

SYLLABUS FOR THE POST OF SENIOR INSTRUCTOR



SYLLABUS AGRICULTURAL ENGINEERING (Diploma STANDARED)

The syllabus should not be considered as the only source of information while preparing for the examination. Keeping in view the nature of examination, all matters falling within the realm of the subject concerned will have to be studied by the candidate as questions can be asked on all relevant matters under the subject. Candidates appearing for the examination should also prepare themselves for answering questions that may be asked on the current/latest developments/Acts taking place under the subject(s) although those topics may not have been specifically included in the syllabus.

1. Farm Power and Machinery :

IC Engine: Basic classification, components, material of construction and their working principle. CI and SI engines and their fundamental differences Working principle of 2-stroke and 4-stroke engines. Valve timing, ignition timing, and firing order. Power efficiencies and their measurements. Fuel and combustion: Important qualities of CI and SI engine fuels, and their rating. Combustion in CI and SI engines. Fuel system of CI and SI engines. Ignition system: Battery ignition system, magneto ignition system, spark plug. Intake and exhaust systems: types of air cleaner, mufflers, super chargers and turbo chargers. Diesel exhaust treatment systems like DPF, DOC and catalytic converter. Cooling system: Purpose and types of cooling, heat transfer during cooling, coolant and antifreeze, cooling system maintenance. Lubrication system: Theory of lubrication, types and properties of lubricant, types of lubrication system and their maintenance.

Various sources of farm power: Mechanical, electrical and renewable sources. Status of farm power in India. Types of off road vehicles. Trends in tractor design. Engine features: Combustion chamber, engine balancing, and flywheel. Engine performance characteristics: Torque, power and fuel consumption. Power transmission system of tractor: Clutch, gearbox, differential, final drive. PTO and brake. Tractor steering system, components and their adjustments. Electrical and electronic system: Alternator, starter motor, battery and wiring harness. Power tiller: Clutch, transmission gear, steering and brake. Tractor, power tiller and implement cost estimation, break even analysis.

Scope, need and constraints of mechanization. Types of implements: Mounted, semi mounted, trailed and self-propelled. Implement performance parameters: Field capacity, field efficiency. Tillage implements: Tillage methods, Mould board plough, disc plough, chisel plough, subsoiler, cultivator, harrows, rotary plough, lister, ridger, puddler and leveler.

Sowing and planting equipment: Methods of sowing, functions, types of furrow opener and metering mechanism. Precision planting. Seed drill and planter: Power transmission system and calibration. No-till drill, strip-till drill and transplanter. Plant protection equipment: Principles, types of sprayers, dusters and their components. Types of. Interculture equipment: Manual and power operated. Harvesting equipment: Principles of cutting. Shear type harvesting devices: Mower, reaper, binder, windrower, and their adjustment. Threshing equipment: Principles of threshing, various types of threshers, and types of threshing cylinders. Thresher performance analysis.

2. Agro-energy :

Energy requirements of agricultural operations and agro-processing. Selection, installation, safety and maintenance of electric motors for agricultural applications. Solar (thermal and photovoltaic), wind and bio-gas energy and their utilization in agriculture. Gasification of biomass for running IC engines and for electric power generation. Energy efficient cooking stoves and alternate cooking fuels. Distribution of electricity for agricultural and agro-industrial applications.

3. Soil and Water Conservation :

Scope of soil and water conservation. Mechanics and types of erosion, their causes. Rainfall, runoff and sedimentation relationships and their measurement. Soil erosion control measures - biological and engineering including stream bank protection-vegetative barriers, contour bunds, contour trenches, contour stone walls, contour ditches, terraces, outlets and grassed waterways. Gully control structures - temporary and permanent - design of permanent soil conservation structures such as chute, drop and drop inlet spillways. Design of farm ponds and percolation ponds. Principles of flood control-flood routing. Watershed Management - investigation, planning and implementation - selection of priority areas and water shed work plan, water harvesting and moisture conservation. Land development - levelling, estimation of earth volumes and costing. Wind Erosion process - design of shelter belts and wind brakes and their management.

4. Hydraulic Machine

Water lifting devices for Agril. use. Classification of water lifting devices Construction, working principle, Installation, limitation, scope for development. Tube well Engineering. Selection of site for tube well. Rigs, types of rotary and percussion for drilling. Tube well construction, Installation and working. Drilling of tube wells and construction of open wells. Preparation of well logs, types of strainer and its advantages. Cavity tube well and bamboo tube well. Pumps maintenance, Reciprocating pump, Principle and operation, Centrifugal pumps, principle and operation. Types of impeller. Installation of centrifugal pump, Pumps characteristics, performance curve, Effect of speed and impeller diameter on pump performance, trouble shooting and remedies, Turbine pump, deep well submersible jet pump, Operation, Maintenance, trouble shooting and remedies.

5. Irrigation and Drainage Engineering

Sources of irrigation water, measurement of irrigation water, water lifts and irrigation pumps. Soil-plant-water relationships, crop water requirement, irrigation efficiencies, irrigation scheduling. Land grading and field layout for efficient irrigation systems; water conveyance and its control. Introductory concept of farm irrigation methods: border, check basin, furrow, sprinkler and drip. Drainage: importance and problems, drainage co-efficient, types of surface and subsurface drainage systems

6. Farm Building Structure

Importance of planning, Improved Farming Practice, Equipment and their Importance. Farm layout selection and acquisition of site measurement of farm, Bum house, Piggery, poultry, house. iii) Planning of various machineries, supplies, enterprises related to farm structure, their economic aspect and utility. Different types of material use in construction Description of engineering material. Bricks- Classification, uses, properties of good brick and testing of brick as per IS 3495 iv) Sand-characteristics of good quality work for mortar and concrete work. Storage house structure. Raw material storage, storage house of agricultural food and feed product. Types, construction details farm grains bins and godowns, silos, Bunker (in brief) Livestock Farm, Types, construction details, capacity & functional requirements, Fencing-types, Estimate of fencing, Rural Sanitation Agricultural Workshop, Septic Tank, soak pit, Bore hole, latrines, trench latrine. Rural Road & Drainage, idea of machine foundation, Installation of machine on platform, Pump house, Bio Gas Plant - Plant and its specification, Threshing floor, Implement sheds



Agricultural Process Engineering

Concept of water activity; types of moisture; Moisture measurements of grain; Equilibrium moisture content and models. Drying facilities of agricultural produce: Psychrometric, theory of grain drying, drying methods, different types of grain dryers; Dryer performance; Solar dryers. Milling of cereals, pulses & oilseeds: Milling of wheat, paddy and pulses; Parboiling of paddy; Processing of oilseed, oil extraction methods. Storage of agricultural produce: physiology of food grain during storage; problems of grain storage and their measures; Moisture migration; source of infestation. Grain storage structure; Different types of improved storage structures; Aeration and fumigation; Storage of agricultural perishables. systems.