

**1. GENERAL AGRICULTURE**

- 1.1. Principles of agronomy (cereals, cash crops, pulses and oilseeds) and horticulture (fruits & vegetables)
- 1.2. Elements of soil science (soil fertility and soil properties)
- 1.3. Crop calendar, cropping pattern and cropping intensity.
- 1.4. Farming systems and status of production of major crops in Nepal.
- 1.5. Crop diversification and agricultural commercialization in Nepal.
- 1.6. Conservation agriculture
- 1.7. Social mobilization, farmer's group, cooperative system
- 1.8. Dissemination and extension of agricultural engineering technologies
- 1.9. Analysis of pertinent problems of agricultural engineering in Nepal and development of concept note with log frame for development and action research project.
- 1.10. Planning of agricultural market centres and network,
- 1.11. Survey and Analysis of agricultural engineering issues related problems

**2. FARM POWER MACHINERY AND ENERGY**

- 2.1. Sources of farm power, status and scope of mechanization in Nepal.
- 2.2. Theory of machine, machine elements and the engineering properties of material for fabrication/manufacturing.
- 2.3. Design criteria of agricultural machines.
- 2.4. Internal combustion engines (petrol and diesel engines) and engine operating systems (combustion, lubrication, fuel supply, air intake, cooling, exhaust system)
- 2.5. Engine and machine components Cams, gears, flywheel, governor, clutch, brakes, bearing, bush, belt drives, threaded fastener, conveyor, joints, pulley
- 2.6. Power trains and traction devices of farm tractors and power tillers.
- 2.7. Types of earth moving machinery and working principles.
- 2.8. Tillage and tillage implements.
- 2.9. Seeding, harvesting and threshing machinery.
- 2.10. Plant Protection equipments and machinery
- 2.11. Resource conservation technology and required machinery, zero tillage and minimum tillage.
- 2.12. Testing evaluation, modification, safety measures and extension of agricultural machinery.
- 2.13. Machines and equipments for livestock farming
- 2.14. Criteria for the selection of appropriate farm power and machinery
- 2.15. Management of agricultural machinery.
- 2.16. Issues and problems of agricultural mechanization in Nepal.
- 2.17. Renewable energy sources (biomass, solar, micro hydro, wind) and its application in Nepal.

**3. SOIL AND WATER ENGINEERING**

- 3.1. Soil-water-plant-environment relationship, evaporation, transpiration, consumptive use, estimation of evapo-transpiration and crop water requirement.
- 3.2. Soil water retentions and movement-saturated and unsaturated flow.

- 3.3 Soil moisture tension, infiltration and permeability.
  - 3.4 Ground water recovery, alluvifers, hydraulics of wells, design of irrigation wells and well construction procedure, Shallow and Deep tube wells.
  - 3.5 Irrigation water lifting devices: centrifugal pumps, turbine pumps, submersible pumps, treadle pump, propeller pump. Pump selection, power requirement, efficiency and economics of irrigation pumping plants.
  - 3.6 Measurement of irrigation water, weirs, Pars hall flume, orifices, metergates, flow-meter, tracer methods.
  - 3.7 Water conveyance and control system, surface water distribution system, Design of underground pipe line irrigation distribution system, design of open channel, channel linings, drop structure and spill ways, water control and division structure.
  - 3.8 Design of irrigation water application methods, border, basin, furrow, pressurized methods (drip and sprinkler) of water application, irrigation efficiencies.
  - 3.9 Land levelling, grading design methods, estimation of earth work quantities, levelling and grading procedures, equipments for land grading.
  - 3.10 Quality of irrigation water.
  - 3.11 Drainage investigation and effect on crop production
  - 3.12 Soil erosion from agricultural land and its measurement.
  - 3.13 Erosion control measures (engineering and bio engineering methods)
  - 3.14 Design of soil and water conservation structures viz. terraces, grassed water way, bunds, gabion walls, water harvesting ponds, gully plugging.
  - 3.15 Integrated watershed management.
- 4 **POST HARVEST ENGINEERING**
- 4.1. Grain drying needs methods and theory.
  - 4.2 Mechanical dryers (batch and continuous type)
  - 4.3 Processing of cereals, legumes and oilseed, cleaning, grading
  - 4.4 Equipments and machinery used in seed processing and storage.
  - 4.5 Equipments and machines used for perishables and semi perishable products.
  - 4.6 Dairy machinery and equipments
  - 4.7 Zero energy cool chambers, refrigeration cycle. Cold storage design for perishable commodities
  - 4.8 Design, construction, testing and evaluation of solar dryer for vegetables and fruits.
  - 4.9 Cleaning, grading, preservation and packaging of cereals, fruits and vegetables.
  - 4.10 Design requirements for fruit and vegetable processing plants.
  - 4.11 Process of value addition of various agricultural products.
- 5 **FARMSTEAD PLANNING, AGRICULTURAL STRUCTURES AND RURAL ENGINEERING**
- 5.1 Planning of farmstead (farm buildings, farm roads, fish ponds, electricity, water supply, storage structures, sewerage and drainage etc.)
  - 5.2 Planning and design of animal shelters (dairy barn, poultry housing, sheep and goat housing, swine housing).
  - 5.3 Design of slaughter house
  - 5.4 Design of food grain, feed and forage storage structure.

- 5.6 Engineering materials and their properties (sand, stone, aggregate, brick, cement, steel, timber, paints etc.)
- 5.7 Aquaculture engineering (planning and design of fish ponds, race way, hatchery).
- 5.8 Design of steel and RCC structures.
- 5.9 Planning and design of farm foad, farm fencing, farm residence, water supply and sanitation
- 5.10 Design of agricultural road, green road, trail, gravity ropeway, culverts, bridge etc.
- 5.11 Design of poly house, screen house and glass house
- 5.12 Farm electrification: Power transmission and distribution, house wiring and its components; AC motor (single and poly phase), starters, selection of electric motors and care and maintenance of electric equipments.
- 5.12 Rate analysis, estimating, costing and quality control of engineering structures.

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### द्वितीय पत्र – समूह सम्बन्धी सामान्य विषय

#### Model questions

1. Explain the importance of agricultural mechanization (AM). What are the constraints of AM in Nepal? Give your views for promotion of AM. 15
2. What are the types of post harvest losses? Explain the ways to minimize post harvest losses. 15
3. What are the general problems of irrigation systems in Nepal? Give your opinion to increase irrigation efficiency. 15
4. Describe the importance of renewable energy (RE) in agriculture. Narrate the prospects and constraints of RE. Express your views for agricultural use. 15
5. What do you mean by Good Water management? What are the ways to solve water shortage crisis in rice season in a command area where the irrigation supply is less than the farmer's demand? 20
6. Give your views with the present problems and future challenges for agricultural engineers in your job. Explain the role of agricultural engineers in increasing the agricultural productivity. 20