

**FURTHER DETAILS REGARDING MAIN TOPICS OF
PROGRAMME NO. 05/2015 (Item No. 1 & 2)**

DEPUTY ENGINEER

**(PART I – GENERAL CATEGORY &
PART II – SOCIETY CATEGORY)**

KERALA CO-OPERATIVE MILK MARKETING FEDERATION LTD.

(CATEGORY NO. 343/2012 & 344/2012)

PART I – MECHANICAL ENGINEERING

Thermodynamics: Concepts of thermodynamics, Laws of thermodynamics, Carnot cycle, Air standard cycles, P-V and T-S diagrams.

Fluid Mechanics and Hydraulic Machines: Fluid properties, Fluid statics, Pascal's law Continuity equation, Bernaulli's equation, Instruments for measuring rate of flow. Pitot tube, Manomteres. Flow through a pipe, Coefficient of friction. Hydraulic resistances, Calculation of head loss. Hydraulic pumps and turbines, Eulers equation for energy transfer, draft tube, cavitation, Positive displacement pumps.

Heat Transfer: Modes of heat transfer, equation of heat conduction. Heat conduction through plates, cylinder and sphere, calculation of thermal resistances, Newton' law of cooling, Convective heat transfer coefficient, overall heat transfer coefficient, Principles in radiation heat transfer, Monochromatic emissive power, emissivity, absortptivity, reflectivity and transmittivity, Radiation shape factor, radiocity and irradiation. Solar constant.

Elements of power cycles: Calorific value, combustion of liquid, solid and gaseous fuels, Boilers, properties of steam, Rankine cycle, Brayton cycle, methods for improving the efficiency of these cycles.

Refrigeration and air conditioning: Vapour compression refrigeration system. Types of refrigerants, Pscychrometry, Psychrometric properties, Psychrometric processes, air washers, human comfort air conditioning, industrial air conditioning.

Power transmission devices: Belt, rope, chain and gear drives. Classification of gears, gear trains, coupling, clutches and brakes.

Engineering Materials: Mechanical properties of engineering materials, Tensile test, Hardness test, Impact test, Ferrous and non-ferrous metals, plastics abrasive materials, ceramics, silicon and glasses.

Manufacturing process: Casting, forging, rolling, welding, soldering and brazing. Machining processes, turning, taper turning, thread cutting, shaping, drilling, grinding, milling. Principle, application and advantages of CNC machines. Electro chemical and discharge machining.

PART II – ELECTRICAL ENGINEERING

Electric circuits : Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady state analysis, resonance, basic filter concept; ideal current and voltage sources, Thevenin's, Norton's, superposition and Maximum power transfer theorems, two port network, three phase circuits;

Power Systems: Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission.

Electrical and Electronic Measurements: Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Electromagnetics: Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distribution; Ampere's and Biot-Savart's law; inductance; dielectrics; capacitance.

Power Electronics and Drives: Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

Electrical Machines: Single phase transformer – equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers – connections, parallel operation; auto-transformer; energy conversion principles; DC machines – types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors – principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Electrical system Design: Medium and HV installations – selection of cables and cable glands, guidelines for cable installation. Installation of induction motors. Design of distribution systems with light power and motor loads. Selection and installation of transformers, switchgears and protective devices – Design of indoor and outdoor 11 KV substation upto 630 KVA - Design of earthing system - Pipe, plate and mat earthing – lightning arresters. Metering and protection. HT and LT breaker control panels .Selection of standby generator – installation and its protection. Pre-commissioning tests of cables, transformers and generators.

PART III – CIVIL ENGINEERING

Resolution of forces, Moment of inertia, Friction, Simple machines, Stresses and strain, Temperature stresses and strain, Principal stresses and strains, Theories of failure, Theory of simple bending, Shear force and bending moment, Shear stress distribution in beams, Equation of continuity, Bernoulli's theorem and its applications, Weirs and notches, Open channel flow, Hydraulic jump, Torsion formula, Direct and bending stresses, Analysis of simple frames, Strain energy and impact loading, Columns and struts, Common building materials, Bearing capacity of soil, Components of a building, Ground improvement.

PART IV – DAIRY ENGINEERING

Classification of dairy plants, Location of Dairy plants, Selection of site.

Dairy building planning, Preparation of process schedule, basis of dairy plant layout, importance of planning, principles of dairy layout, Space requirements for dairy plants, General points of consideration for designing dairy plants, Types of layouts. Arrangement of different sections in dairy, Locating the process section, utility/service section, offices and workshop, Arrangement of equipment, milk piping, and other utilities.

Dairy floors, general requirement of dairy floor finishes, floor for different section of dairy, Foundations, walls, doors and windows, Drains and drain layout for small and large dairies, Ventilation, fly control, mold prevention. Illumination in dairy plants.

Materials and sanitary features of the dairy equipment, care and maintenance of pipes & fittings.

Types, construction, care and maintenance of sanitary pumps.

Milk receiving equipments: Equipments for can reception and tanker reception.

Can washers and bottle washers, Milk storage tanks.

CIP cleaning and designing of CIP system.

Separation of milk: Principles of centrifugal separation, different types of centrifuges and their application in Dairy industry. Clarifiers, cream separators. Care and maintenance of separators and clarifiers.

Homogenization: classification of homogenizers, single stage and two stage homogenizers, operation and power requirement, care and maintenance,

Pasteurization: Batch, flash and continuous (HTST) pasteurizers. Use of flow diversion valves, pasteurizer controls, operation, care and maintenance. Sterilization: Different type of sterilizers. In bottle sterilizers, care and maintenance of sterilizers.

UHT sterilization: Different methods, operation, care and maintenance of UHT plants. Aseptic packaging and equipments.

Filling equipments: Operation and working of different types of bottle fillers and capping machine. Pouch filling machine, bulk handling system and aseptic filling. Care and maintenance of filling machines.

Evaporation: Basic principles of evaporators, construction and operation, different types of evaporators used in Dairy industry. Basic concepts of multiple effect evaporators. Principle of Thermo compressor and MVR system. Thermodynamics of TVR and MVR.

Drying: Principle of drying, rate of drying-constant and falling rate, equilibrium moisture content, bound and unbound moisture, free moisture, critical moisture content.

Classification of dryers-spray and drum dryers. Drum dryers: Construction, important parts, types and mechanism of feed distribution, factors affecting capacity, operation, care and maintenance.

Spray dryers: Various stages of spray drying, principal parts of spray dryer, types, air heating systems, Atomization and feeding system, selection of atomizer. Dry collectors- Cyclone separator, bag filter and electro static separator, wet scrubbers, selection of type of powder collecting device, control systems in spray dryer. Care and maintenance of spray dryers. Instantization of powder.

Fluidization: Mechanisms of fluidization, characteristics of gas-fluidization systems, fluidized bed dryer.

Mechanization and equipment used in manufacture of indigenous dairy products, butter and ghee making machine

Ice-cream and cheese making equipment's-operation- care and maintenance

Dairy farm mechanization- milking machines, milking parlors, rotating milking parlors, ETP. Slurry pumps-care and maintenance.

PART V – GENERAL KNOWLEDGE, CURRENT AFFAIRS AND RENAISSANCE IN KERALA

General knowledge, Current Affairs and Renaissance in Kerala

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.