

24. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF TEACHING ASSOCIATE IN AGRICULTURAL ENGINEERING

Unit 1: Soil and Water Conservation Engineering–

Hydrological cycle and measurement of its components; Precipitation-analysis of precipitation data; runoff estimation; Hydrograph analysis, Unit hydrograph Infiltration – Indices and equations, drought and its classification. Mechanics of soil erosion - wind and water erosion: soil erosion types, factors affecting erosion; Soil loss measurement techniques; 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 and its techniques. Universal Soil Loss Equation. Watershed Management, watershed characterization and land use capability classification; water budgeting in watershed, rainwater harvesting, check dams and farm ponds. Darcy's Law, steady and unsteady flow in confined and unconfined aquifers.

Unit 2: Irrigation and Drainage Engineering–

Water requirement of crops; consumptive use and evapotranspiration; measurement of infiltration, soil moisture & Water requirement. Design of irrigation channels and underground pipelines; irrigation scheduling; surface, sprinkler and micro irrigation methods, design and evaluation of irrigation methods; irrigation efficiencies. Measurement of irrigation water. Classification of pumps; pump characteristics; pump selection and installation. Planning, design and layout of surface and sub-surface drainage systems; Drainage coefficient; leaching requirement.

Unit 3: Agricultural Structures and Process Engineering-

Site selection, design and construction of farm steps – farm house, cattle shed, dairy barn, poultry house, goat housing, machinery and implement sheds, storage structure for food grains, feed and forage, construction of silos. Green house technology: Introduction of green and net house, Types of Green Houses. Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Importance of Engineering properties such as physical, thermal, rheological and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Basic concepts of cleaning & grading, drying and dehydration. drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, circulatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Unit 4: Dairy Processing Engineering –

Dairy development in India, Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Unit operation of various dairy and food processing systems. Cleaning of dairy utensils, Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation. Preparation methods and equipment for manufacture of cheese, paneer, shrikhand, butter and ice cream, Filling and packaging of दूध and milk products; Spray and roller drying; Dairy plant design and layout, Plant utilities.

Unit 5: Farm Power

Sources of farm power, Status of farm mechanization in India. Thermodynamic principles of I.C. engines; I.C. engine cycles; Engine components, diesel vs petrol ignition engines, two stroke & four stroke engines, various systems of diesel and petrol engines– fuel supply, cooling, lubrication, ignition and power transmission. Clutch & Brakes. Calculation of power, Torque heat load & power losses. Power tiller, farm tractors and types, design,

mechanical and power steering, tractor chassis mechanics, hitching systems and hydraulic control, for tractors, automatic position control, draft control system used in tractors, types of dynamometers, tractor testing.

Unit 6: Farm Machinery

Animal and power operated equipments – (design, construction, operation & maintenance) of tillage, seeding, land development, sowing, calibration of seed drills, zero ferti-drills, intercultivation, planters – corn planters, potato planters, sugarcane planters, rice trans planters, vegetable trans planters, Plant protection equipment – manual and power operated sprayers and dusters, calibration of sprayers, harvesting equipment – mower, reaper, combine harvester, potato harvester, thresher- different types, installation, operation and safety considerations, calculation of field capacity, field efficiency and cost analysis of implements.

Unit 7: Renewable Energy

Classification of energy sources, contribution of these sources in agricultural sector, biomass, types of biogas plants – design, construction, operation and maintenance; gasifiers, biogas, bio alcohol, biodiesel and bio oil production and their utilization, Briquetting. Introduction of solar energy, collection and their application, solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photo voltaic system and their applications. Solar radiation and its measurements. Introduction of wind energy and their applications. Construction and working of wind mill, applications of wind energy in irrigation.

Unit 8: Surveying and Leveling

Measurement of distance and area; instruments for surveying and leveling; chain surveying, Compass Survey, methods of traversing; measurement of angles and bearings, plane table surveying; Leveling; theodolite, traversing; contouring; total station, introduction to GPS survey.

Unit 9: Computer Application in Agriculture engineering-

Application of microprocessors in data acquisition and control of agricultural engineering processes. Computer introduction, input / output devices, central processing unit, memory devices, operating systems, processors, keyboards and printers. Use of ICT in agricultural engineering, Drone operated aerial spray.
