EXTENDED LECTURE OUTLINE

AEG6 221 Farm Machinery And Power (1+1)

Module 1 : Status of Farm Power in India

Theory: Overview of Farm Power in India (Status and Trends, Evolution, Future Outlook), Sources of Power (Animate Power, Mechanical Power, Electrical Power, Renewable energy), Advantages, limitations and applications of Sources of Power, Farm Power Availability (FPA), Cropping Intensity (CI), Effect of Cropping Intensity on Farm Mechanization, Explain farm Mechanization, Need of Farm Mechanization, scope of farm mechanization.

Practical's: (not included in theory exams)
Students are expected to solve basic problems related to:

1. Power Availability: Calculating the total power available on a farm given the number of laborers, animals, and machinery.
2. Efficiency: Comparing the cost of operation per hour for different power sources.
3. Unit Conversions

Module 2: IC Engines
Theory: Heat Engines, Differentiate between IC and EC Engines with Examples, components of IC Engines, Nomenclature of IC Engines, Classification of IC Engines, Thermodynamic cycles: Otto Cycle and Diesel cycle, Functionality of Four stroke SI Engine and CI Engine, Differentiate between Four stroke SI Engine and CI Engine, Functionality of Two stroke SI Engine and CI Engine, Differentiate between Two stroke SI Engine and CI Engine, comparison between Two stroke Engine and Four Stroke Engine, Performance Parameters (Definition and Mathematical Formula) : Indicated Power (IP), Brake Power (BP), Friction Power (FP), Mechanical Efficiency, Brake Thermal Efficiency and Brake Specific Fuel Consumption. Simple problems on these performance parameters. Measurement of Powers: Indicated Power- Indicator diagram, Brake Power- Brake Dynamometer (Prony brake type, electrical type, hydraulic type) and Drawbar Dynamometer (Spring type, hydraulic type, strain gauge type), Friction Power (Willan's Line method, Morse test, motoring test, difference between IP and BP)

Valve working and Valve Timing Diagram:

Fuel Systems: Properties of the fuel – definition of Flash and Fire Point, Viscosity, density, calorific value, volatility, Ignition quality of the fuel (octane number and cetane number), Knocking. Fuel Test- gravity test, distillation test, vapour pressure test, sulphur test, carbon residue, color test, gum test, flash test Fuel Supply system in Spark Ignition engine (components, neat sketch, working explanation), Carburetor- principle of working , functionality and components. Fuel system in Diesel Engine (components, neat sketch, working explanation) , fuel Injection pump and injector- principle of working , functionality and components

Air Cleaners: Types of Air cleaners – Dry type, oil bath type, oil wetted type air cleaner, paper pleated type air cleaner, centrifugal type air cleaner

Governing System/Governors: Principle of governor, classification of Governing System (Explanation with a neat sketch) Governor regulations, Governor hunting
Lubrication Systems: Brief about purpose of lubrication, Lubrication theory, types of lubricant, Lubricating oil tests. Engine Lubricating System – Splash System, forced feed

system and Combination of splash and forced feed system (explanation with a neat sketch). Oil filters – Full flow and By-pass filter.

Cooling Systems: necessity of Cooling the IC Engine, different methods of cooling: Air cooling and water cooling. Air cooling – principle, advantage and disadvantage, Water cooling – open jacket or hopper method, Thermosiphon method and forced circulation method (explanation with a neat sketch). Coolant – characteristics of coolant and various types of coolant

Ignition System:
Ignition by electric Spark – (a) Battery Ignition: principle of working, components, storage battery (neat sketch explanation), care and maintence of battery and causes of ignition failure in battery system (B) Magneto Ignition : principle, components
Ignition by heat of compression, other methods of ignition.

Practical's: (not included in theory exams)

1. Study of components of IC Engines using cut sections
2. Study the principle and working of Four stroke and two stroke engine
3. Study the principle and working of SI Engine and CI engine
4. Study of Fuel Supply system of SI and CI engine
5. Study of Air Cleaning and Cooling System of an Engine
6. Study of Lubrication system

Module 3: Tractors and Power Tillers

Theory: Farm Tractor- Introduction, Classification of Tractors, Tractor Components, selection of tractor. Power transmission system of tractor – function of power transmission system. Clutch – Necessity of clutch in tractor, essential features of ta good clutch, Types of Clutch –Friction Clutch (single plate clutch and multiple plate clutch), Dog Clutch, Fluid Coupling. Transmission Gears and torque converter gears. Differential Unit and final drive. Steering System- working principle, Brake- principle of operation, classification of brake – Mechanical brake, hydraulic brake. Hydraulic control system- working principle, basic components of hydraulic system and operation, types of hydraulic system, advantages and disadvantages of hydraulic system. Estimating the cost of tractor power – simple problem.
Power Tillers : Introduction, components, operation , power transmission in power tiller, uses. Rotary tilling- plane tilling,puddling,

Practical's: (not included in theory exams)

1. Study of tractor - important parts and attachments
2. Learning of Tractor Driving and Study of clutch, transmission, differential and final drive of a tractor
3. Precaution while starting and operating of tractor
4. Study of power tiller- important parts and attachments

Module 4: Tillage and Plant Protection implements

Tiilage: introduction, objective of tillage, classification and types of tillage – primary and secondary tillages. Forces acting upon a tillage implement. Ploughing of land, methods of ploughing. Plough: purpose of ploughing, types of plough, Indigenous plough, mouldboard plough (component and explaination), Disc plough (advantages,disadvantages, types),Harrow- harrowing, disc harrow, typesof disc harrow,components of disc harrow,

animal drawn disc harrow, other harrows. Cultivators: Disc cultivator,rotary cultivator, tine cultivator, tractor drawn cultivator. Other implements and hoes : Puddler, Bund former, ridger,soil scoop, green manure trampler, paddy weeder, hand hoes and hand tools

Seeding methods – Broadcasting, dibbling, drilling, seed dropping behind the plough, transplanting, hill dropping, check row planting. Seed Drill – function of seed drill, components of seed drill, Seed metering mechanism. Furrow openers. Calibration of seed drill and seed cum fertilizer drill. Cultivator with seeding attachment, one row jute seed drill, single row cotton seed drill, pneumatic seed drill. Planter – function of planter, seed metering device in a planter.

Plant protection implements: Sprayers –purpose, function, desirable quality of sprayer, basic components of sprayer, types of sprayer, power sprayer, hydraulic sprayer, care and maintenance of sprayer, commercial sprayer, pumps for spraying. Duster – types of duster, care and maintenance of dusters

Practical's: (not included in theory exams)

1. Study of Primary Tillage Implements: Mouldboard Plough and Disc Plough
2. Study of secondary tillage implements- Disc harrows, cultivators and Rotavators
3. Study the Implements for hill agriculture
4. Study of Inter-Culturing Tools and Implements - Manual and Animal Drawn
5. Study of Seed-Cum-Fertilizer Drill and Calibration of Seed Drill
6. Study of Sprayers and Dusters

Module 5: Harvesting and Threshing

Harvesting: definition, principle of cutting a crop, Explanation with diagrams – Sickle, Mower, Reaper.

Threshing: definition, principle of threshing, threshing methods, power threshers – types of power thresher, components of power thresher. Cleaning unit, aspirator, blower, winnower, winnowing fan, seed damage. Threshing efficiency. Terminology connected with power thresher. Safety precautions and care in operation for threshers. Paddy threshers. Combine-harvester-thresher

Practical's: (not included in theory exams)

1. Study of Harvesting and Threshing Machinery