles, Philosophy, Functions, Scope, importance and the Extension educational Process. Teaching Learning Process: An effective learning Situation, Criteria for effective teaching & Learning, Principles of learning, Steps in Extension Teaching. Communication Process- Meaning, Concept, Models of Communication, Elements of Communication System, Types of Communication, Extension teaching methods- Classification of Communication Methods, Selection and combination of extension methods. Barriers in communication & feedback. Communication Skills for Transfer of Technology. Audiovisual aids classification. Cyber extension- internet, Kisan Call Centers, teleconferencing, agriculture journalism. Extension Programme Planning -the concept of need, steps and principles of programme planning, Monitoring and Evaluation. Adoption and Diffusion of Innovations: Diffusion and adoption processes, Adopter categories. Capacity building of extension personnel and farmers training to farmers, women and rural youth. Role of mass media in diffusion of agricultural technology. Rural development- meaning, importance and problems; Rural development programmes in India- Pre-independence era to recent ones.

Problems in the management of extension programmes. Rural Sociology- Concept of sociology, Society, social stratification, Social groups, types of groups, social organization, social change and Rural leadership. Role and qualities of a good extension worker. Major organizational streams of extension in India-First Line Extension System.

GENETICS AND PLANT BREEDING (6 Questions)

Structure and function of cell organelles Mendelian inheritance. Cell division and cell cycle. Chromosome structure and function. Gene concept, organization, replication and function of genetic material. Gene frequency and Hardy Weinberg equilibrium. Quantitative inheritance. Heritability and response to selection. History and achievements of plant breeding. Germplasm resources their origin, conservation and utilization. Male sterility, self-incompatibility, mutation and polyploidy in plant breeding. Heterosis and its exploitation. Breeding methods in self-pollinated (pure line and massselection, pedigree, bulk, SSD and backcross method); Cross pollinated (population improvement methods, recurrent selection techniques) and vegetatively propagated crops. Combining ability analysis. Introduction to seed technology and hybrid seed production.

SOIL SCIENCE (6 Questions)

Introduction to Soil: Soil as a medium for plant growth, Composition of Earth's crust, weathering of rocks and minerals, Soil profile. Soil Physical Properties: Soil texture, Density, Porosity, soil structure, Soil air, Soil temperature, and Soil water their descriptions, Factors affecting, Importance for plant growth. Soil Colloids: Properties of soil colloids, Structure of silicate clay minerals, Sources of electrical charges, Properties of clay minerals, Cation and anion exchange capacity, Buffering capacity of soils. Problem Soils: Acid, saline, sodic, and acid sulphate soils, Characteristics, formation, problems, and management. Essential Plant Nutrients: Criteria of essentiality, Functions for plant growth, Mechanisms for movement and uptake of ions in soils and plants, Forms of nutrients in soils, Deficiency symptoms, Luxury consumption, Nutrient interactions and chelation. Soil Classifications: Diagnostic surface and sub-surface horizons, Soil survey - types, objectives, uses, Land capability classification. Soil Fertility: Evaluation methods and management for plant growth, Soil testing and fertilizer recommendations. Soil Biology: Classifications of soil microorganisms and their role in nitrogen fixation, phosphate mobilization, decomposition, C:N ratio, mineralization, and immobilization processes, Humus and its role in soil quality Fertilizers and Manures: Classifications, NPK fertilizers and their reactions in soils, Green manuring, recycling of organic wastes, composting

STATISTICS (8 Questions)

Introduction to statistics, Basic concepts: types and sources of data, data classification, graphic representation of data, Measures of central tendency, Measures of Dispersion, Probability: Basic concept, additive and multiplicative laws. Theoretical distributions, binomial, poisson and normal distributions, sampling, basic concepts, sampling vs. complete enumeration, parameter and statistic, sampling methods, simple random sampling and stratified random sampling. Hypothesis testing, t-test, chi-square test. Correlation and regression. ANOVA-one way and two-way classification.

Plant Physiology (4 Questions)

Plant cell, water and its role of water in plant metabolism, solution and suspension, osmosis, diffusion, water potential and its measurement, water absorption and ascent of sap. Stomata - structure, distribution, function, classification and its regulation. Transpiration and guttation.

Plant Nutrition: nutrient uptake, mechanism of absorption role in plant metabolism and deficiency symptoms. Plant nutrients: classification and function. photosynthesis, light and dark, cyclic and non-cyclic electron transfer, C3, C4 and CA metabolism. Respiration – glycolysis, TCA cycle and electron transport. Carbohydrate metabolism. Plant growth and development, growth analysis. Plant growth regulators and their physiological role, Seed germination and dormancy, viability and vigour. Photoperiodism, vernalization.

Biochemistry (4 Questions)

Carbohydrates: Importance and classification; physical and chemical properties of carbohydrates-

Lipids: Classification and functions; saturated and unsaturated fatty acids; essential fatty acids- their nomenclature. Physical and chemical properties of fats. **Proteins:** classification and structure, peptide bond. Amino acids: classification; properties of amino acids- **Enzymes:** Classification; factors affecting enzyme action; co-factors and coenzymes. Vitamins and minerals as co-enzymes/co-factors. **Metabolism of carbohydrates and lipids:** Glycolysis; TCA cycle; Glyoxylate cycle; electron transport chain; regulation of glycolysis. Beta-oxidation of fatty acids. **Nucleic acids:** structure and function; DNA replication. **Recombinant DNA technology:** Basic concept; different types of vectors.

ENVIRONMENTAL SCIENCES (4 Questions)

- ❖ Natural Resources: Renewable and non-renewable resources, Natural resources, and associated problems. a) Forest resources: Use and over-exploitation.
- ❖ Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- ❖ Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Food chains, food webs and ecological pyramids.
- ❖ Forest ecosystem, Grassland ecosystem, Aquatic ecosystems
- ❖ Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Hot-spots of biodiversity. Threats to biodiversity.
- ❖ Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Endangered and endemic species of India.
- ❖ Environmental Pollution: definition, cause, effects and control measures of: Air pollution, Water pollution, Soil pollution,
- ❖ Solid Waste Management: causes, effects and control measures of urban and industrial waste.
- ❖ Climate change, global warming, acid rain, ozone layer depletion.
- ❖ Environment Protection Act. Air (Prevention and Control of Pollution) Act.

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves.

Plant Biotechnology (4 Questions)

Central Dogma of Molecular Biology, DNA as a molecule of life-. Structure of DNA, Chromosome structure- Nucleosome, Epigenetics, Control of gene expression in prokaryotes and eukaryotes, Translation, Operon concept, Genetic engineering, Restriction enzymes, Types of Restriction enzymes, DNA vectors; Gene cloning; Primer designing online tools, Sequence analysis and Phylogenetic analysis using Bioinformatics. Isolation and Screening of Industrially Important Micro-organisms, Industrial production of metabolites. Production of single-cell proteins, probiotics, hormones. Phyto-remediation. Agarose gel and SDS PAGE electrophoresis, DNA Isolation from Plants, Fungi, Bacteria. Plant Tissue Culture- Types of Media, Plant Hormones used in Plant tissue culture, DNA Markers- Marker Assisted Selection. Transgenic Plants and Benefits of gene manipulation in Transgenic plants,

MICROBIOLOGY (4 Questions)

Theory of spontaneous generation, germ theory, archaebacteria, and eukaryotes. Techniques used in the identification and classification of bacteria. Microbiology of ecosystems - soil, rhizosphere, phyllosphere. Biological nitrogen fixation. Microbial growth curve. Methods of sterilization. Industrial production of metabolites - antibiotics. Fermentation process and fermenter designs and types. Control of fermentation process - batch, feed batch, and continuous. Microbiology of biogas, production of biofertilizers, biopesticides. Plant growth promoting rhizobacteria and their mode of action.

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FISHIRIES

UNIT-I Classification and taxonomical characteristics of cultivable fisheries, crustaceans and mollusks. Fresh water, brackish water and marine fishery resources of India, marine fisheries of the world. Estuarine, lacustrine, brackish water and pond ecosystem. Population dynamics, fish stock, abundance methods and analysis. Conservation and management of fishery resources. Fisheries legislations and law of the water bodies. Impact of over exploitation and climate change on fisheries resources. **(15 QUESTIONS)**

UNIT-II Reproduction and breeding behaviour in fishes and shellfishes, brood stock improvement, maturity and fecundity studies. Induced spawning methods and seed production, natural fish seed collection and rearing methods. Types of eggs and development of larval stages of fin fishes and shellfishes. Preparation and management of fresh water and brackish water fishponds. Cultivable species identification, introduction of exotic fishes in India. Culture methods: Pen and cage culture practices, crab and shrimp hatchery management, basic aspects of biotechnology in relation to fisheries. **(15 QUESTIONS)**

UNIT-III Important limnological, oceanographical and biological parameters in relation to fisheries of lotic and lentic waters, biological productivity and its impact on fisheries. Environmental impact assessment on fisheries in lentic and lotic waters. Biological parameters including energy flow, community ecology and aquatic association, biodiversity and its conservation, aquatic pollution and its management. **(15 QUESTIONS)**

UNIT-IV Common crafts and gears used for fish capture. Boat building material and demerits of wood, steel, aluminum, Ferro cement and FRP. Different types of fibres and netting materials and their characteristics, preservation of netting, parts of a trammel net, purse-seine, gill net and tuna long line. **(15 QUESTIONS)**

UNIT-V Food chemistry, fundamentals of microbiology. General methods of fish preservation and fishery by products. Canning and packaging techniques, processing and product development techniques. **(15 QUESTIONS)**

UNIT-VI Introduction to fishery economics and concepts of cooperative, marketing and banking management. Supply v/s demand economics of hatchery management and fish culture operations. Profit maximization. Problems in estimating costs and returns in fisheries. WTO agreements in Fisheries sector, intellectual property rights (IPR) and international fish trade. Basics of statistics in fisheries and computer science. **(15 QUESTIONS)**

UNIT-VII Fisheries extension methods. Training and education needs in fisheries. Communication concepts, Modern tools of fishery extension education, participatory rural appraisal (PRA), Rapid rural appraisal (RRA), role of women in fisheries; **(10 QUESTIONS)**

FORESTRY

UNIT-I Importance of Agriculture/Forestry/Livestock in national economy. Basic principles of crop production. Important rural development programmes in India. Elementary principles of economics and agri-extension. Organizational set up of Agricultural Research, education and extension in India. Elements of statistics and computer applications. **(05 QUESTIONS)**

UNIT-II Mendelian inheritance. Cell division and cell cycle. Chromosome structure and function. Chromosome aberrations. Polyploidy. Genetic recombination. Gene concept, organization, replication and function of genetic material. One gene one enzyme hypothesis. Gene frequency and HardyWeinberg equilibrium. Quantitative inheritance. Heritability and response to selection. Role of biotechnology in agriculture and forestry. Transgenics and GMO's. **(05 QUESTIONS)**

UNIT-III Forest- importance, types, classification, ecosystem, biotic and abiotic components, ecological succession and climax, nursery and planting technique, social forestry, farm forestry, urban forestry, community forestry, forest management, silvicultural practices, forest mensuration, natural regeneration, man-made plantations, shifting cultivation, taungya, dendrology, hardwoods, softwoods, pulp woods, fuel woods, multipurpose tree species, wasteland management. **(20 QUESTIONS)**

UNIT-IV Plantation technology, watershed management and ecotourism. Forest Genetics and breeding. Forest genetic resources and Forest biotechnology. Environmental management and Forest business management. **(15 QUESTIONS)**

UNIT-V Agroforestry – importance and land use systems, forest soils, classification and conservation, watershed management, forest genetics and biotechnology and tree improvement, tree seed technology, rangelands, wildlife – importance, abuse, depletion, management. **(15 QUESTIONS)**

UNIT-VI Major and minor forest products including medicinal and aromatic plants, forest inventory, aerial photo interpretation and remote sensing, forest depletion and degradation – importance and impact on environment, global warming, role of forests and trees in climate mitigation, tree diseases, wood decay and discolouration, tree pests, integrated pest and disease management, biological and chemical wood preservation, **(20 QUESTIONS)**

UNIT-VII Forest conservation, Indian forest policies, Indian forest act, forest engineering, forest economics, joint forest management and tribology. **(10 QUESTIONS)**

UNIT-VIII Objectives and principles of extension education. Models of communication. Audiovisual aids classification and importance in extension teaching. Problems in communication and feedback. Role of mass media in diffusion of agricultural technology. Diffusion and adoption processes. Communication skills for technology transfer. Extension teaching methods. Programme planning principles and procedures. Methods and steps in evaluating extension programmes. Rural development past strategies and current approaches. Problems in the management of extension programmes. Role and qualities of a good extension worker, supervisor, administrator and local leader. Role and functions of voluntary organizations. Scope and significance of psychology in the formation of social attitudes. Principles of effective teaching learning. Importance and types of interpersonal perception, human interaction and social behaviour. Barriers in human resource development and establishing good human relations. **(10 QUESTIONS)**

Entrance Syllabus for M.Tech. Food Technology

UNIT-I (10 Questions): Basics of food science and technology. Methods of food preservation such as heat processing, pasteurization, canning, dehydration, freezing, freeze drying, fermentation, microwave, irradiation and chemical additives. Refrigerated, modified and controlled atmospheric storage. Aseptic preservation, hurdle technology. Use of non-thermal technologies - microfiltration, bacteriofugation, high voltage electric fields, pulse electric fields, high pressure processing, irradiation, thermosonication, alternate thermal technologies - ohmic heating, dielectric heating, microwave, RF, infrared. Biological technologies - antimicrobial enzymes and bacteriocins in food processing. Intermediate moisture food products, low acid foods, high acid foods and shelf stable foods. Unit operations of food processing viz. grading, cleaning, washing, sorting, size reduction, cryogenic grinding, crystallization, membrane separation processes; Evaporation, Distillation, Mixing, coagulation, mechanical separation processes, filtration, pressing, expelling, leaching, extraction, extrusion.

UNIT-II (10 Questions) Harvest handling. Primary, secondary, value addition and storage of fruits and vegetables. Extraction, clarification, concentration and packaging of fruit juice, jam, jelly, marmalade, squash, candies, tomato sauce, ketchup, and puree, chips, pickles- equipment's used. Minimally processing of fruit and vegetables. Dehydrated fruits and vegetables. Technology of Preservation by sugar, salt, chemical. Fermented foods and beverages from fruit and vegetables. Aerated drinks, frozen fruits and vegetables, IQF products. Byproducts utilization of fruits and vegetable processing industry.

UNIT-III (10 Questions) Food Chemistry Carbohydrates: structure and functional properties of mono-, oligo-, & poly-saccharides including starch, cellulose, pectic substances and dietary fibre, gelatinization and retrogradation of starch. Proteins: classification and structure of proteins in food. Lipids: classification and structure of lipids, rancidity, polymerization and polymorphism. Pigments: carotenoids, chlorophylls, anthocyanins, tannins and myoglobin. Food flavours: terpenes, esters, aldehydes, ketones and quinines. Enzymes: specificity, simple and inhibition kinetics, coenzymes, enzymatic and non-enzymatic browning. Nutrition: balanced diet, essential amino acids and essential fatty acids, protein efficiency ratio, water soluble and fat soluble vitamins, role of minerals in nutrition, co-factors, anti-nutrients, nutraceuticals, Chemical and biochemical changes during processing and storage. Metabolism of carbohydrates, lipids and protein. Biological value and PER. Food additives, contaminants and anti-nutritional factors. Food flavors and puff-flavors. National and international food standards, modern analytical techniques in food analysis.

UNIT-IV(10 Questions) Engineering properties of food materials, System analysis, mass and energy balance, Principles operations and equipment for food materials flow handling, cleaning, dehusking, sorting and grading; peeling, size reduction, mixing and forming, bakery foods manufacture, extrusion, separation, filtration and membrane processes, expression, baking roasting, frying, extraction and leaching, crystallization, distillation, blanching, pasteurization, sterilisation, evaporation, drying, freezing, packing, heat exchanging, dairy specific operations. Process equipment design, heat and mass transfer, equipment for steam generation, compressed air, refrigeration and air conditioning, water and waste water treatment, biochemical engineering and thermo bacteriology. Automation, on-line data acquisition and process control. Food plant layout and design. Energy audit.

UNIT-V (10 Questions) Structure, composition, milling and processing of different food grains like wheat, rice, maize, oat, pulses, millets and oil seeds. Anti-nutritional factors in food grains and oilseeds. Milling of food grains. Primary and secondary processing. Value added food grain products like breads, biscuits, cakes, doughnuts, buns, pasta goods, extruded, Instant ready mixtures, puffed foods, confectionary products, breakfast cereals, snack foods, malted food products, legume-based food products. Milling and parboiling of rice byproducts of rice milling and their utilization. Oil seed processing: expelling, solvent extraction, refining and hydrogenation.

UNIT-VI (10 Questions) Characteristics of microorganisms: morphology of bacteria, yeast, mold and actinomycetes, spores and vegetative cells, gram-staining. Microbial growth: growth and death kinetics, serial dilution technique. Food spoilage: spoilage microorganisms in different food products including milk, fish, meat, egg, cereals and their products. Toxins from microbes - aflatoxins: pathogens and non-pathogens including Staphylococcus, Salmonella, Shigella, Escherichia, Bacillus, Clostridium, and Aspergillus genera. Fermented foods and beverages: curd, yoghurt, cheese, pickles, soya-sauce, sauerkraut, idli, dosa, vinegar, alcoholic beverages and sausage. Thermal death time and process time calculations. Methods for microbiological examination of foods, food hygiene and safety regulations. Water quality and waste disposal in food industry.

UNIT-VII (10 Questions): Milk composition, Physical and chemical properties of milk. Milk reception. Dairy plant operations viz. receiving, cooling separation, clarification, pasteurization, standardization, homogenization, sterilization, storage, transport and distribution of milk. Toned, double toned, standardised, UHT, fortified, reconstituted and flavoured milks. Technology of fermented milks. Milk products processing viz. cream, butter, ghee, cheese, condensed milk, evaporated milk, whole and skimmed milk powder, ice cream, khoa, channa, paneer and similar products. Judging and grading of milk products. Dairy plant sanitation and waste disposal, CIP.

UNIT-VIII (10 Questions): Technology of Meat, Fish and Poultry Products: Chemistry, Nutritional value and microscopic structure of meat tissue. Ante mortem inspection, principle and methods of slaughtering of various animals and poultry birds, Post mortem examination and Rigor mortis. Retail and wholesale cuts. Factors affecting meat quality. Meat tenderization, meat preservation like curing, smoking, freezing, canning and dehydration of meat, poultry and their products. Value addition and byproducts utilizations. factors influencing keeping quality of meat. Processing and preservation of fish and its products. On board handling and transportation of fish. Preservation canning, smoking and freezing of fresh and sea water fish and its products. Utilization of by-products from fish processing industries. Structure and composition of egg, factors affecting egg quality. Quality measurement of egg. Preservation methods of shell eggs and egg products freezing-pasteurization desugarisation. Technology of egg products viz. egg powder, albumen and flakes.

UNIT-IX (10 Questions): Food Quality Management Quality systems and tools used for quality assurance including control charts, acceptance and auditing inspections, critical control points, reliability, safety, recall and liability. Food adulterations & detection techniques. Measurement techniques and instruments for food quality determination. National Food laws and standards - PFA, FPO, BIS, APEDA. International standards and organizations – FDA, ISO, GRAS, EU, CAC, TQM, GMP, GAP, HACCP. International

standards for export and quarantine requirements for export of Agricultural and Horticultural produce.

UNIT X (10 Questions): Food Packaging and labeling Packaging terminologies.

Functions of food packaging. Packaging requirements for different environments. Basis for selection of packaging material. Packaging materials viz. properties and testing procedures, packaging technologies for perishables and highly perishables fresh and processed foods Packaging technologies for. Shelflife studies. Recent trends in packaging, aseptic, active packaging, smart packaging, intelligent packaging, modified atmosphere, vacuum and gas packaging. Labelling requirements.

SERICULTURE

UNIT I Importance of Sericulture in national economy; Genetics; elementary knowledge of photosynthesis; respiration, and transpiration; Major pests and diseases of field crop and their management.; Elements of statistics. Measures of central tendency and dispersion, regression and correlation; concept of probability, sampling techniques and tests of significance. **(10 Questions)**

UNIT II Farming systems, cropping systems, cropping patterns, cropping schemes and crop plans. Seed and seeding practices. Nutrient management principles and practices of fertilizer use, organic manures, biofertilizers and integrated nutrient management for sustainable agriculture. Soil-water-plant relationships. Crop growth, yield and quality interactions. Water management and improving water use efficiency in crops and cropping systems. Dry farming principles and practices. Management problems and practices for waterlogged, eroded and saline alkali soils. Physiological processes in crop growth and development. Use of growth regulators for modifying growth and abscission. **(10 Questions)**

UNIT III Weathering of minerals and rocks. Factors of soil formation and their dynamics. Pedogenic processes. Soil survey and mapping. Soil taxonomy. Land suitability evaluation for agriculture. Soils of India. Soil colloids. Cation and anion exchange. Soil reaction. Saline and sodic soils characterization and amelioration. Plant nutrients functions, deficiency systems, transformation and availability. Soil fertility evaluation and maintenance. Fertilizers and their use efficiency. Concept of integrated fertilizer use. Soil testing importance and problems. Principles in the determination of available nitrogen, phosphorus, potassium, sulphur and zinc in soils. Analysis of fertilizers and irrigation water. Micro and macro organisms in soils and their role in biochemical decomposition of organic manures, farm wastes and nutrient transformations. **(10 Questions)**

UNIT-IV History, development and organization of silkworm industry. Silk industry in world and India. Central silk board. Host plants of silkworm. Arboriculture and moriculture. Mulberry cultivation techniques. Floral biology of mulberry: flower, fruit and seed development Mulberry based farming systems. Propagation of mulberry and establishment of mulberry orchards. Non-mulberry – their food plants. Different species of non-mulberry silkworm, brief account of Tasar, Muga and eri silkworm.. Types of cocoon and silk produced by them. Silk marketing, trade prices. Sericulture marketing organization – cocoon market and silk exchange -regulated and non regulated market – stabilization of price in cocoon market and silk exchange . Breeding of host plants of silkworm. Bivoltine sericulture technology. By products of sericulture industry. **(20 Questions)**

UNIT- V Systematics, morphology, Anatomy , physiology and life cycle of silkworm. Silkworm rearing and grainage. Mulberry silkworm and its food plants – Mulberry sericulture – Silkworm races Classification of Mulberry silkworm on the basis of its origin and voltinism. Silkworm breeding and Genetics. Genetic resources of mulberry and silkworm. Diseases and pests of silkworm and host food plants and their management. Nutrient management in mulberry. Morphology of silk gland silk proteins and their synthesis. Moulting – structure of integument and cuticle, Formation and shedding of cuticle, hormonal control. Silkworm metamorphosis – hormonal control. **(15 Questions)**

UNIT-VI Silk reeling and spinning. Out line of different reeling machineries and reeling process. History of Reeling Industry- Charka- Cottage basin- Filature basin- Multi end basin Semiautomatic and Automatic reeling machinery - Different types of cocoon stifling – Different types of cocoon cooking – Principles of reeling, reeling process. Silk weaving technology. Silk dying and printing. Twisting and weaving- Twisting machinery and processing – Handloom Weaving (Different types) Power loom weaving (Different types) printing- Dyeing Calendaring and Finishing. Silkworm rearing and grainage. Silk grading and testing. Silkworm seed technology. **(20 Questions)**

UNIT-VII. Importance of seed production in sericulture. Seed organization in India and abroad, seed areas, special features of seed areas and seed transaction. Seed grainage, grainage equipments and seed production; cost structure of a model grainage, management of industrial grainages,. Reproductive and industrial seeds. Importance of seed cocoons; nucleus seed- production and their preservation. Pebrine disease management. Seed hibernation, hibernation schedules, preservation and handling of silkworm eggs. Embryonic development. Artificial and natural hatching- different methods of artificial hatching. Schedule of chilling and acid treatment. Preparation of loose eggs and egg layings. Standards of quality egg production and seed transportation Seed legislation Act.**(15 Questions)**

VETERINARY & ANIMAL HUSBANDARY

UNIT I: Anatomy and Physiology. Structure of cells, cell organelles, chromosome structure and functions, cell growth, division and differentiation and functions. Structure and function of basic tissues-epithelium, connective tissue, muscle and nervous tissue. Gross Morphology, Histology and physiology of mammalian organs and systems, major sense organs and receptors, circulatory system. Digestion in simple stomached animals, birds and fermentative digestion in ruminants, Kidney and its functions-respiratory system animal behaviour-growth-influence of environment on animal production-biotechnology in animal production and reproduction-electrophysiology of different types of muscle fibres. Exocrine and endocrine glands, hormones and their functions, blood composition and function. Homeostasis, osmoregulation and blood clotting. Gametogenesis and development of urogenital organs. Boundaries of body cavities. Pleural and peritoneal reflections.

(10 QUESTIONS)

UNIT II: Scope and importance of biochemistry in animal sciences, cell structure and functions. Chemistry and biological significance of carbohydrates, lipids, proteins, nucleic acids, vitamins and hormones. Enzymes— chemistry, kinetics and mechanism of action and regulation. Metabolic inhibitors with special reference to antibiotics and insecticides. Biological oxidation, energy metabolism of carbohydrates, lipids, amino acids and nucleic acids. Colorimetry, spectrophotometry, chromatography and electrophoresis methods. History of molecular biology, biosynthesis of proteins and nucleic acids, genome organization, regulation of gene expression, polymerase chain reaction, basic principles of biotechnology applicable to veterinary science gene sequence, immunodiagnostics, animal cell culture, in vitro fertilization. Subunit vaccines: Principles of fermentation technology. Basic principles of stem cell and animal cloning. **(10 QUESTIONS)**

UNIT-III: Veterinary Microbiology (Bacteriology, Virology, Immunology), Veterinary Pathology, Parasitology. Classification and growth characteristics of bacteria, important bacterial diseases of livestock and poultry, general characters, classification of important fungi. Nature of viruses, morphology and characteristics, viral immunity, important viral diseases of livestock and poultry. Viral vaccines. Antigen and antibody, antibody formation, immunity, allergy, anaphylaxis, hypersensitivity, immunoglobulins, complement system. Etiology of diseases and concept, extrinsic and intrinsic factors, inflammation, degeneration, necrosis, calcification, gangrene, death, atrophy, hypertrophy, benign and malignant tumours in domestic animals. General classification, morphology, life cycle of important parasites, important parasitic diseases (Helminths, Protozoa and Arthropods) of veterinary importance with respect to epidemiology, symptoms, pathogenesis, diagnosis, immunity and control. **(10 QUESTIONS)**

UNIT-IV: Veterinary Medicine, Epidemiology veterinary surgery and Veterinary Obstetrics and Gynaecology including reproduction. Clinical examination and diagnosis, Etiology, epidemiology, symptoms, diagnosis, prognosis, treatment and control of diseases affecting different body systems of various species of domestic animals, epidemiology— aims, objectives, ecological concepts and applications. General surgical principles and management of surgical cases. Types, administration and effects of anaesthesia. Principles and use 32 Information Bulletin 2011–2012 of radiological techniques in the diagnosis of animal diseases. Estrus and estrus cycle in domestic animals, Synchronization of estrus, fertilization, pregnancy diagnosis, parturition, management of postpartum complications dystokias and its

management, fertility, infertility and its management, artificial insemination. **(15 QUESTIONS)**

UNIT-V: Veterinary Public Health, Veterinary Pharmacology & Toxicology. Zoonotic diseases through milk and meat, Zoo animal health. Source and nature of drugs, pharmacokinetics, Chemotherapy-sulpha drugs, antibiotics, mechanism and problem of drug resistance. Drug allergy, important poisonous plants, toxicity of important agro-chemicals and their detoxification, drugs action on different body systems. **(10 QUESTIONS)**

UNIT-VI: Animal Genetics and Breeding- Principles of animal genetics, cell structure and multiplication. Mendel's laws, principles of population genetics, concept of heredity, heterosis and mutation, principles of evolution, principles of molecular genetics, genetic code, quantitative and qualitative traits. Selection of breeding methods in livestock and poultry. Population statistics of livestock. **(10 QUESTIONS)**

UNIT-VII: Animal Nutrition, Feed Technology, Animal Physiology. General nutrition, proximate principles, carbohydrates, proteins and fats their digestion and metabolism in ruminants and non-ruminants. Energy partition- measures of protein quality. Water, minerals, vitamins and additives, feeds and fodders and their classification. Common anti-nutritional factors and unconventional feeds. Hay and silage making. Grinding, chaffing, pelleting, roasting, feed block. Feed formulation principles. Digestion- control motility and secretion of alimentary tract. Mechanism, natural and chemical control of respiration, gaseous exchange and transport, high altitude living, physiology of work and exercise. Cardiac cycle, natural control of cardiovascular system. Smooth and skeletal muscle contraction. Blood coagulation. Physiology of immune system. Male and female reproduction including artificial insemination, in-vitro fertilization, cryo-preservation. Excretory system. **(15 QUESTIONS)**

UNIT VIII: Animal Husbandry, Dairy Science, Livestock Production and Management, Animal Product Technology & Meat Science and Poultry Science. General concepts of livestock production and management, status of dairy and poultry industry, impact of livestock farming in Indian agriculture. Livestock housing, production and reproduction management, lactation management, breeding programmes for livestock and poultry. Composition, quality control and preservation of livestock products, methods of processing and storage livestock products. International Trade/WTO/IPR issues related to livestock products. **(10 QUESTIONS)**

UNIT IX: Veterinary Extension. Concept of sociology, differences between rural, tribal and urban communities, social change, factors of change. Principles and steps of extension education, community development- aims, objectives, organizational set up and concept evolution of extension in India, extension teaching methods. Role of livestock in economy. Identifying social taboos, social differences, obstacles in the way of organizing developmental programmes. Concept of marketing, principles of co-operative societies, animal husbandry development planning and programme, key village scheme, ICDD, Gosadan, Goshala, Role of Gram Panchayat in livestock development. Basics of statistics, data analysis and computational techniques. **(10 QUESTIONS)**