

SYLLABUS FOR BCS (WRITTEN) EXAMINATION

CERAMIC ENGINEERING

(POST RELATED)

Subject Code: 491

Total Marks-200

Part-I

Marks: 100

- | | |
|--|-----------|
| 1. Materials: | 25 |
| <ul style="list-style-type: none">(a) Basic concept, importance and properties of materials(b) Science and engineering of materials, Historical perspective(c) Classifications of materials- Indigenous, Advanced, Modern and smart materials(d) Engineering materials and its scopes | |
| 2. Ceramics: | 25 |
| <ul style="list-style-type: none">(a) Concept, Classification, Sources, and scope of ceramics(b) Historical Development and Scientific explanation(c) Raw materials- natural and synthetically prepared(d) Classification of ceramic products, Refractories, Tiles, White wares, Ceramic Insulators, Abrasive | |
| 3. Microstructure and Crystallography: | 25 |
| <ul style="list-style-type: none">(a) Concept of microstructure of ceramics and its relationship with property(b) Crystalline, Amorphous and polycrystalline solids and their bonding(c) Crystal, crystal structures, lattice planes and crystal imperfections(d) Atomic packing and its imperfections effect | |
| 4. Manufacturing of Ceramics: | 25 |
| <ul style="list-style-type: none">(a) Particle mechanics and Rheology(b) Beneficiation and Forming processes(c) Sintering and development of microstructure(d) Special furnaces for ceramic processing | |

SYLLABUS FOR BCS (WRITTEN) EXAMINATION

CERAMIC ENGINEERING

Part-II

Marks: 100

- | | |
|--|-----------|
| 1. Properties of Ceramics: | 25 |
| <ul style="list-style-type: none">(a) General properties(b) Mechanical properties and behavior(c) Electrical, Optical, Thermal, Magnetic, and Dielectric Properties of Ceramics(d) Properties of engineering ceramics, porous ceramics, ceramic cutting tools and ceramic Bearing | |
| 2. Characterization of Ceramics: | 25 |
| <ul style="list-style-type: none">(a) Spectroscopic, X-ray techniques(b) Microscopic and microstructural analysis(c) Mechanical and non-destructive testing(d) Thermal analysis and Quality control | |
| 3. Advanced Ceramics: | 25 |
| <ul style="list-style-type: none">(a) Concept of advanced ceramics and different forms(b) Ceramic for biomedical, optical and electrochemical cells(c) Ceramic substrate, membrane, capacitors and insulators(d) Electro-optic ceramics and devices- Sensor and super conductor | |
| 4. Applications and Markets of Ceramics: | 25 |
| <ul style="list-style-type: none">(a) Applications of ceramics(b) Prospect and market of ceramic industries in Bangladesh(c) Impact of ceramic industries on national economy(d) Future of ceramic industries in Bangladesh | |

SYLLABUS FOR BCS (WRITTEN) EXAMINATION

GLASS ENGINEERING

(POST RELATED)

Subject Code: 492

Total Marks-200

Part-I

Marks: 100

- | | | |
|---|---|-----------|
| 1. Introduction to Glass: | | 25 |
| | (a) Basic concept, Historical perspective | |
| | (b) Batch materials and minor ingredients | |
| | (c) Glass fundamentals | |
| | (d) Applications and prospect of glass industries in Bangladesh. | |
| 2. Glass Characteristics and Properties: | | 25 |
| | (a) Structural concept and general characteristics | |
| | (b) Mineralogical and chemical analysis of sand | |
| | (c) Physical, chemical and Rheological properties of glass | |
| | (d) Optical, Electrical, thermal, mechanical and surface properties | |
| 3. Glass Manufacturing: | | 25 |
| | (a) Raw Materials and Composition of glass | |
| | (b) Melting, forming and heat treatment of glass | |
| | (c) Glass cullet, hot spot and foam line | |
| | (d) Kinetic considerations and vitrification | |
| 4. Quality Control and Inspection: | | 25 |
| | (a) Industrial concept of glass rerolling and decolorizing | |
| | (b) Defects in commercial glasses | |
| | (c) Dust and emission control | |
| | (d) Finishing and Inspection | |

SYLLABUS FOR BCS (WRITTEN) EXAMINATION

Part-II

Marks: 100

- | | |
|--|-----------|
| 1. Furnaces and Fuel Technology: | 25 |
| (a) Glass furnaces and their design, construction and operation | |
| (b) Heat losses and heat recovery system of a glass furnace and their evaluation | |
| (c) Gas dynamics of furnaces | |
| (d) Furnace operating fuels and their economic considerations | |
| 2. Advanced Glass: | 25 |
| (a) Optical fiber, fiber-glass reinforced composites | |
| (b) Safety, reflective, coated and metallic glasses | |
| (c) Special purposes glasses | |
| (d) Recycling of glasses | |
| 3. Glass-Ceramics: | 25 |
| (a) Concept of glass-ceramics and its special applications | |
| (b) Processing of Glass and Glass-Ceramics | |
| (c) Composition systems and solid state reactions | |
| (d) Effect of heat treatment on microstructure to control key properties | |
| 4. Multifunctional Bioactive Glass and Bioceramics: | 25 |
| (a) Bioinert and Bioactive ceramics and their fabrication methods | |
| (b) Bioactive glass and Bioceramics for various applications. | |
| (c) Current applications, Adverse effect and Future of Nanotechnology | |

SYLLABUS FOR BCS (WRITTEN) EXAMINATION

FOOD ENGINEERING

(POST RELATED)

Subject Code: 478

Total Marks: - 200

Part-I

Marks-100

Food Engineering and Technology-40

Material balance: mass balance, energy balance; rheological properties; kinetics of processed food; physical, chemical, mechanical, thermal and electromagnetic properties of food. Unit operation in food engineering: fluid flow, heat transfer, mass transfer, mode of heat transfer, freezing, evaporation, drying, dehydration, quality aspects as affected by drying parameters and problems on design aspects of different types of dryers. Packaging: general principles, requirements and function of containers, different types of packaging materials. Principles and methods of food preservation, canning, fermentation, pickling, salting and novel technique of food preservation – sound, light, high-pressure, non-thermal- pulsed-electric fields, surface and edible coating, encapsulation, irradiation.

Food Microbiology and Hygiene-30

General characteristics and growth factors of mould, yeast, bacteria and virus. Morphological characteristics, Microbiology of food: animal, plant and canned food, causes of spoilage, types of spoilage of canned food, spoilage of canned meat and fish. Thermal process calculation, microbial for production: alcoholic beverage, vinegar, yogurt, probiotic drinks, single cell proteins and other fermented foods. Food-borne diseases, toxins, food-borne infection, food intoxication. Control and prevention of food-borne diseases. Intrinsic and extrinsic factors in foods. Methods for controlling microbial growth in food, Enzymatic reactions involving food.

Food Chemistry and Analysis-30

Chemistry of water, carbohydrate, protein, lipid, vitamins and minerals; Food colour & flavour, enzyme, food pigments, enzymatic and non-enzymatic browning reactions. Proximate composition: determination of moisture content, fat content, sugar, protein, vitamins & minerals. Food analysis using Gas Chromatography (GC), High Performance Liquid chromatography (HPLC), texture analyser, rheometer, Thin Layer Chromatography (TLC), atomic absorption spectroscopy, mass spectroscopy and Differential Scanning Calorimetry (DSC).

SYLLABUS FOR BCS (WRITTEN) EXAMINATION

FOOD ENGINEERING

Part-II

Marks- 100

Food Engineering and Technology-40

Sugar, dairy, fish and meat plant design and layout. Manufacture of sugar, refining process and by-products of sugar. Dairy products processing – cheese, butter, fermented milk products, ice-cream, condensed milk, ghee, milk powder, skim milk and dehydrated milk. Slaughtering, cattle dressing and chill cooling, process of poultry, common processes of fish and meat. Cleaning, sanitation and waste management in a sugar, dairy, fish and meat plant. Beverage and fermentation technology – soft drinks and alcoholic beverage. Bread, biscuit, cake, pasta, noodles and confectionary products. Tea, coffee, cocoa and spices technology. Processing of tea, coffee and cocoa. Classification of spices, chemical composition and flavouring components of spices. Fats and oils technology, refining of fats and oils, preparation of margarine, butter, salad, cooking and frying oil, shortening. Design of heat exchanger and evaporator. Design of mechanical separation process such as filtration, sedimentation, centrifugation and distillation.

Food Quality and Food Safety Management-30

Food quality control and its elements. Concept of food hazards; principles, type and components of risk assessment. Pre-requisite control program: Good Manufacturing Practices (GMP), Good Laboratory Practices (GLP), Good Hygiene Practices (GHP), Good Documentation Practices (GDP), Hazard Analysis Critical Control Point (HACCP). Food Safety laws and standards: Food safety, Food Safety Management System (FSMS), ISO and CODEX, Food Safety Auditing, Inspection, Monitoring, Food Regulations and Compliance, Principles for uses of food additives, Food Adulteration and Misbranding, Product information and consumer awareness, Food recall and traceability.

Post-harvest Management-30

Introduction to horticultural crops in Bangladesh. Pre-harvest factors. Unit operations involve in fresh produce handling: harvesting, cleaning, sorting, grading, handling, pre-packaging, Packaging, transportation, and distribution of fresh fruits and vegetables. Post-harvest management: physiology and biochemistry of fruits and vegetables. Post-harvest diseases. Cold storage design, controlled atmosphere (CA) storage, modified atmosphere (MAP) storage and silo. Value added products from fruits and vegetables – Jam, Jelly, marmalade, preserve, squash, vinegar, fruits and vegetables juices, pickle, chutneys, sauces, ketchup, chips and French fries. Parboiling, drying, milling, storage of rice.