

**FURTHER DETAILS REGARDING MAIN TOPICS OF
PROGRAMME NO.7/2013 (Item No.15)
ASSISTANT ENGINEER
KERALA AGRO MACHINERY CORPORATION LTD.
(CATEGORY NO.382/2010)**

Part I - Mechanical Engineering

Basic concepts and definitions, Gas laws, specific heat -Universal gas constant. Isothermal, adiabatic and polytropic processes, work done, heat transferred, internal energy and entropy. Basic laws of heat transfer. Fourier's law of heat conduction, Newton's law of cooling Steffen Boltzmann's law. Air conditioning system: Concept of Air conditioning, psychometry, psychometric properties. Refrigeration: Unit of refrigeration, COP.

Power transmission elements: Belt Drive, velocity ratio of belt drive, length of belt, slip in belt. Power transmitted, Ratio of tensions. Rope drive, chain drive and gear drive, Types of gear trains.

Classifications of hydraulic turbines, types of hydraulic turbines, draft tube, cavitations, selection of hydraulic turbines. Classification of pumps, positive displacement and roto dynamic pumps.

Steam turbines: Classification of steam turbines.

Basic concepts of CNC, DNC, CIM and CAD/CAM.

Part II Automobile Engineering

Cycles, Otto and Diesel Cycles, Air standard efficiency. I.C. Engines: Classification of I.C Engines, Different parts of I.C engines, Working of two stroke and four stroke engines, petrol and diesel engines-air intake system, exhaust system, fuel supply system, ignition system, lubrication system, cooling system and engine starting system-Performance of I.C. engines, advantage of MPFI and CRDI over conventional system.

Introduction: Types of chassis layout with reference to power plant locations and drive. Vehicle frames. Various types of frames.

Front axle and Steering System: Types of front axle. Steering geometry. Ackerman and Davis steering system. Power and Power assisted steering.

Propeller shaft. Universal joints. Constant velocity universal joints. Front wheel drive. Final Drive Differential: Different types of final drive. Worm and worm wheel, Straight bevel gear, Spiral bevel gear and hypoid gear final drives. Differential principles. Types of loads acting on rear axles. Rear axle housing.

Suspension System: Need of suspension system, types of suspension, suspension springs. Braking System: Classification of brakes, drum brake & disc brakes. Theory of braking. Mechanical hydraulic and Pneumatic brakes. Servo brake. Anti-lock braking systems.

Pollutants- sources-formation-effects-transient operational effects on pollution. SI engine Combustion and Pollutant Formation: Chemistry of SI engine Combustion, HC and CO formation in 4 stroke and 2 stroke SI engines, NO formation in SI Engines, Effect of operating variables on emission formation. CI engine Combustion and Emissions: Basic of diesel combustion-Smoke emission in diesel engines-Particulate emission in diesel engines. Use of unleaded petrol.

Part III -Electrical Engineering

Kirchhoff's Laws, Formation of network equations by mesh current method, Matrix representation, Solution of network equations by matrix method - Star delta conversion. Magnetic circuits, mmf, field strength, flux density, reluctance, permeability - comparison of electric and magnetic circuits - force on current carrying conductor in magnetic field. Electromagnetic Induction, Faraday's laws, lenz's law - statically and dynamically induced emf self and mutual inductance, coupling coefficient.

Alternating current fundamentals - generation of AC -frequency, period, average and r m s value, form factor, peak factor, phasor representation - j operator - power and power factor -solution of RLC series and parallel Circuits.

DC machine - principle of operation of DC generator - e m f equation - types of generators. DC motor - principle of operation of DC motor - back emf- need for starter - losses and efficiency - type of motors - applications.

Transformer - principle of operation -emf equation, losses and efficiency. Three phase system - generation of three phase voltage - star and delta system - relation between line and phase voltages and currents - phasor representation of three phase system. Induction motors - principle of operation of three phase induction motors - applications of cage and slip ring induction motor - single phase induction motors - capacitor start / run, shaded pole - universal motors - Applications. Synchronous generator (Alternator) - principles of operation and types.

Requirements of good lighting system - working principle of incandescent lamp, Fluorescent lamp and mercury vapor lamp-energy efficient lamps (CFL,LED lights), need for energy management and power quality, home energy management.

Part IV- Agricultural Engineering

Ideal and real fluids, properties of fluids; hydrostatic pressure and its measurement; continuity equation;-Bernoulli's theorem: laminar and turbulent flow in pipes, Darcy- Weisbach and Hazen-Williams equations, Moody's diagram; flow through orifices and notches; flow in open channels. Engineering properties of soils; fundamental definitions and relationships.

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

Simultaneous heat and mass transfer in agricultural processing operations. Material and energy balances in food processing systems; water activity, sorption and desorption isotherms; centrifugal separation of solids, liquids and gases; kinetics of microbial death -pasteurization and sterilization of liquid foods; preservation of food by cooling and freezing; refrigeration and cold storage basics and applications.

Mechanics and energy requirement in size reduction of granular solids; particle size analysis for comminuted solids; size separation by screening; fluidization of granular solids-pneumatic, bucket, screw and belt conveying; cleaning and grading; Effectiveness of grain cleaners. Sources of power on the farm-human, animal, mechanical, electrical, wind, solar and biomass; bio-fuels; design and selection of machine elements - gears, pulleys, chains and sprockets and belts; overload safety devices used in farm machinery; measurement of force, torque, speed, displacement and acceleration on machine elements. Tractors and power tillers - type, selection, maintenance and repair.

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.