

**SYLLABUS OF EXAMINATION FOR THE
POST OF SUBJECT MATTER SPECIALIST
(AGRICULTURE ENGINEERING)**

Surveying, Levelling and Land Development:

Linear Measurements, different surveying devices and methods, Total Station Survey, land grading and levelling, contouring and terracing, earth work estimation.

Soil and Water Conservation:

Precipitation, hydrologic cycle, point rainfall analysis, frequency analysis. Watershed: definition and concept, agricultural watersheds, prediction of peak runoff, factors affecting runoff, hydrograph, concepts of unit and instantaneous hydrographs. Erosion-type and factors associated with erosion, assessment of actual annual soil loss by erosion and its impact on agricultural production and productivity. Erosion control measures on various classes of lands i.e. contour cultivation, strip cropping, terracing, afforestation, pastures. Design of gully control measures including permanent structures i.e. spillways, retards and stream bank erosion, mechanics of wind and water erosion, Desertification and its effects wind erosion control, water harvesting structures i.e. Khadin, Tanka, Nadi and Anicut, farm pond.

Irrigation and Drainage

Soil-Water- Plant relationship, water requirements of different crops and irrigation scheduling, direct and indirect methods of soil moisture measurements, measurements of irrigation water. Water conveyance and control, design of field channels. Design of irrigation methods, irrigation efficiencies. Drainage: Benefits of drainage, surface drainage, drainage of flat and slopping lands. Design and layout of surface and sub surface drains, installation of drains and drainage wells. vertical drainage and bio drainage. Pumps: Construction and performance characteristics, selection, installation, working principle and maintenance of pumps. Water Resources Development and Management: Water resources, surface water, ground water, canal irrigation, On Farm Development (OFD) works, aquifer parameters, hydraulics of wells, steady and unsteady flow, well log, construction of wells, well development. Installation and maintenance of micro irrigation systems.

Farm Power and Machinery

Classification of Internal Combustion (IC) engines, engine terminology, Otto, diesel & dual cycle, engine components. Fuels properties & fuel supply system, Lubricants & lubrication system, cooling system, governing system. Types of tractors, clutch & brakes, power transmission system, hydraulic system, steering system and three-point linkages. Traction theory, mechanics of tractor chassis, C.G. determination, tyres and selection of tractors.

Farm Machinery

Scope of farm mechanization, Custom Hiring Centers (CHC) in Rajasthan. Tillage and its objectives, primary and secondary tillage equipment & rotary tillers, ploughing methods. Sowing & planting methods & equipment and their calibration, interculture operation and weeders, Plant protection methods, nozzles & spray pattern, selection and calibration of sprayers and dusters, Principles, selection and operation of forage, grains and root crop

harvesting machinery. Threshing methods and threshers, performance of threshing machinery. Types of farm implements, measurement of draft, field capacity, field efficiency, and power requirement. Operation and management of all farm machinery implements and tools.

Designing, fabrication of farm implements for refinement and use.

Cost analysis of operations of farm power & equipment's. Simple numerical problems on engines, tractors and farm machinery weeders, Plant protection methods, nozzles & spray pattern, selection and calibration of sprayers and dusters, Principles, selection and operation of forage, grains and root crop harvesting machinery. Threshing methods and threshers, performance of threshing machinery. Types of farm implements, measurement of draft, field capacity, field efficiency, and power requirement. Integrated pest management, & fencing technology of farmers fields.

Renewable Energy

Importance and Development of Renewable Energy Sources in Rajasthan, Solar Radiation its measurement, solar energy conversion process and devices i.e. solar cooker, solar water heater, solar dryer, solar refrigeration and air conditioner etc. Solar cells and photovoltaic (PV) system. Solar water pump sets. Solar light traps for integrated pest management.

Agriculture Processing

Various size reduction machinery and size reduction theories and milling process for Rice, Maize, Wheat, Oil seeds and Pulses. Establishment and operations of seed grading units and their maintenance. Small scale processing and value addition using post harvest technology. Grains storage structures, theory and their design requirement. Civil work layout and design for seed and fodder storage godown. Principles of food preservation and thermal processing. Heating and cooling of food products. Psychometric chart and its application in drying. EMC and its determination, Principles of drying, drying equipment, water activity. Types of evaporators, steam economy. Refrigeration and cooling load calculation.

Protected Cultivation: design, operation and maintenance of different Protected Cultivation structures as Polyhouse, & Green net house etc., Mulching.