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Agriculture Engineering Syllabus for Uttarakhand State Civil Services Main Exam-2011

AGRICULTURAL ENGINEERING

PAPER-I

1. Fluid Mechanics: Fluid properties, units and dimensions; mass, momentum and energy conservation principles; special cases of Navier-stoke equation; vorticity, flow of fluids in pipes and channels; friction factor; turbulence; instruments and measurement systems.

2. Heat and Mass Transfer: Thermal properties of materials, units and dimensions; steady state and transient heat conduction; natural and forced convection; boiling, condensation; thermal radiation heat exchangers; heat-mass transfer analogy; fick's laws' psychrometrics; analysis of heat and mass transfer processes; instruments and measurements systems.

3. Surveying, Levelling and Land Development : Linear Measurements; different surveying devices and methods; land grading and leveling; contouring and terracing, earth work estimation; land development, budgeting, power driven earth moving machinery, bullock drawn land leveling and terrace construction machinery.

4. Pumps: Design, construction, performance characterization, selection, installation, servicing and maintenance of reciprocating, centrifugal, gear, turbine, submersible, propeller, jet and air lift pumps and hydraulic rams; renewable and non-renewable power sources for pumps.

5. Process and Food Engineering: Units operations in post-harvest processing (cleaning, grading, drying, size reduction, evaporation, pasteurization, distillation): processing of food grains, animal feed, seeds, fruits & vegetables, flowers, spices, dairy products, eggs and meat; design of processing equipment and systems.

6. Storage and Handling Engineering: Changes in stored products during storage; storage of food grains & their products, feed, fruits and vegetables, flowers, spices, dairy products, eggs and meat; air tight, ventilated, refrigerated, modified atmosphere and controlled atomosphere storage systems; packaging; conveyors; design and management of storage and handling systems.

7. Rural Engineering: Building materials and their properties; design of beams, slabs, columns and foundations; fencing; planning and design of rural houses in plains and in hills made out of stones & timber, farm roads, village drainage systems, waste disposal and sanitary structures; material and cost estimation in construction; integrated rural energy planning and development; rural electrification.

PAPER-II

1. Thermodynamics and Heat Engines: Concept of energy; temperature and heat; equation of state; laws of thermodynamics; pure substances and properties; entropy; boilers, boiler efficiency; steam engines and turbines; rankine, air standard' Otto, diesel and Joule cycles, indicator diagrams; I.C. engines.

2. Farms Power: Sources of power on farm; farm power and agricultural productivity relationship, comparison of tractor/engine power with animal power operation and constructional features of I.C. engines; various systems present in I.C. engines, viz, carburation, ignition, cooling, lubrication, starting and electrical system, valves and valve timings; special features of diesel engines; tractors: their classification, power transmission , clutch, drawbar, three-point hitch, p.t.o., belt and pulley; tractor controls; tractor chassis; stability; trouble shooting, repair and maintenance of tractors; tractor testing; economics of tractor utilization, small tractors and power tillers: their economics and suitability.

3. Farm Machinery: Design, construction, operation, repair and maintenance of primary and secondary tillage tools; implements and machines, viz, m.b. plough, disc plough, rotary tillers, harrow and cultivator; seeding, planting and transplanting machines; weeders; sprayers and dusters; forage harvesters and mowers; reapers, threshers, winnowers and combines harvesters, crop and soil factors affecting machine performance and energy requirements, economics of tractorization, combining and other mechanized operations; selection of farm machines, bullock driven and hand operated farm equipment suitable for hill agriculture.

4. Irrigation Engineering: Water resources of India; soil-water plant relationship; permeability; infiltration; percolation, evaporation; water requirements of crops and irrigation scheduling; direct and indirect methods of soil moisture measurement; measurement of irrigation water: weirs and notches, orific, parshall flumes, H-flumes, etc; water conveyance and control; design of field channel and canals; Lacey and Kennedy's theories; most economical channel cross-section; selection of underground pipe line structures and their design; irrigation methods-their hydraulics and design, viz, border, furrow, flood, drip & sprinkler methods; concepts in irrigation efficiencies, design of gravity fed irrigation systems, viz drip, sprinkler etc. for terraced farming in hills.

5. Drainage Engineering: Benefits of drainage; hydraulic conductivity; drainable porosity; drainage coefficient; surface drainage; drainage of flat and sloping lands; design of open ditches; their alignment and construction; design and layout of sub surface drains; depth and spacing of drains and drainage outlets; installation of drains and drainage wells; drainage of salt affected areas, design of intercepter drains for hilly regions.

6. Soil and Water Conservation Engineering: Forms of precipitation; hydrologic cycle; point rainfall analysis; frequency analysis; watershed management: definition and concepts; management techniques for agricultural and forested watershed in plains and hills; estimation of peak runoff; factors affecting run-off; hydrograph; concepts of unit and instantaneous unit hydrograph; soilerosion: mechanics of water and wind erosion: types, factors affecting; damages associated with soil erosion; soil loss estimation by Universal Soil Loss Equation: land capability classification; soil erosion control by vegetative and mechanical measures on various classes of land viz, contour cultivation, strip cropping,bunding, terracing afforestation, pastures, etc.; grassed waterway and its design; design of gully control measures including permanent structures, viz chute spillway, drop spillway, drop inlet spillway; steam bank erosion and control; control of mass soil movement and land slides in hills; flood routing; flood control and management through soil and water management in upstream zones; water harvesting techniques suitable for hills & plains.