KERALA PUBLIC SERVICE COMMISSION

SYLLABUS FOR THE POST OF

RANGE FOREST OFFICER IN

KERALA FOREST & WILDLIFE DEPARTMENT

Optional subject- Agricultural Engineering

Module – I

Primary and secondary tillage operations -mould board plough, disc plough- functional component, accessories and attachments- chisel plough- subsoiler- horizontal and vertical suction of MB plough -forces acting on tillage implements- field efficiencies. Draft measurement of tillage implements and calculation of power requirement for tillage. Sowing, planting and weeding equipment. Seed drills and planters –types of seed metering mechanisms and furrow openers. Calibration and adjustments of seed drills and planters. Sprayers and dusters. types of nozzles.

Marks: 20

Module – II

Harvesting- methods and technologies: Reapers (VCR), mowers and chaff cutters. Threshers: types of threshing drums- factors affecting thresher performance. Winnowers. Grain and straw Combines– computation of combine losses. Tractors and power tillers - engines -power transmission systems: clutch, gearbox, differential and final drives. Tractor power outlets- p.t.o power and drawbar power. Determination of maximum draw bar pull. Tractor tyres. Traction aids. Centre of gravity and moment of inertia of tractors.

Marks: 20

Module - III

Hitching of implements – mounted, semi-mounted and trailed type implements. Traction mechanics: pull and draft, coefficient of traction, tractive efficiency and weight transfer. Calculation of field capacity and field efficiency- Economics of machinery usage, fixed cost, variable costs- estimating the cost of operation and break-even point.

Marks: 20

Module - IV

Testing of tractors and farm machines: type of tests, test codes and procedure. Ergonomic considerations in designing farm machines – anthropometry and assessment of energy expenditure. Vibration and noise levels and its physiological effects. Non-conventional energy sources- solar thermal energy conversion- flat plate and concentrating collectors - solar constant - photovoltaic electric production– PV systems.

Marks: 20

Module - V

Wind energy conversion- power coefficient- Betz limit -Bio energy: thermo chemical energy conversion of biomass- biomass gasification- gasifiers – biochemical energy conversion of biomass:

anaerobic digestion process - fixed and floating type bio gas plants-bio mass characteristics. Gasifier technology- types of gasifiers.

Marks: 20

Module - VI

Soil properties influencing irrigation management- soil- water relations- infiltration characteristics of soil and equations -water requirement of crops. Mechanics and types of soil erosion- soil loss estimation -biological and engineering measures to control erosion- water harvesting structures. Estimation of mean rain fall. Measurement of run off – Cook's method. Linear, aerial and relief aspects of watersheds –stream order. Watershed management: factors and measures. Hydrograph-applications and limitations.

Marks: 20

Module - VII

Surveying: basic principles and classification. Levelling – rise and fall system, classification of levelling. Total station and GPS survey. Remote Sensing: basic components, advantages and limitations. Types of sensors and platforms. GIS: basic components, spatial data, map projections, data models and its integration. Properties of fluids- hydrostatic pressure and its measurement-Bernoulli's theorem- laminar flow in pipes- general equation for head loss-Darcy's equation-major and minor losses through pipes and fittings- open channel hydraulics-Chezy's and Bazin's formula- on farm structures for water conveyance- control and distribution-drop structures.

Marks: 20

Module - VIII

Surface and sub surface drainage – coefficient- design parameters - hydraulic conductivity-drainable porosity - Hooghoudt's spacing equations. Hydraulics of flow in wells- centrifugal pumps- total pumping head-NPSH- maximum suction lift- power requirement - performance curves. Sprinkler and drip irrigation systems- layout- hydraulic design of lateral sub-main and main pipe line- selection of pump.

Marks: 20

Module - IX

Rheological properties- force deformation- stress- strain- elastic –plastic- and viscous behavior-drying - theory of grain drying- moisture content and water activity- free, bound and equilibrium moisture content. Equipment for cleaning and grading. Size reduction: fineness modulus-principles of communition: laws and procedures, crushing, impact, cutting and shearing.

Marks: 20

Module – X

Principles of processing and preservation: blanching and canning. Thermal processing of food – freezing, refrigeration and cold storage. Drying: hysteresis effect -EMC determination

psychometric chart. Grain dryers - batch and continuous type -types of grain dryers:deep bed dryer- flat bed, continuous flow and LSU dryer. Storage of grains - improved storage structures: CAP, hermetic storage, pusabin, RCC ring bins.

Marks: 20
