

Model Answer Paper

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION
B.Sc. (Hons.) Agri. Business Management

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|------------|--------------|-------------|----------------------------|---------------|-----------|
| Semester | : II (New) | Term | : Second | Academic Year | : 2022-23 |
| Course No. | : ENGG - 121 | Title | : Farm Machinery and Power | | |
| Credits | : 2 (1+1) | | | | |
| Day & Date | | Time (hrs.) | | Total Marks | : 40 |

- Note :**
1. Solve ANY EIGHT questions from SECTION "A".
 2. All questions from SECTION "B" are compulsory.
 3. All questions carry equal marks.
 4. Draw neat diagrams wherever necessary.

SECTION 'A'

Marking
scheme
4 Marks

Q.1 Give the advantages and disadvantages of disc plough.

Ans:

Advantages

1. The soil which is too hard and dry for ploughing with mouldboard plough can be ploughed to required depth by disk plough.
2. It works well in sticky soils than mouldboard plough.
3. It is more useful for deep ploughing.
4. It can be used safely in stony and stumpy soil without much danger of breakage.
5. It works well in loose soils also without much clogging.

Disadvantages

1. It is not suitable for covering surface bush and weed as that of mouldboard plough.
2. It leaves soil more in rough and cloddy conditions.
3. It is much heavier than mouldboard plough for equal capacities.

Q.2 A four cylinder four stroke engine having cylinder bore 7.5cm and stroke length 10 cm develops 15 kW at 1650 rev/min . Assuming a mechanical efficiency of 85%, find indicated power and mean effective pressure.

Ans: Given,

$$D = 7.5 \text{ cm} = 75 \text{ mm}$$

$$L = 10 \text{ cm} = 100 \text{ mm} \quad \text{Break power (bp)} = 15 \text{ kW}$$

$$n = 1650 \text{ rev/min} \quad \eta = 85 \% \quad x = 4$$

$$ip = \frac{bp}{\eta} = \frac{15}{0.85} = 17.64 \text{ kW}$$

$$\begin{aligned}
 & \text{Pl An} \quad \times \\
 & \text{ip} \quad 60 \times 10^{12} \quad 2 \\
 & \frac{P \times 100}{60 \times 10^{12}} \times \frac{a}{4} \times 75 \times 75 \times 1650 \times \frac{4}{2} \quad \text{kW} \\
 & \text{Or } 17.64 = \frac{P \times 24298.25}{10^9} \quad \text{Pascal} \\
 & \text{Or } P = 725.97 \text{ kPa}
 \end{aligned}$$

Q.3 Explain the working principle of hydraulic control system of tractor.

4 Marks

Ans: Working principle.

The Working principle of hydraulic system is based on Pascal's law. This law states that the pressure applied to an enclosed fluid is transmitted equally in all directions. Small force acting on small area can produce higher force on a surface of larger area.

$$\frac{\text{Wt. on small cylinder (W}_1\text{)}}{\text{Area of small cylinder (A}_1\text{)}} = \frac{\text{Wt. on bigger cylinder (W}_2\text{)}}{\text{Area of bigger cylinder (A}_2\text{)}}$$

W₂ is higher in the same proportion as the ratio of the areas of the two sections. A simple hydraulic system consists of a pump which pumps oil to a hydraulic ram. This pump may be driven from tractor's transmission system or it may be mounted on its engine. This system consists of a cylinder with a close fitting piston like an engine cylinder. As the oil is pumped into the closed end of the cylinder, the piston is forced along with it. The movement of the piston is transmitted to the lower links by means of a cross shaft and lift rods. A control valve controls the flow of oil and directs it back to the reservoir. It allows the oil in the cylinder to flow out again when the links are to be lowered. It also traps the oil in the cylinder when the links are to be held at any height.

Q.4 Enlist difference sources of farm power. Write merits and demerits of human power.

4 Marks

Ans: A. Mobile Power

1. Human Power (men, women, children)
2. Draught animals (bullock, buffalows, camels, ponies, mules and donkeys)
3. Tractors
4. Power tiller
5. Self propelled machines like:
 - (i) Combines (ii) Transplanters (iii) Reapers (iv) Sprayers(v) Others

B. Stationary Power

1. Diesel engines (For pump sets, thresher, sprayers, other stationary operation)
2. Electric motors (For pump sets, thresher, and other stationary operations)

3. Renewable energy (Biomass, Solar, Wind)

Merit

1. Easily available
2. Used for all type of work

Demerit

1. Costly power compared to all other forms of power
2. Very low efficiency
3. Requires full maintenance when not in use
4. Affected by weather condition and season.

Q.5 What is primary tillage and what are the objective of tillage?

4 Marks

Ans: **primary tillage** :The operations performed to open up any cultivable land with a view to prepare a seed bed for growing crops is known as Primary tillage.

Objective of Tillage

1. to obtain deep seed bed, suitable for different type of crops.
2. to add more humus and fertility to soil by covering the vegetation.
3. to destroy and prevent weeds.
4. to aerate the soil for proper growth of crops.
5. to increase water absorbing capacity of the soil.
6. to destroy the insects, pests and their breeding places and
7. to reduce the soil erosion.

Q.6 Explain in detail about different type of duster.

4 Marks

Ans: **Types of duster**

- 1)Plunger type
- 2)Knapsack type
- 3)Rotary type
- 4) Power operated duster

1. Plunger type: It is a simple duster with a small piston. The drives a current of air over the dust in the hopper. The dust is carried away through a delivery spout. Small hand pump dusters of piston this type are available and are suitable only where the area to be dusted is small like vegetable or flower garden.

2.Knapsack type duster: It is a duster with the powder container on the back of the operator. Knapsack dusters have a hopper through which a current of air is blown to pick up the dust. The air current is produced by lever operated leather bellows. Shoulder straps carrying straps are generally provided in such dusters and they can be easily carried in the fields. These dusters are suited for small areas only.

3. Rotary duster: It is a duster with a hand operated rotor in front of the operator. For spraying tall crops, more force of delivery is required, hence rotary dusters are preferred. Dust is fed from a hopper into a current of air produced by a rotary fan and is blown out through delivery pipe. Most of the models have stirring device, actuated by the fan crank to ensure a steady flow of dust. The rate of delivery can be regulated by a valve below the hopper. The delivery force is controlled by controlling the speed of the fan.

4. Power operated duster: Power operated duster mainly consists of a power driven fan, a hopper and a delivery spout. The fan creates strong air flow which causes the dust to blow off from the hopper to a considerable distance either vertically or horizontally. The direction of the dust is regulated by a movable

delivery spout suitably fitted with the unit. This type of dusters are used for large areas.

Q.7 Explain the fuel supply system of diesel engine with neat sketch.

4 Marks

Ans: Fuel system of diesel engine

Fuel system of diesel engine consists of the following components

1. Fuel tank
2. Fuel lift pump or feed pump
3. Fuel filter
4. Fuel injection pump
5. High pressure pipe
6. Over flow valve
7. Fuel Injector (Injection nozzles)

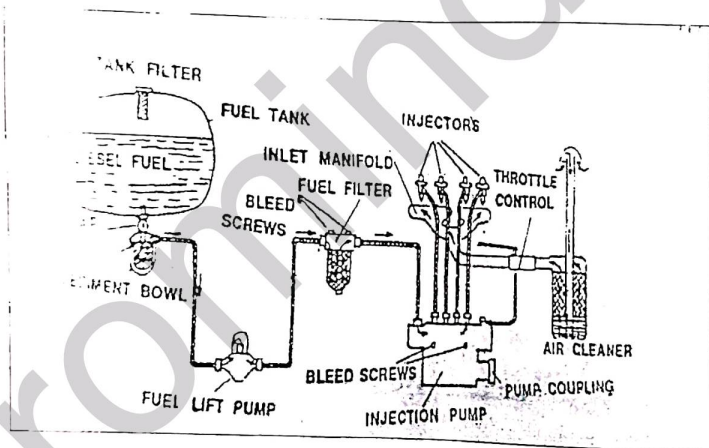


Fig. Fuel supply system in diesel engine

Fuel is drawn from the fuel tank by the Feed pump and forced to the Injection pump through Fuel filter. The Injection pump supplies high pressure fuel to injection nozzles through delivery valves and high pressure pipes. Fuel is injected into the Combustion chamber through Injection nozzles. The fuel that leaks out from the injection nozzles passes out through leakage pipe and returns to the fuel tank through the over flow pipe. Overflow valve installed at the top of the filter, keeps the feed pressure under specified limit. If the feed pressure exceeds the specified limit, the overflow valve opens and then the excessive fuel returns to fuel tank through overflow pipe.

Q.8 Differentiate between two stroke and four stroke engine on any four point.

4 Marks

| Ans: | S. No. | Particulars | Four stroke engine | Two stroke engine |
|------|--------|------------------------------------|--|---|
| | 1. | No. of power stroke | one power stroke for every two revolutions of the crankshaft | one power stroke for each revolutions of the crankshaft |
| | 2. | Power for the same cylinder volume | Small | Large (about 1.5 times of 4 stroke) |
| | 3. | Valve mechanism | Present | Ports instead of valves |
| | 4. | Construction and cost | Complicated and expensive | Simple, cheap |
| | 5. | Fuel consumption | Little | High (about 15% more) |
| | 6. | Removal of exhaust gases | Easy | Difficult |
| | 7. | Durability | Good | Poor |
| | 8. | Stability of operation | High | Low |
| | 9. | Lubrication | Equipped with an independent lubricating oil circuit | Using fuel, mixed with lubricating oil |
| | 10. | Oil consumption | Little | Much |
| | 11. | Carbon deposit inside cylinder | Not so much | Much because of mixed fuel |
| | 12. | Noise | Suction & exhaust is noiseless. but other working is noisy | Suction & exhaust is noiseless, but other working is noise less |
| | 13. | Air tight of crankcase | Un necessary | Must be sealed |
| | 14. | Cooling | Normal | Chances of overheating |
| | 15. | Self weight and size | Heavy & large | Light & small |

Q.9 Define cultivator. Give its type and explain any one.

4 Marks

Ans: **Cultivator** : It is an implement for inter cultivation with laterally adjustable tines or discs to work between crop rows. This can be used for seed bed preparation and for sowing with seeding attachment. The times may have provision for vertical adjustments also. The cultivator can be either Disc cultivator or Rotary cultivator or Tine cultivator.

Disc cultivator: It is a cultivator fitted with discs.

Rotary cultivator: It is a cultivator with tines or blades mounted on a power driven horizontal shaft.

Tine cultivator: It is a cultivator fitted with tines having shovels. The rigid tine cultivator.

Trailed type cultivator: It consists of a main frame which carries a number of cross members to which tines are fitted. At the forward end of the cultivator, there is a hitch arrangement for hitching purpose. A pair of wheels is provided in the cultivator. The PTO is operated by both wheels simultaneously or one shaft can be

even and uniform. The height of the hitch is adjusted so that main frame remains horizontal over a range of depth setting. The tines in each row are spaced widely to allow free passage of the soil and trash around them. The tines in subsequent rows are staggered so that the implement can cover the entire width nicely. The depth of working is set roughly by adjusting the line in their clamps and the final depth control is done by a screw lever. Usually the tines are damaged due to turning the implement at the headland without lifting it up. Care should be taken to lift the tines off the ground before turning.

Mounted type Cultivator: Tractors fitted with hydraulic system operate the mounted type cultivators. A rectangular frame of angle iron is mounted on three point hydraulic linkage of the tractor. The cross members carry the tines in two staggered lines. For actual cutting the soil, different types of shovels and sweeps are used. A few important shovels and sweeps are a) Single point shovel b) Double point shovel c) Spear head shovel d) Sweep e) Half sweep f) Furrower. Depending upon the type of soil and crop, shovels are chosen for use on the cultivators. Usually tractor drawn cultivators are of two types, depending upon the flexibility and rigidity of tines (i) Cultivator with spring loaded tines (ii) Cultivator with rigid tines

Q.10 Write short notes on (Any Two)

4 Marks

Ans: a) Air cleaner: It is a device, which filters and removes dust, moisture and other foreign matter from the air before it reaches the engine cylinder. Air cleaner is usually of two types: (1) Dry type air cleaner and (2) Oil bath type air cleaner.

- 1) **Dry type air screen cleaner:** the filtering element in this case is type of felt the air passes through the element. The element has got larger surface area so the air speed become relatively low and consequently particle or dirt in the air is deposited on or stopped by its surface.
- 2) **Oil bath type air cleaner :** In this type of air cleaner this incoming air impinges upon the surface of the oil kept in the container in the lower part of casing. The foreign particles of the air are trapped in the oil and then the air passes through a wire element before reaching the inlet manifold of the engine.

b) Internal combustion engine: In this type of engine the burning or combustion of the fuel takes place inside the engine cylinder. There are two ways in which combustion takes place in the cylinder:

- i) By rapid explosion of air-fuel mixture within the cylinder, when it is ignited by a spark, is called constant volume combustion (C.V.C.).
- ii) Combustion takes place by slow burning when the fuel is injected into highly compressed heated air contained in the cylinder. This is called constant pressure combustion (C.P.C.), because when the combustion takes place, the pressure in the cylinder is almost constant. The power is developed during the power stroke. Most of the engines used in tractors, automobiles, combine harvesters, oil engines and traction vehicles are of this type. The line diagram of working principle of Internal combustion engine. The thermal efficiency of internal combustion engine is about 40%.

c) Sugarcane planter : It is used for planting of sugarcane sets. Desired spacing between row to row and plant to plant is maintained for sugarcane planting. The fertilizer and chemical pesticides can be applied simultaneously. The machine consists of a hopper, two rotating distributor discs, two fertilizer hoppers, a pesticide

tank with a distribution valve and two furrow openers. All these components are mounted on a frame and two wheels. The seed distributor box and applicator are powered from ground wheels through a set of roller chains and gears. Two persons are required to put seeds in seed rotor manually from the hopper. The machine is mounted on the tractor. Its output may be 0.6 ha/hr. It may require 4-6 men for field operations.

d) **Compression type sprayer** : The compressed air sprayer consists of an air pump mounted in an air tight chamber, which is filled three quarters full with spraying material. The pressure is developed by pumping air into the tank and the spray is forced out under pressure. The tank capacity is usually 14 litres. Frequent pumping must be done to maintain the pressure.

SECTION 'B'

4 Marks

Q.11 Define the following terms

1) **Scraper**: It is a device to remove the soil that tends to stick to the working surface of a disk.

2) **Sowing**: It is the process of placing seeds in line at a desired depth.

3) **Tillage**: It is the process of mechanical manipulation of soil to make it suitable for crop production.

4) **Harrow**: It is an implement to break the soil to a shallow depth to kill weeds and to mix material into the soil.

4 Marks

Q.12 Give full forms of the following.

1) TDC - Top Dead Centre

2) PTO - Power Take off

3) FHP - Frictional Horse Power

4) CPC - Constant Pressure Combustion

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