SYLLABUS FOR COMMON ENTRANCE TEST

Master of Science (Except Sociology)

Section-A (Physical Science)

There will be 100 (One hundred) questions of multiple choice type. There will be four sections, Section A: General knowledge, Section B- Chemistry, Section C –Medical (Bioscience) and Section D – Non- medical (Mathematics and Physics). Section- A will carry questions of 5 marks; section B carry questions of 35 marks; section C and D will carry questions of 60 marks each. Section –A and B will be common for both medical and non-medical students. Section- C will be for medical students and section- D will be for non-medical students. Minimum 40 per cent marks will be required for general category and 38 % marks for SC category to get admission in Master's programme as per qualification mentioned in above Table (**There will be no negative marking**).

SYLLABUS FOR COMBINED ENTRANCE TEST

M.Sc. (Biochemistry, Bioinformatics, Botany, Plant Physiology, Chemistry, Microbiology, Molecular Biology and Biotechnology, Zoology and Food Science and Technology)

Total: 100 Marks

Section A: General knowledge (Common for medical and non- medical stream)
5 Marks

Basic concepts in agriculture, Food Security, Important facts and figures of Indian agriculture, Important crops of India, Green, white and blue revolution, Organic farming, Agricultural research and education in India, Events of national and international importance.

Section B: Chemistry (Common for medical and non-medical stream)
35 Marks

Atomic structure; Periodic properties; Solid, Liquid and Gaseous states, Critical phenomenon; Kinetics; Electrochemistry; Thermodynamics; Chemical equilibrium; Distribution law; Quantum mechanics; Physical properties (optical, polarization, dipole, magnetic permeability, magnetic susceptibility) and Molecular structure; Spectroscopy (rotational, vibrational and Raman); Electronic spectrum; Photochemistry; Solutions, dilute solutions and Colligative properties, Phase equilibrium.

Structure and bonding; Stereochemistry of organic compounds; Mechanism of organic reactions; Alkanes and cycloalkanes; Alkenes, Arenes and aromaticity; Dienes and alkynes; Alkyl and aryl halides; Alcohols; Phenols; Epoxides; Carboxylic acids & acid derivatives; Amines; Diazonium salts; Aldehydes and ketones; Organometallic compounds; Organosulphur compounds; Heterocyclic compounds; Basics of Ultraviolet (UV) absorption spectroscopy, Infrared (IR) absorption spectroscopy, NMR spectroscopy, and Synthetic polymers.

Hydrogen bonding & Vander Waals forces, Metallic bond and semiconductors; s-Block elements; p-Block Elements; Chemistry of d-Block Elements; Chemistry of f – block elements; Chemistry of noble gases; Coordination compounds; Non-aqueous solvents; Theory of qualitative and quantitative inorganic analysis; Metal-ligand bonding in transition metal complexes; Thermodynamic and kinetic aspects of metal complexes; Acids and bases, HSAB concept; Bioinorganic chemistry; Silicones and phosphazenes.

Section C:Biological Science (For Medical Stream)
60 Marks

Cell as a unit of life, cell structure and function, General account of prokaryotic and eukaryotic cells, cell organelles, cell division, biomembranes.

Morphology and life history of algae, fungi, bacteria, viruses, lichens, brayophytes, pteridophytes and gymnosperms; Air, soil and water pollution; Basic knowledge of anatomy, embryology and systematics of angiosperms; Plant water relationship, mineral nutrition; Concept of pH and buffers; biomolecules – carbohydrates, mono-, di- and polysacchrides, amino acids, fatty acids and lipids, nucleic acids – DNA and RNA; Structural organization of proteins, enzymes, their general mechanism of action and classification; Vitamins; Concept of bioenergetics; Respiration: aerobic & anaerobic, HMP pathway, glycolysis, Krebs cycle, electron transport chain; Photosynthesis, nitrogen metabolism, translocation of photo-assimilates; Growth and growth hormones, photoperiodism, vernalization, senescence and aging, morphogenesis, dormancy, fruit growth and fruit ripening; Abiotic stress in plants; Principles of centrifugation, chromatography, electrophoresis, spectroscopy; Basics of immunological and radioisotopic techniques.

Animal classification and biosystematics; Comparative anatomy and physiology of invertebrates and vertebrates; various aspects of developmental biology, evolution, animal behavior and ecology, parasites and parasitism, pests and their management; Structure and Function of invertebrates and vertebrates.

Origin and evolution of life, Unity and diversity of life, Heredity and variations; Principles of inheritance, Mendelian genetics, chromosomal basis of inheritance, gene interaction, multiple allelism, sex linked, sex influenced and sex limited inheritance, linkage, crossing over and chromosome mapping, quantitative inheritance, gene mutations.

Introduction and historical developments of microbiology; Microbial nutrition, Biology of viruses, microbial interactions, Role of microbes in agriculture, food, dairy and other fermentation industries; Important microbial diseases of man.

History, nature, structure and replication of genetic material; Basics of gene structure, gene expression; genetic code, gene regulation, Recombinant DNA technology, cloning vehicles, restriction endonucleases and other enzymes used for cloning, gene isolation, transformation, genomic. Basics of cDNA libraries, transgenic plants and animals, Plant tissue culture: media composition, culture techniques, callus and suspension culture, cellular totipotency and differentiation, role of tissue culture in Biotechnology.

Section D: - Mathematics and Physics (For Non-Medical Stream)
60 Marks

Mathematics: Number systems, Real and complex numbers; polynomial and roots; Elements of set theory, De Morgan's laws, vector space, linear dependence and independence of vectors, orthogonality; Matrices addition and multiplication, rank of a matrix, determinants, inverse of a matrix, solution of a system of linear equations, characteristic roots and vectors; Convergence of infinite sequences and infinite series, tests for convergence, absolute convergence; Co-ordinate geometry in two dimensions – lines, circle, parabola, ellipse and hyperbola; Differential calculus: limits, differentiation of function of a single variable; Taylor's and Maclaurin's theorems, mean-value theorem, maxima and minima; Indeterminate forms of curvature, asymptotes, tracing of curves, function of two or more independent variables, partial differentiation, homogeneous functions and Euler's theorem, composite functions, total derivatives, derivative of an implicit function; Integral

calculus: integration by standard methods, standard forms, simple definite integrals, double integrals, change of order of integration, Gamma and Beta functions, application of double integrals to find area; Ordinary differential equations: differential equations of first order, equations reducible to exact form by integrating factors, equations of first order and higher degree, methods of finding complementary functions and particular integrals; Calculus of finite differences interpolation; Numerical differentiation and integration, difference equations; Solution of simple non-linear equations by numerical methods like Newton-Raphson method. Definition, scope and limitations of statistics; Frequency distributions and frequency curves; Measures of Central Tendency: Arithmetic mean, Geometric mean, Harmonic mean, Median, Mode; Measures of Dispersion: Range, Mean deviation, Quartile deviation, Variance and Coefficient of Variation; Probability: Definition and concepts, laws of addition and multiplication, conditional probability, Bayes' theorem; Binomial, Poisson and normal distribution.

Physics

Electronics : Junction diode, Zener diode, Tunnel diode, LED, LCD, Rectification-half wave and full wave rectifier, Filter circuits, voltage regulation, Junction transistor, structure and working; Characterstics of JFET; Transistor biasing; Working of common emitter amplifier. Analysis using h parameters. FET amplifier, Feedback in amplifiers, Oscillators: LC oscillator, RC oscillators, Phase shift and Wein bridge, Modulation and detection. AM and FM Radio transmitter and receiver, lonosphere.

Solid State Physics: Crystal structure, two and three dimensional Bravais lattices, Miller indices, diamond and sodium chloride structures; Crystal diffraction, Bragg's law, Laue's equation, Reciprocal lattices of scc, bcc and fcc structures, Lattice vibrations, Einstein and Debye model of specific heat. Free electron model of metals, Fermi gas and Fermi energy; Band theory; Brillouin zones, Kronig-Penny model; Metals and insulators; Superconductivity.

Nuclear Physics : Constituents of nucleus and their intrinsic properties; Properties of nuclear forces; Liquid drop model; Nuclear shell model; Radioactivity, Modes of decay, Alpha, electron, positron and gamma ray emission; Nuclear reactions; Conservation laws; Q value and its significance. Energy loss due to ionization, Bremsstrahlung radiations, Interaction of gamma rays with matter; Cyclotron, Betatron, Linear accelerator, lonization chamber; Proportional counter, GM counter, Scintillation counter, Elementary particles-classification; Conservations laws; Quarks.

M.A./M.Sc. (Sociology)

There will be 100 (one hundred) questions of multiple choice type. There will be three sections: Section A : General Knowledge; Section B : General Studies and Section C: Social Sciences. Section A will carry questions of 05 marks; Section B will carry questions of 35 marks; Section C will carry questions of 60 marks. Minimum 35 per cent marks will be required for General Category and 25 per cent Marks for SC Category to get admission in Master's Programme as per qualification mentioned in above Table **(There will be no negative marking).**

Section-A : General Knowledge (Common for medical, non-medical and Social Science) 05 marks

Basic concepts in agriculture, Food Security, Important facts and figures of Indian Agriculture, Important crops of India, Green, white and blue revolution, Organic farming, Agricultural research and education in India, Events of national and international importance.

Section-B : Social Science :

95 Marks

Sociology : Meaning, Nature and Scope, Basic Concepts : Social Structure, Status and Role, Society, Community, Association, Norms and Values, Organization, Social Group and Process : Primary, Secondary and Reference Group, Its Nature and Types, Accommodation, Assimilation, Cooperation, Competition, Conflict and Integration, Social

Institutions : Marriage, Family, Polity, Education and Religion, Its Functions and Characteristics, Leadership, Personality, Motivation and Learning, Rural and Urban Community, Its Meaning, Nature, Types and Characteristics, Culture: Nature, Concepts and Types, Socialization and Social Control: Its meaning, Types and Agencies, Processes of Social Change, Social Stratification, Social Problems : Female Foeticide, Dowry, Divorce, Poverty, Crime and Juvenile Delinquency, Corruption, Drug Addiction, Unemployment, Demography, Environmental Ecology, Bio-Diversity and Climate Change, Concepts of Social Research, Observation, Interview, Case Study, Social Survey, Research Design, Sampling, Hypothesis, Comte's Law of three stages, Durkheim's Suicide, Marx's Class and Class Conflict.

Rural Sociology : Nature, Subject Matter and Importance, Jajmani System, Rural Family and Changing Pattern, Land Tenure, Land Reform, Migrant Labourers, Trends of Change in Rural Society, New Panchayati Raj, Empowerment of Women.

Agricultural Economics and Extension Education : Micro and Macro Economics, Various Rural Development Programmes, Agricultural Marketing : Meaning, Scope and Subject Matter, Trade and Prices, Agribusiness : Meaning, Concept and Importance, Communication process, Diffusion and Adoption of Technologies, Extension Training Management, World Trade Organization, General Agreement on Tariffs and Trade.

Home Science : Management of Family Resources, Women in Agriculture, Consumer Education, Adolescence and Adulthood, Children with Special Needs, Women and Child Welfare.

Entrance Test for M. Sc. Ag. Programme

Objective type: Multiple choice questions
No. of Questions: 100
Total marks: 100
Qualifying marks: 40 (38 for SC)
Duration of Test: Three hours

Syllabus with Distribution of Marks in parentheses

AGRICULTURAL ECONOMICS (8)

Principles of agricultural economics: Economics and agricultural economics: law of diminishing marginal utility: consumer's surplus; demand and supply; law of demand and supply, elasticity of demand and supply, factors influencing the elasticity of demand and supply, national income, inflation and deflation, kinds of inflation, basic concepts of economic growth and development.

Agricultural finance and co-operation : Agricultural finance; nature and scope, compounding and discounting; agricultural credit, credit analysis; Banking system in India and Institutions related, crop insurance and assessment of crop losses; Agricultural cooperation, pre-independence and post independence era, history of Indian Cooperative movement.

Agricultural marketing, trade and prices: Agricultural marketing: definition, scope and subject matter; market and marketing: definitions, dimensions and components of a market; market structure; conduct and performance, marketing functions, market functionaries or agencies; producer's surplus, types and factors effecting marketable surplus; marketing channels, definition, types of channels for different products; market integration: meaning and type; marketing efficiency; meaning, definition, marketing costs, margins and price spread, factors affecting the cost of marketing; GATT, WTO, AOA, market access; cooperative marketing: meaning and types; AGMARK, characteristics of agricultural products; agricultural prices: meaning, role and types, need for agricultural price policy; risk in marketing: meaning, types of risk in marketing; speculations and hedging.

Production economics and farm management: Production economics: meaning, definition, nature and scope of agricultural production economics; basic concepts and terms; concepts of production; production function: meaning, definition, types; farm management: meaning, definition, importance; economic principles applied to the organizations of farm business; types and systems of farming, farm planning and budgeting, risk and uncertainty, principles of farm management.
Fundamentals of agribusiness management: Agribusiness: meaning, definition and importance, agribusiness management - distinctive features of agribusiness; importance of financial statements, balance sheet, profit and loss statement, agro-based industries: importance and need, classification, marketing management: meaning, definitions, 7Ps of marketing, market segmentation and targeting; product life cycle; project, project cycle, and steps involved. Appraisal and evaluation techniques: NPV, BCR, IRR; characteristics of agricultural projects.

AGRIL. METEOROLOGY (3)
Definition, aim and scope of agricultural meteorology; atmosphere, brief description of weather elements, impact of weather elements on crop and livestock production, crop microclimate and its modification, weather forecasting and agriculture, climate of Haryana and India, concept of climate change, remote sensing and GIS.

AGRONOMY (21)
Introductory agriculture: Art, science, business & basic elements of crop production and factors affecting it; history of agricultural development in India; Indian agriculture: soil groups, marine, livestock and water; liabilities: soil & weather factors, economic ecology, dry & irrigated agriculture, farming system approach, value addition; women in agriculture: roles & tasks, stress factors, nutritional & rural life standards, house hold design making, drudgery reduction, women friendly agricultural technology; women empowerment: group dynamics, rural women; the nucleus of agricultural extension and training.
Principles of agronomy: Meaning & scope of agriculture, its development in India/Haryana: agricultural research institutes in India; agronomy: definition, history, relation with other sciences; classification of crops; characteristics of good seed, types of seed & seed multiplication; crop growth and factors affecting it, agronomic principles; tillage: objectives, and optimum requirement; soil fertility, productivity; application of manures & fertilizers, cropping pattern(s), cropping and farming systems.
Irrigation water management: Importance of water and forms of soil moisture in crop production; irrigation and its source, water resources & irrigation development in India/ Haryana; soil plant water relationship, energy concept, components of water potentials; evapotranspiration, crop water requirement, effective rainfall; scheduling & methods of irrigation including micro/pressure irrigation/rain gun; irrigation & water use efficiency and factors affecting them; conjunctive use of water; irrigation water quality & its management; water management of field crops; drainage and its methods; prevention of water losses; effect of water logging & water stress: irrigation strategies under limited water conditions.
Field crops - i (*kharif* crops): Origin, distribution, economic importance, soil & climatic requirement, varieties, manuring, water management, constraints and cultivation of rice, maize, sorghum, pearlmillet, pigeonpea, green gram, black gram, groundnut, sesamurn, soybean, cotton, sorghum, cowpea and napier.
Field crops - ii (*rabi* crops): Origin, distribution, economic importance, soil & climatic requirements, varieties, cultural practices, manuring, water management, constraints & cultivation of wheat, barley, chickpea, lentil, peas, frenchbean, rapeseed & mustard, sunflower; sugarcane, tobacco, berseem, lucerne and oat.

Weed management: Weeds: harmful & beneficial effects, classification, propagation, dissemination, biology & ecology, crop weed association & competition, allelopathy; concepts of weed management, methods of weed control: herbicides: advantages, limitations, classification, formulations, method of application; adjuvants & their uses: selectivity & compatibility of herbicides with other agro-chemicals; weed management: major field & horticultural crops; shift of weed flora, aquatic & problematic weeds and their control.

Production technology of spices, medicinal, aromatic & plantation crops: Importance & cultivation technology of spices: ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek; medicinal plants: diascoria, rauvolfia, opium, ocimum, periwinkle, aloe, guggal, aonla, isabgol,senna, stevia, coleus, acorus; aromatic plants: lemon grass, citronella, palmarose, vetiver, geranium, dawana; plantation crops: coconut, betel vine, cashew, cocoa, coffee, oil palm.

Rainfed agriculture: Rainfed farming: characteristics, rainfall distribution in the state/India, problems of crop production, land shaping & planting methods, management of rainfed crops: critical stages of life saving irrigations, constraints & package of practices for rainfed crops of Haryana; mulches and anti-transpirants; water harvesting, moisture conservation; principles of intercropping, cropping systems/intercropping; choice of crops & varieties; contingent crop planning for aberrant weather; watershed management: principals & practices; agro-horticultural, agro-forestry & silvi-pasture in dry land agriculture.

Organic farming: Introduction, concepts, relevance; organic production requirements; biological nutrient management-organic & bio-fertilizers: soil improvement & amendments; integrated diseases & pest management, use of bio-control agents, bio-pesticides, pherornones, trap crops, bird perches; water & weed management; quality considerations, certification, labelling, accreditation, marketing, exports.

Farming systems and sustainable agriculture: Sustainable agriculture: introduction, definition, goal, current concepts; land degradation, conservation of natural resources, low & high external input agriculture; waste land & their development; organic farming & farming systems: definition principle & components; IFS models for wet land, irrigated dryland and drylands; problems & prospects of present day agriculture.

ENTOMOLOGY (11)

Insect morphology and systematic: The external features and morphological characters of the insect body; modification of antennae, legs, wings and mouth parts. Different anatomical systems in the insects and classification of class Insecta up to Orders and Families.

Insect ecology and integrated pest management including beneficial insects: Basic knowledge of biotic and abiotic factors of environment affecting the insect population. Concept of Integrated Pest Management (IPM) and recent methods of pest control. Insecticides and their symptoms of poisoning. Acquaintance with non-insect pests and micro-organisms.

Crop and stored grain pests and their management: Distribution, biology, nature and symptoms of damage and management strategies of insect and non-insect pests of cereal crops, cash crops, vegetables, fruits, plantation and ornamental crops. Stored grain pests and their control.

EXTENSION EDUCATION (7)

Dimensions of agricultural extension: Meaning and concepts of Extension Education; Rural development and its different programmes from pre-independence era till today.

Extension methodologies for transfer of agricultural technology: Communication process along with its different models; Adoption process, Extension teaching methods;

Programme planning; ICT tools in Agriculture; Capacity building of extension and farmers through training etc.

Entrepreneurship development and communication skills: Entrepreneurship development: concept, entrepreneurial and managerial characteristics; Different entrepreneurship development programmes; Govt. policy on small and medium enterprises; Export policies relevant to agriculture sector; Contact farming; Public-private partnership etc.

FORESTRY (3)

Forests in India, forest policy and law; Principles of silviculture; Social forestry: need, objectives and scope; watershed management; nurseries practices; Afforestation on different problematic sites; Energy plantations; Farm forestry: objectives and role; Principles and practices of Agroforestry; Forest products, their processing and use.

GENETICS & PLANT BREEDING (12)

Fundamentals of genetics: Ultra structure of cell and cell organelles and their functions: mitosis and meiosis, their significance and differences between them; Mendel's laws of inheritance and exceptions to the laws; types of gene interaction, multiple alleles, law of population equilibrium, quantitative traits, qualitative traits; multiple factor hypothesis; cytoplasmic inheritance, it's characteristic features; mutation and it's characteristic features; methods of inducing mutations; linkage, types of linkage and estimation of linkage; crossing over and factors affecting it; mechanism of crossing over and cytological proof of crossing over; DNA and it's structure, function, types, modes of replication and repair; RNA and its structure, function and types; transcription, translation, genetic code and outline of protein synthesis; gene expression and differential gene activation; lac operon and fine structure of gene; numerical and structural chromosomal aberrations.

Principles of plant breeding: Floral biology, emasculation and pollination techniques in cereals, millets, pulses, oil seeds, fibers, plantation crops etc; modes of reproduction, sexual, asexual, apomixis and their classification; modes of pollination, differences between self and cross pollinated crops; methods of breeding: introduction and acclimatization; selection, mass selection, johannson's pure line theory, genetic basis, pure line selection; hybridization, types of hybridization; methods of handling of segregating generations, pedigree method, bulk method, back cross method and various modified methods; incompatibility and male sterility; heterosis, inbreeding depression, various theories of heterosis, single cross and double cross hybrids; recurrent selection, synthetics and composites; mutation breeding; ploidy breeding; wide hybridization.

Breeding of field crops: Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Study of origin, distribution of species, wild relatives and forms, cereals, (rice, wheat, maize, millets, sorghum, bajra); pulses (redgram, greengram, blackgram, soybean); oilseeds (groundnut, sesame, sunflower, castor, mustard) etc. fibers (cotton) etc.; major breeding procedures for development of hybrids / varieties of various crops; plant genetic resources their conservation and utilization in crop improvement; ideotype concept in crop improvement (with examples of wheat, rice, maize, sunflower etc.); breeding for resistance to biotic and abiotic stresses; introduction to IPR and its related issues.

Principles of plant biotechnology: Concepts of plant biotechnology; totipotency and morphogenesis, nutritional requirements of *in-vitro* cultures; micro propagation, anther culture, pollen culture, ovule culture, embryo culture, test tube fertilization, endosperm culture, somaclonal variation, types, reasons: somatic embryogenesis and synthetic seed production technology; protoplast isolation, culture, manipulation and fusion; products of somatic hybrids and cybrids, genetic engineering; restriction enzymes;

vectors for gene transfer, gene cloning, direct and indirect method of gene transfer, transgenic plants and their applications; PCR, blotting techniques (southern, northern, and eastern); DNA finger printing using, DNA markers – RAPD, RFLP, AFLP, SSR, SNP.

HORTICULTURE (6)

Production technology of fruit crops: Horticulture: importance and status; fruit zones; classification of fruits; dormancy, chilling requirement, heat units, juvenility; physiology of flowering and fruit-bud-differentiation; parthenocarpy, C/N ratio, problems of unfruitfulness, fruit development and maturity; protection from abiotic stresses; modern propagation structures and greenhouses;Planning and Layout of orchard; orchard management practices; Cultivation of temperate, sub-tropical and tropical fruits, *viz*. apple, pear, peach, plum, almond, loquat, mango, citrus, grapes, guava, sapota, litchi, ber, phalsa, pomegranate, aonla, jamun, date-palm, papaya, banana and pineapple.

Post-harvest management of fruits and vegetables: Importance and scope of post-harvest technology of horticultural crops; post-harvest classification of fruits and vegetables; maturity indices; changes during maturity and ripening; harvesting and post-harvest operations; cold chain storage systems; causes of post-harvest losses and their control measures; principles and methods of preservation of fruits and vegetables

Ornamental horticulture: Importance and scope of floriculture in the state and country; cultivation of annuals, shrubs, hedges, climbers, bulbous plants, ornamental trees and roses; history, concept and styles of gardens and their salient features; aesthetic and bio-aesthetic planning; Preparation and maintenance of lawns, rock gardens, hedges, edges, topiary, water gardens and indoor plants.

NEMATOLOGY (3)

Types and habitats of nematodes; history, economic importance, gross morphology, biology, ecology, nature of damage and general symptomatology of plant parasitic nematodes. Principles and practices of nematode management. Diagnosis, hosts, distribution, biology, symptoms and management of important plant parasitic nematodes in India.

PLANT PATHOLOGY (11)

Economic importance, symptoms, causes, epidemiology, disease cycle, integrated disease management of field crops, vegetables and horticultural crops; Principles of Plant Pathology; Importance of Plant Pathogens, their life cycles, viz., fungi, bacteria, viruses, viroids, phytoplasma, spiroplasma, fastidious vascular bacteria, algae, protozoa and phenerogamic parasites; Principles of plant disease management, epidemiology including factors; Disease forecasting and application of biotechnology in plant disease management.

SEED TECHNOLOGY (3)

Introduction to seed production; Deterioration of crop varieties; Maintenance of genetic purity during seed production; Seed quality; Different classes of seed, principles of seed production; Seed certification; Introduction to Seed Act & WTO; Varietal identification; Seed processing; Seed treatments; Seed storage and marketing.

SOIL SCIENCE (9)

Introduction to soil science: Soil formation, rocks and minerals, weathering, soil formation factors and processes, soil profile, soil physical properties, soil water, soil temperature, soil air, ion exchange, soil reaction, soil organic matter and soil organisms.

Soil fertility, soil chemistry and nutrient management: Soil fertility, essential nutrients, their functions and deficiency symptoms; C, N and S cycles in soils; problem soils, their types and management; irrigation water quality and its use in agriculture; soil fertility evaluation and nutrient recommendations to crops; nutrient use efficiency in respect of N, P, K, S and Zn fertilizers; nutrient application and scheduling for different soils and crops.

Manures, fertilizers and agro-chemicals: Manures, their types and properties, composting; fertilizers: history and their classification; manufacturing process, properties and reaction in soil of major N, P and K fertilizers; secondary and micronutrient fertilizers; fertilizer control order; soil pollution and agrochemicals, remediation of soil contaminated with agrochemicals.

VEGETABLE SCIENCE (3)

Role of vegetables in human nutrition; fundamentals of vegetable production; types of vegetable gardening; varieties, sowing time, seed rate and cultural practices of potato, tomato, brinjal, chilli, cauliflower, peas, cowpea, cluster bean, onion, garlic, carrot, radish, okra, sweet potato, watermelon, muskmelon, bottle gourd, beet leaf and fenugreek.

Entrance Test for M. Sc. (Home Science) Programme

DEPARTMENT OF FOODS & NUTRITION

Functions of food; Cooking methods: types, merits and demerits; Food groups and the nutrients contributed by each group; Digestion, absorption, functions and deficiency/excess of major nutrients; protein quality evaluation; Concept of recommended dietary allowances; Meal planning: Dietary modifications and Principles of menu planning for different age groups, special physiological conditions, Therapeutic nutrition; Structure, basic composition and processing techniques of foods; Food processing and preservation; Institutional food management; Community nutrition and health: Methods to assess nutritional status; Public health problems and Interventions, Prophylaxis programmes, Role of national and International agencies; Food related laws and policies; Concept, significance and Principles of hygiene and sanitation; Food Adulteration.

DEPARTMENT OF EXTENSION EDUCATION AND COMMUNICATION MANAGEMENT

Home Science education in India; Home Science in State Agricultural Universities and Conventional Universities; professional, vocational and self-employment opportunities in Home Science; extension education: historical development, concept, need, importance, philosophy, principles, objectives and approaches; role of extension education in rural development; panchayati raj institutions: land grant system of education; Indian Council of Agricultural Research, State Agricultural Universities and Non Government Organizations in rural development; development programmes for women and children. Communication: concept, importance, functions, models, elements and barriers ; Communication methods and audio visual aids; psychological concepts in teaching and learning; evaluation of teaching and learning; Concept and elements of diffusion; innovation decision process; innovativeness and adopter categories; rate of adoption and factors affecting adoption; technology transfer process, social change, change agents and opinion leaders. Status, issues and challenges of rural women in agriculture; programmes for women in agriculture; women friendly technologies; agroenterprises for sustainable development; Extension training: concept, definitions, objectives, importance, nature,

types, phases, models, methods and principles; training need assesment; important training institutions in India. Programme planning: concept, importance, objectives, principles and steps; leader and leadership: monitoring and evaluation of extension programme; Five Year Plans and rural development; participatory approaches in rural development.

DEPARTMENT OF TEXTILE & APPAREL DESIGNING

Technical terminology of weaving; handloom: kinds, principal parts, functions; important motions of the handloom; weaving accessories; basic processes of weaving; basic weaves: plain, twill, satin-their variations and uses; standard sizes of woven household articles; knitting: terminology, knitting needles; stitches used in knitting; types of knits: warp and weft knits; textile: classification, terminology; fibres: manufacturing, properties and use of cotton, silk, wool, jute, linen, viscose rayon, nylon, polyester and acrylic; yarn classification; textile finishes: introduction, classification and common finishes used in textiles; cleansing agents: water, soap and detergent; stain removal and bleaches; laundry reagents: acidic and alkaline; laundry additives: stiffening agents and blues;classification of dyes: application and properties of direct, acid, basic, vat, naphthol, disperse, reactive, pigment; dyeing methods: fibre, yarn and fabric; printing methods: hand block, stencil, screen, roller, transfer, flock, duplex and resist dyeing – tie and dye and batik; common dyeing and printing defects;clothing construction: terminology; sewing equipments; general rules for taking body measurements; biological, sociological and psychological functions of clothes; elements and principles of design applied to clothing; factors affecting clothing requirements; clothing requirements for infants, toddlers, pre schoolers, elementary school children, adolescents, adults and senior citizens; clothing budget; wardrobe planning;study of traditional woven textiles of India: Dacca muslin, brocades, sarees - Jamdani, Baluchari, Pochampalli, Patola, Ikat, Kanchipuram, Chanderi, woven shawls of Kashmir, Himachal Pradesh and North Eastern states; carpets of India: Kashmir, Uttar Pradesh and Amritsar; traditional embroideries of India: Kashida of Kashmir, Chamba rumal of Himachal Pradesh, Phulkari of Punjab, Kasuti of Karnataka, chikankari of Uttar Pradesh, Kantha of Bengal, Manipuri embroidery, Kutch and Kathiawar embroideries of Gujarat.

DEPARTMENT OF FAMILY RESOURCE MANAGEMENT

Systems approach to resource management; family: types, composition and stages of family life cycle; concepts of management, resources, communication; types and steps decision making:, management process; time & energy management; work simplification; fatigue; storage principles and Mundel's classes of change; Financial demands at various stages of family life cycle; family income & types; Engel's laws of consumption; budget, credit, savings & investments, insurance & taxation; Housing needs; ownership versus rentership; selection of site; planning of house; building bye laws; construction material; types of kitchen and work triangle; Elements of art and principles of design; colour schemes; furniture and furnishings; wall, floor and window treatments; home lighting, accessories; optical illusion; table setting; Consumer education, rights Pand responsibilities; market types; demand& supply; consumers' choice; consumer problems; sources of consumer information; adulteration; standardization; govt. laws and legislations; grievance redressal mechanism; consumer organizations in India; Appropriate technology viz. health and sanitation, fuel and energy conservation, drudgery reducing, generation & segregation of household waste management, energy conservation.

DEPARTMENT OF HUMAN DEVELOPMENT AND FAMILY STUDIES

Principals of growth and development; role of heredity and environment; importance of early stimulation; common behavioral problems of children; disciplinary techniques; child study methods; prenatal counseling; stages of prenatal development; role of family, peers and society in development of children; physical, motor, social, emotional, moral and cognitive development during stages of life span; counseling and guidance during adolescence; premarital, marriage and family counseling; marital harmony and personal compatibility in marriage; changing trends in family system; laws related to marriage and family; family disorganization; crises in family life; demographic profile of women and child; children with special needs, educational provisions and rehabilitation programmes; personality patterns, approaches and personality determinants.

Annexure I

Syllabus for M.F.Sc Entrance Examination

UNIT-I: Classification and taxonomical characteristics of cultivable fisheries, crustaceans and molluscs. 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 Seas. Impact of over exploitation and climate change on fisheries resources.

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, carp and shrimp hatchery management, basic aspects of biotechnology in relation to fisheries.

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.

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-scene, gill net and tuna long line. Food chemistry, fundamentals of microbiology. General methods of fish preservation and fishery by products. Canning and packaging techniques, processing and product development techniques.

UNIT-V: 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; 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; Basics of statistics in fisheries and computer science.

M.Tech.

Number of question = 100
Marks: 100 (1 mark for each question)

Unit	Syllabus contents
	Farm Machinery & Power Engineering
Unit I	Sources of farm power; classification of tractors and internal combustion engines; review of thermodynamic principles of internal combustion (compression ignition and spark ignition) engines and deviation from ideal cycle; study of engine components, their construction, operating principles and functions; study of valves and valve mechanism, fuel and air supply, cooling, lubricating, ignition and electrical systems; study of constructional details, adjustments and operating principles of these systems; internal combustion engine fuels their properties and combustion of fuels, gasoline tests and their significance, diesel fuel tests and their significance, detonation and knocking in internal combustion engines, properties of coolants, anti freeze and anti-corrosion materials, lubricant types and their properties; engine governing systems.
Unit II	Farm mechanization: objectives and advantages; classification of farm machines; materials of construction; heat treatment; principles of operation and selection of machines used for production of crops; field capacities and economics; primary and secondary tillage equipment; forces acting on tillage tools; hitching systems and controls; draft measurement of tillage equipment; earth moving equipment, their construction and working principles: bulldozer, trencher, elevators, laser land levelleretc; sowing, planting and transplanting equipment their calibration and adjustments; minimum tillage, no-tillage and straw management equipment;fertilizer application equipment; weed control and plant protection equipment viz sprayers, dusters and their calibration, selection, constructional features of different components and adjustments.
Unit III	Principles and types of cutting mechanisms; construction and adjustments of shear and impact-type cutting mechanisms; working and constructional details of mowers, windrowers, reapers, reaper binders, forage harvesters, forage chopping and handling equipment; threshing mechanism, various types of threshers and their use, straw combines, grain combines, maize harvesting and shelling equipment, root crop harvesting equipment i.e. potato, groundnut etc., cotton picking and sugarcane harvesting equipment; principles of fruit harvesting tools and machines; horticultural tools and gadgets; importance of testing of farm machinery, use of test codes and their procedure, interpretation of test results; selection and management of farm machines for optimum performance.
Unit IV	Transmission systems, clutch, gear box, differential and final drive mechanism; familiarization of brake mechanism; study of ackerman, hydraulic steering systems and hydraulic systems; tractor power outlets: power take off, belt pulley, drawbar etc.; tractor chassis mechanics and design for tractor stability; ergonomic considerations and operational safety.
Unit V	Tractor maintenance procedure and trouble shooting; maintenance schedule after 10, 50,100, 250, 500 and 1000 hours of operation; safety hints; top end overhauling; fuel saving tips; preparing the tractor for storage; care and maintenance procedure of agricultural machinery during operation and off-season; workshop requirements/design layout for repair and maintenance of agricultural machinery.
Processing & Food Engineering	
Unit I	Introduction to heat and mass transfer and their analogous behavior steady and

unsteady state heat conduction. Fluid flow and continuity equation, Mass transfer, mixing of fluids, Thermodynamic properties and process, heat pump, refrigeration and heat engines.

Unit II Thermal and chemical properties of milk and milk products; unit operation of various dairy and food processing systems, process flow charts, working principles of equipment, design and layout of dairy plant.

Unit III Drying and dehydration, dryers, seed drying and processing, Sorption and desorption isotherm, water activity, EMC, size separation equipments; Filtration, sieving, centrifugation, Material handling equipment; Size reduction processes and machineries.

Unit IV Engineering properties of biological materials; non-Newtonian fluid and viscometry, rheological properties, force, deformation, stress, strain; elastic and plastic behavior, extrusion cooking

Unit V Storage of grains and seed, biochemical changes during storage, storage factors affecting losses, storage requirements. calculation of refrigeration load; traditional and modern grain storage structures; air movement inside the storage; design theory and design considerations of bag and bulk storage

Unit VI Planning and layout of farmstead, environmental control systems and their design; BIS Standards, Design, construction and cost estimation of farm structures; Rural roads and their construction. Drinking water standards and water treatment; Site and orientation of buildings; sewage system and its design, domestic power requirement and rural electrification.

Soil & Water Engineering

Unit I Hydrological cycle; analysis of precipitation data; abstraction from precipitation; runoff; hydrograph analysis, unit hydrograph theory and application; stream flow measurement; flood routing, hydrological reservoir and channel routing.

Unit II Hydraulics of open channel flow, energy and momentum principles, specific energy, Design of different types of irrigation channels. Irrigation water measurement: using velocity area method, water meters, weirs, notches, flumes, orifices etc. Water conveyance and control. Underground pipe line system

Unit III Mechanics of soil erosion, soil erosion types; wind and water erosion; factors affecting erosion; soil loss estimation; biological and engineering measures to control erosion; terraces and bunds; vegetative waterways; gully control structures, drop, drop inlet and chute spillways; earthen dams; water harvesting structures, farm ponds, watershed management

Unit IV Soil-water-plant relationship, water requirement of crops; consumptive use and evapotranspiration; irrigation scheduling; irrigation efficiencies; measurement of soil moisture, irrigation water and infiltration; surface, sprinkler and drip methods of irrigation; design and evaluation of irrigation methods.

Unit V Drainage coefficient; planning, design and layout of surface and sub-surface drainage systems; leaching requirement and salinity control; irrigation and drainage water quality.

Unit VI Groundwater occurrence confined and unconfined aquifers, evaluation of aquifer properties; well hydraulics; groundwater recharge. Classification of pumps; pump characteristics; pump selection and installation.

M.Sc. (Mathematics) Entrance Examination Syllabus

Algebra: Groups, subgroups, Abelian groups, non-abelian groups, cyclic groups, permutation groups; Normal subgroups, Lagrange's Theorem for finite groups, group homomorphism and quotient groups, Rings, Subrings, Ideal, prime ideal. maximal ideals; Fields, quotient field.

Linear Algebra: Vector spaces, Linear dependence and Independence of vectors, basis, dimension, linear transformations, matrix representation with respect to an ordered basis, Range space and null space, rank-nullity theorem; Rank and inverse of a matrix, determinant, solutions of systems of linear equations, consistency conditions. Eigenvalues and eigenvectors. Cayley-Hamilton theorem. Symmetric, Skewsymmetric, Hermitian, Skew-Hermitian, Orthogonal and Unitary matrices.

Real Analysis: Sequences and series of real numbers. Convergent and divergent sequences, bounded and monotone sequences, Convergence criteria for sequences of real numbers, Cauchy sequences, absolute and conditional convergence; Tests of convergence for series of positive terms-comparison test, ratio test, root test, Leibnitz test for convergence of alternating series. Functions of one variable: limit, continuity, differentiation, Rolle's Theorem, Cauchy's Taylor's theorem. Interior points, limit points, open sets, closed sets, bounded sets, connected sets, compact sets; completeness of R, Power series (of real variable) including Taylor's and Maclaurin's, domain of convergence, term-wise differentiation and integration of power series. Functions of two real variable: limit, continuity, partial derivatives, differentiability, maxima and minima. Method of Lagrange multipliers. Homogeneous functions including Euler's theorem.

Complex Analysis: Functions of a complex Variable, Differentiability and analyticity, Cauchy Riemann Equations, Power series as an analytic function, properties of line integrals, Goursat Theorem, Cauchy theorem, consequence of simply connectivity, index of a closed curves. Cauchy's integral formula, Morera's theorem, Liouville's theorem, Fundamental theorem of Algebra, Harmonic functions.

Integral Calculus: Integration as the inverse process of differentiation, definite integrals and their properties, Fundamental theorem of integral calculus. Double and triple integrals, change of order of integration. Calculating surface areas and volumes using double integrals and applications. Calculating volumes using triple integrals and applications.

A-2. Rmk 19.7.19

Differential Equations: Ordinary differential equations of the first order of the form $y'=f(x,y)$. Bernoulli's equation, exact differential equations, integrating factor, Orthogonal trajectories, Homogeneous differential equations-separable solutions, Linear differential equations of second and higher order with constant coefficients, method of variation of parameters. Cauchy-Euler equation.

Vector Calculus: Scalar and vector fields, gradient, divergence, curl and Laplacian. Scalar line integrals and vector line integrals, scalar surface integrals and vector surface integrals, Green's, Stokes and Gauss theorems and their applications.

Linear Programming: Convex sets, extreme points, convex hull, hyper plane & polyhedral Sets, convex function and concave functions, Concept of basis, basic feasible solutions, Formulation of Linear Programming Problem (LPP), Graphical Method of LPP, Simplex Method.

Laplace Transforms: Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, solution of ordinary differential equations using Laplace transform.

19/7/19