Department of Food Technology-IUST

Syllabus for Ph.D Admission Test 2018

Paper - II

Note: Each unit carries 8 Marks **Max Marks: 40**

UNIT I: Carbohydrates: structure and functional properties of mono-, oligo-, & poly-saccharides including starch, resistant starch, cellulose, pectic substances and dietary fibre, gelatinization and retrogradation of starch. Sweetners – Natural and artificial. Proteins: classification and structure of proteins in food, biochemical changes in post mortem and tenderization of muscles. 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 quality evaluation (PER, NPU, etc) , Glycemic Index water soluble and fat soluble vitamins, role of minerals in nutrition, co-factors, anti-nutrients, nutraceuticals, nutrient deficiency diseases. Chemical and biochemical changes: changes occur in foods during different processing operations.

UNIT II: 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. Fermented foods and beverages: curd, yoghurt, cheese, pickles, soya-sauce, sauerkraut, idli, dosa, vinegar, alcoholic beverages and sausage. Food spoilage: spoilage microorganisms in different food products including milk, fish, meat, egg, cereals and their products. Food Borne infections/intoxication: Toxins from microbes: pathogens and non-pathogens including Staphylococcus, Vibrio cholera, Listeria, Mycobacterium, Salmonella, Shigella, Escherichia, Bacillus, Clostridium, and Aspergillus genera. Microbiological criteria of foods and their significance Mycotoxins. Aflatoxins – Patulin, rapid detection methods.

UNIT III: Processing principles: thermal processing, chilling, freezing, dehydration, addition of preservatives and food additives, irradiation, fermentation, hurdle technology, intermediate moisture foods, extrusion technology. Membrane

Technology - Pressure activated membrane processes: micro- filtration, UF, NF and RO and their industrial application. Supercritical fluid extraction, Microwave and Radio Frequency Processing, High Pressure Processing, Ultrasonic processing. Newer Techniques in Food Processing: Application of technologies of high intensity light, pulse electric field, ohmic heating, IR heating, inductive heating and pulsed X-rays in food processing and preservation irradiation Nanotechnology: Principles and applications in foods, Encapsulation Technology. Food packaging and storage: packaging materials, aseptic packaging, controlled and modified atmosphere storage.

Cereal processing and products: milling of rice, wheat, and maize, parboiling of paddy, bread, biscuits, extruded products and ready to eat breakfast foods. Oil processing: expelling, solvent extraction, refining and hydrogenation. Essential oils, recovery methods for essential oils. Composition of essential oils Spice extracts, oleoresins. Fruits and vegetables processing: extraction, clarification, concentration and packaging of fruit juice, jam, jelly, marmalade, squash, candies, tomato sauce, ketchup, and puree, potato chips, pickles. Processing of tea, coffee, cocoa, spice, extraction of essential oils and oleoresins from spices. Waste utilization: pectin from fruit wastes, uses of by-products from rice milling.

Milk and milk products processing: pasteurization and sterilization, cream, butter, ghee, ice-cream, cheese and milk powder. Processing of animal products: drying, canning, and freezing of fish and meat; production of egg powder.

Food standards and quality maintenance: FSSAI, CAC, SPS-TBT, Agmark, ISI, HACCP, food plant sanitation and cleaning in place (CIP). Concepts of quality management: Quality assurance, Total Quality Management; GMP/GHP; GLP, GAP; NABL accreditation and NABL accredited Laboratories in India

UNIT IV: Analytics and Instrumentation of UV spectra-Instrumentation, FTIR Spectroscopy, Fluorescence Spectroscopy. Types of chromatographic techniques: paper, TLC, HPTLC, HPLC. GC-MS, LC-MS. Examining food microstructures: light microscopy, transmission electron microscopy, scanning electron microscopy, other instrumentation and techniques, image analysis: image acquisition, image processing, measurement analysis.

UNIT V: Mass and energy balance; Momentum transfer: Flow rate and pressure drop relationships for Newtonian fluids flowing through pipe, Reynolds number. Food rheology. Heat transfer: heat transfer by conduction, convection, radiation, heat exchangers. Mass transfer: molecular diffusion and Fick's law, conduction and convective mass transfer, permeability through single and multilayer films. Mass transfer operations: psychrometry, humidification and dehumidification operations.

Mechanical operations: size reduction of solids, high pressure homogenization, filtration, centrifugation, settling, sieving, mixing & agitation of liquid. Thermal operations: thermal sterilization, evaporation of liquid foods, hot air drying of solids, spray and freeze-drying, freezing and crystallization.