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**Uttar Pradesh Public
Service Commission
(UPPCS Mains)**

Exam Syllabus

Optional Subjects
Agricultural Engineering

:: PAPER – I ::

(a) Thermodynamics and Heat Engines: concept of energy, temperature and heat equations; laws of thermodynamics, pure substances and their properties; entropy; Rankine, air standard otto, diesel and joule cycles; indicator diagrams.

(b) Farm Power: sources and status of power in India; farm power and agricultural productivity relationship; construction and operation features of IC engines, various systems of an IC engine viz carburetion, ignition, cooling, lubrication, valves and valve timing; special features of Diesel engines; Tractors and their classification, power transmission systems and devices, repair and maintenance; Tractor testing and tractor economics; power tillers- their economics and suitability, energy in agriculture.

(c) Farm Machinery: design, construction, operation, repair and maintenance of tillage tools, implements and equipment viz. Mould board and disk ploughs; hoe, harrow and cultivator; seeding and planting machines; weeders, sprayers and dusters; harvesters, threshers and combines; soil and crop factors influencing machine performance and energy requirement; selection of farm machines, economics of agricultural mechanization.

(d) Mass Transfer: thermal properties of materials, steady state and transient heat conduction, natural and forced convection; boiling, condensation, thermal radiation exchange; heat exchangers; heat and mass transfer analogy, Fick's laws of diffusion, psychrometrics; analysis of heat and mass transfer processes; instrument and measurement systems.

(e) Process and Food Engineering: protected cultivation- green house concept, structures and instruments; unit operations in post harvest processing (cleaning, grading, drying, size reduction, evaporation, pasteurization, distillation etc.); processing of cereals, pulses, oilseeds, fruits & vegetables, animal feed, spices, dairy products, meat etc. design of processing equipment and processing systems; Milking Machines.

(f) Storage and Handling: changes in stored products during storage; storage of food grains and their products, perishables (vegetable fruits, dairy product, meat, eggs); storage system- airtight ventilated, refrigerated, modified atmospheric and controlled atmospheric storages; packaging; conveyors; design and management of storage and handling systems.

:: PAPER - II ::

(a) Fluid Mechanics: fluid properties, units and dimensions; surface tension and capillarity, equation of continuity, Bernoulli equation, laminar and turbulent flow, steady and unsteady flow, flow of fluids in pipes and open channels, design of open channels for non erosive and non silting velocities, most economical cross section, measurement of irrigation water and other water measuring devices viz. Weirs, notches, orifices and flumes.

(b) Surveying and Levelling: linear measurements; survey methods and devices used; principle of levelling; differential and profile levelling; contouring and characteristics of contour lines; land levelling and grading; earth work estimation; earth moving machineries.

(c) Soil and Water Conservation Engineering: forms of precipitation; hydrologic cycle; point rainfall analysis, frequency analysis; agricultural watershed and its management; water management in agri-horti-aquaculture system, mechanics of water and wind erosion; Rational method of prediction of peak runoff; concept of unit hydrograph and instantaneous hydrograph; factors affecting erosion and run off; water erosion control measures- contour cultivation, strip cropping, terracing, including afforestation and pastures; design of gully control structures- temporary and permanent; stream bank erosion; flood routing, flood amelioration by upstream watershed management; wind erosion control measures and sand dune stabilization.

(d) Pumps: design, construction and performance characteristics; selection, installation, servicing and maintenance of different pumps (reciprocating, centrifugal, gear, turbine, submersible, propeller, jet); hydraulic ram; renewable and non-renewable power sources for pumping; solar pumps.

(e) Irrigation Engineering: water wealth and irrigation in India; soil water plant relationship; basic soil physical properties influencing soil water relationship; forms and occurrence of soil water; methods and devices for soil moisture measurement; water requirement of crops; irrigation scheduling; irrigation methods viz flood, border, furrow, sprinkler and drip irrigation, their hydraulics and design; concept of irrigation efficiencies; water conveyance and control; design of canals, Lacey and Kennedy's theories.

(f) Drainage Engineering: drainage needs and its benefits; Darcy's Law, hydraulic conductivity; drainage coefficient; drainage methods, surface drainage (drainage of flat and sloping lands); design of open ditches their alignment and construction; designs and layout of subsurface drains; depth and spacing of drains and drainage outlets; installation of drains and drainage wells; drainage of salt affected areas.

(g) Rural Engineering: building materials and their properties; farmstead planning, factor affecting location of farmstead; design of dairy barns, poultry housing, Planning and Design of rural houses, farm roads, village drainage; waste disposal and sanitary structures; cost estimates; rural electrification; integrated rural energy planning and development.

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