

**INTERMEDIATE VOCATIONAL COURSE**  
**Second Year**

**FARM MACHINERY LAB**

*For the Course of Rural Engineering Technician*



**State Institute of Vocational Education**  
**Directorate of Intermediate Education**  
**Govt. of Andhra Pradesh, Hyderabad.**  
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## **PREFACE**

The main objective of vocational education is to train the students at +2 level for meeting the demands for the skilled manpower in both organised and unorganised sectors and also to provide an alternative channel for those who aimlessly pursue higher education and to prepare them for self reliance. The State Institute of Vocational Education (SIVE) in collaboration with the Board of Intermediate Education, Andhra Pradesh has developed curriculum for 43 vocational courses in the field of

**Engineering & Technology**

**Agriculture**

**Health & Paramedical**

**Business & Commerce**

**Home Science and Humanities**

Accordingly the text books have been developed by SIVE as per the restructured curriculum by utilizing the services of various professional teachers in the respective fields. I am sure that this book will be immensely useful to the vocational students and teachers in understanding the concepts.

I wish to place my sincere thanks on record to Sri Shali Habibulla, Author of this text book for extending his support in developing this book for printing and publishing.

I shall be grateful to receive suggestions and observations from all the readers which would help in bringing out a revised and improved version of this book in future.

**Sri. Shashank Goel, I.A.S.,**  
Director & Secretary  
Board of Intermediate Education  
Andhra Pradesh, Hyderabad

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## EXPERIMENT – 1

**Aim:** To study Internal combustion Engine components:

**Main components of I.C. Engine:**

- i) **Cylinder:** It is a part of engine which confines the expanding gases and forms the combustion space. It is the basic part of the engine. It provides space in which piston operates to suck the air or air-fuel mixture. The piston compresses the charge and the gas is allowed to expand in the cylinder, transmitting power for useful work. Cylinders are usually made of high grade cast iron.
- ii) **Cylinder block:** It is the solid casting which includes the cylinder and water Jackets.
- iii) **Cylinder head:** It is a detachable portion of an engine which covers the cylinder and includes the combustion chamber, spark plugs and valves.
- iv) **Cylinder liner or sleeve:** It is a cylindrical lining either wet or dry which is inserted in the cylinder block in which the piston slides. Cylinder liners are fitted in the cylinder bore and they are easily replaceable.
- v) **Piston:** It is a cylindrical part closed at one end which maintains a close sliding fit in the engine cylinder. It is connected to the connecting rod by a piston pin. The force of the expanding gases against the closed end of the piston, forces the piston down in the cylinder. This causes the connecting rod to rotate the crank shaft.
  - a) **Head or crown of piston:** It is the top of the piston.
  - b) **Skirt:** It is that portion of the piston below the piston pin which is designed to absorb the side movement of the piston.
- VI) **Piston ring:** It is a shift expansion ring, placed in the grove of the piston. Piston rings are fitted in the grooves, made in the piston. They are usually made of cast iron or pressed steel alloy.
- VII) **Compression ring:** Compression rings are usually plain, single piece and are always placed in the grooves, nearest to the piston head.

## EXPERIMENT – 2

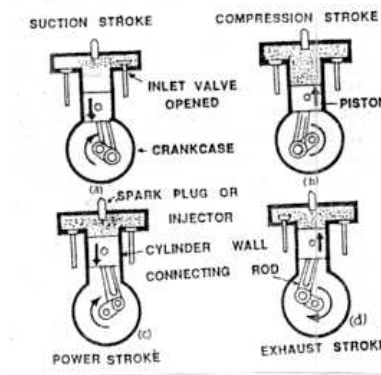
**Aim:** To study four stroke cycle engine

### Four stroke cycle Engine:

The four stroke cycle engine completes all the events in four strokes of the piston.

The four strokes of the piston are:

1. Suction Stroke
2. Compression stroke
3. Power stroke
4. Exhaust stroke



### Suction stroke

During suction stroke, only air or mixture of air and fuel are drawn inside the cylinder. The charge enters the engine through the inlet valve which remains open during admission of the charge. The exhaust valve remains closed during this stroke. The pressure in the engine cylinder is less than atmospheric pressure during this stroke.

### Compression Stroke

The charge taken in the cylinder is compressed by the piston during this stroke. If only air is compressed in the cylinder (as in case of diesel engine), the fuel is injected at the end of the compression stroke. The ignition takes place due to high pressure and temperature. If the mixture of air and fuel is compressed in the cylinder (as in case of spark ignition engine) the mixture is ignited by spark plug. After ignition, tremendous amount of heat is generated, causing very high pressure in the cylinder which pushes the piston backward for useful work. Both valves are closed during this stroke.

**Power stroke:**

During power stroke, the high pressure developed due to combustion of fuel causes the piston to be forced forward or backward at regular intervals. The connecting rod with the help of crank shaft transmits the power to the transmission systems for useful work. Both valves are closed during this stroke.

**Exhaust stroke:**

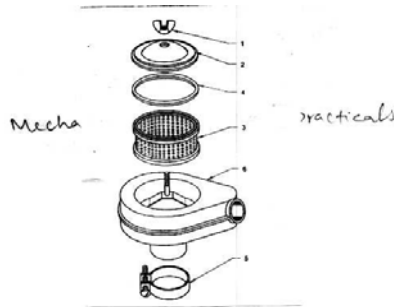
Exhaust gases go out through exhaust valves during this stroke. All the burnt gases go out of the engine and the cylinder becomes ready to receive the fresh charge. The inlet valve is closed and exhaust valve remains open during this stroke. The cycle is repeated.

### EXPERIMENT – 3

#### Servicing of air cleaner (dry type)

**Aim:** To dismantle, clean and reassemble a dry type of air cleaner

**Tools required:** Screw driver, spanner set, cotton waste, cutting plier.



**Job sequence:** Remove the top cover (2) with the fitter element (3) and gasket (4) Loosen the nuts / fixing clip (5) fixing the air cleaner on the inner manifold. Remove the bottom case (6) of the air cleaner clean the air cleaner housing and cover with cloth. Inspect filter element. If it is clogged, replace the same.

Blow off the dust from the inside element by compressed air.

If the element is heavily dirtied, wash it with a household type detergent. After washing rinse the detergent out of the element and dry it completely.

Check visually the cleaned element for puncture or damage. Discard it, if it is found damaged.

Check the plastic or rubber ring gasket (4) for smoothness.

**Installation:** Place the new or old element in the lower housing.

Put the plastic gasket ring on the element.

Put the top cover on the element. Tighten the wingnut with the help of a plier.

Refix the air cleaner on inlet manifold.

Test the air cleaner by starting the engine for smooth running.

**Data required to be noted:**

<b><u>SERVICE REPORT</u></b>	
Date: _____	
<b>Name &amp; Address of the Client :</b>	<b>Service Man's Name :</b>
<b>Problems Reported</b>	<b>Service rendered</b>
<b>Servicing of dry type air cleaner</b>	i.Dismantling ii.Cleaning and iii.Reassembling
Materials replaced :	
<b>Customer's comments:</b> Reported problem and rectified to our satisfaction.	
Serviced by	Signature of Client

## Servicing of air cleaner (wet type)

### EXPERIMENT – 4

**Aim:** To dismantle, clean and reassemble a wet type air cleaner.

**Tools required:** screw driver, spanner set, cutting plier, cotton waste etc.

#### Servicing of oil bath type air cleaner:

Open the bonnet type grill if needed.

Disconnect the air cleaner assembly from the manifold and place it on the working table.

Unscrew the bolt or wing nut (1) on the top cover (2) by hand or plier. Remove the top cover with the dust collector (3) and seating ring (4) clean the dust collector seating ring (4). Loosen the fixing clip (5) of the lower portion of the air cleaner. Remove the bowl (6) from the pre-clean cleaner assembly (7).

Using a piece of card board, block the opening of the air intake on the inlet manifold to avoid entry of foreign material.

Drain the oil from the bowl and clean the sludge.

Pour a little diesel / kerosene over the air cleaner element (8).

Hold it in vertical position. Rotate and stir the element by hand until all the dust is absorbed by the oil. Drain the used oil. Repeat the procedure until all the dust or dirt is removed from the wire mesh.

Blow compressed air under reduced pressure over the wire mesh from the opposite side and dry the element.

Clean the bottom case (bowl) (6) of the air cleaner with diesel / kerosene and wipe with clean cloth.

Check the filter element and the wire mesh for damage and clogging of dust. If damaged, replace with a new one.

Check the gasket ring (9) and clean it; if damaged replace the gasket ring.

Check the threads of the top cover mounting bolts/ wing nut (1).

Check the air cleaner bowl (bottom case) for damage

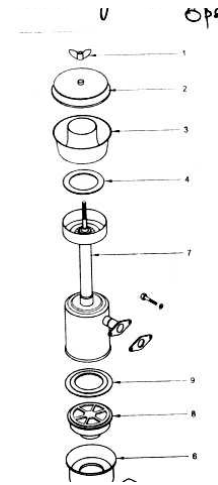
Installation : Refill the air cleaner bowl / housing up to the oil level mark with clean, recommended grade of oil.

Place the gasket (9) and install the filter element (8) in the housing bowl.

Mount the bowl (bottom portion) to the pre-cleaner by fastening the clip (5).

Place the gasket ring (4) and dust collector (3) and fit the cover (2) and tighten the wing nut (1).

Start the engine and check the performance of the engine for smooth running.



**Data required to be noted:**

<b><u>SERVICE REPORT</u></b>	
Date: _____	
<b>Name &amp; Address of the Client :</b>	<b>Service Man's Name :</b>
<b>Problems Reported</b>	<b>Service rendered</b>
<b>Servicing of wet type air cleaner</b>	i. Dismantling ii. Cleaning and iii. Reassembling
Materials replaced :	
<b>Customer's comments:</b> Reported problem and rectified to our satisfaction.	
Serviced by	Signature of Client

## **Removal and installation of clutch assembly in a tractor**

### **EXPERIMENT – 5**

**Aim:** To remove, inspect and reinstall clutch assembly in a tractor.

**Tools required:** Standard tools and equipment

**Job sequence:**

#### **Splitting of engine from transmission:**

Safely park the tractor with both brakes in locked position. Place suitable wooden blocks in the front and back of both the rear wheels.

Disconnect battery ground cable from the battery.

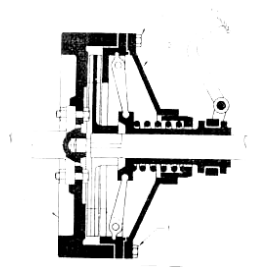
Disconnect battery starter cable from the starter terminal. Remove the instrument panel.

Instrument panel is removed after disconnecting all the wiring, gauge connections and bolt connections etc.

Unscrew fuel tank after turning off the fuel.

Disconnect both steering rods from the steering arms.

Place suitable trolley jack underneath engine oil sump and provide suitable support with sport jack under gear bore and rear axle central housing. Raise the sport jack until it supports the weight partially and the weight of the tractor is equally distributed.



Remove all the bolts and springs washer attaching the gear housing to the bell housing. Carefully roll the tractor engine forward away from the rear wheels for splitting the tractor engine from the gearbox joint.

#### **Disconnecting single plate clutch assembly:**

Mark with some paint the position of the clutch cover and flywheel. While resetting, this mark will be helpful to ensure the original position of the clutch cover and the flywheel so that the balancing of the flywheel and clutch does not get disturbed.

Remove locking wire pressure plate cover if available. Slacken the bolts (1) or unscrew diagonally across pressure plate cover (2) mounting bolts, until the trust spring pressure is completely relieved.

Remove the bolts, and spring washers and lift the complete clutch assembly from the flywheel (3) to remove clutch plate.

Support the three release arm (2) of disengaging lever of tractor drive (3) by putting forks.

Unscrew bolts from the clutch cover (4) and take out the complete clutch assembly from the flywheel (5).

Remove the clutch plate (6) from the tractor drive which remained in the flywheel.

**Assembly of clutch plates:** Assembly the clutch assembly in reverse sequence of clutch removal.

**Data required to be noted:**

<b><u>SERVICE REPORT</u></b>	
Date: _____	
<b>Name &amp; Address of the Client :</b>	<b>Service Man's Name :</b>
<b>Problems Reported</b>	<b>Service rendered</b>
<b>Servicing of clutch assembly</b>	i. Dismantling ii. Inspecting and rectifying the the problem iii.Reinstalling
<b>Materials replaced :</b>	
<b>Customer's comments:</b> Reported problem and rectified to our satisfaction.	
Serviced by	Signature of Client

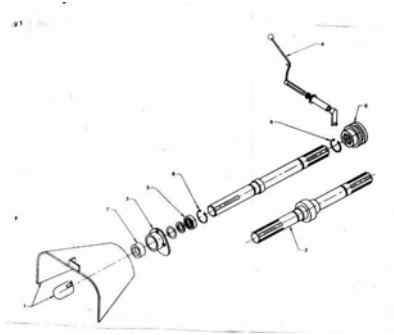
## Servicing of the P.T.O. Shaft.

### EXPERIMENT – 6

**Aim:** To dismantle, inspect and clean and reinstall the P.T.O. Shaft.

**Tools required:** Screw drivers, spanner set, cutting plier, hammer, cotton waste etc.

#### Job sequence



Dismantling: Drain the gearbox oil. Remove the bottom side cover of the gearbox.

Remove the protecting guard (1) of the P.T.O shaft (2). Remove the P.T.O shaft bracket cover (3).

Shift the P.T.O shaft drive lever (4) upwards so that the gear (9) of the hydraulic power lift is in disengagement and remove air clip lock (6).

Slide off the P.T.O shaft (2) from the gearbox and the main transmission housing by means of puller together with the ball bearing (5).

Then the P.T.O shaft (2) Slides out from the ball bearing after removing air clip (8). Take out P.T.O shaft (2).

**Cleaning and inspecting the parts:** clean all the parts with kerosene oil.

Inspect the bearing for excessive play, pits, rusts or breakage.

Check the shafts splines for proper fitting, wear and twisted spline.

Check the lever and the gear of P.T.O shaft for any damage.

**Assembly:** press the bearing (5) on the P.T.O shaft (2) and lock it with air clip(8).

Slide the P.T.O shaft (2) into the housing of and slip into the grooves of differential of the P.T.O shaft the binder drive gear.

KNOCK home the P.T.O shaft by slight tapping so that the bearing fits at the air clip in the rear wall of the housing.

Put a paper sealing under the bracket cover and fix the bracket cover on gearbox / differential.

Put the P.T.O shaft guard cover. Fix the bottom / side cover and refill the oil.

**Data required to be noted:**

<b><u>SERVICE REPORT</u></b>	
Date: _____	
<b>Name &amp; Address of the Client :</b>	<b>Service Man's Name :</b>
<b>Problems Reported</b>	<b>Service rendered</b>
<b>Servicing of P.T.O Shaft</b>	i. Dismantling ii. Inspecting Iii. Cleaning iv. Re installing
Materials replaced :	
Customer's comments: Reported problem and rectified to our satisfaction.	
Serviced by	Signature of Client

## **EXPERIMENT – 7**

**Aim:** To study Air cooling system and its advantages:

**Cooling system:** A system which controls the engine temperature is known as cooling system.

**Air cooling system:** In this type of cooling system, the heat which is conducted to the outer parts of the engine is radiated and conducted away by the stream of air which is obtained from the atmosphere.

In order to have efficient cooling by means of air, the contact area is increased by providing fins around the cylinder and cylinder head, the hot spots of the engine. The fins are metallic which are formed during the casting of the cylinder and cylinder head. The amount of heat carried off by air cooling depends up on the following factors:

- i) The total area of the fin surfaces
- ii) The velocity and amount of the cooling air and
- iii) The temperature of the fins and of the cooling air.

Air cooling is mostly used in motor cycles, scooters, small cars etc., Air cooling is also provided in some small industrial engines.

**Advantages:** Air cooled engines have the following advantages.

1. Its design of air cooled engine is simple
2. It is lighter in weight.
3. It is cheaper to manufacture.
4. It needs less care and maintenance.
5. No risk of damage from frost such as cracking of cylinder jackets.

## EXPERIMENTS – 8

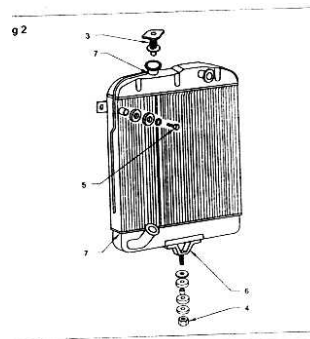
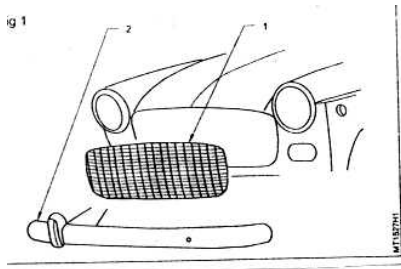
**Aim:** To servicing the radiator

**Objectives:**

1. Drain the radiator
2. Remove the radiator from the vehicle.
3. Inspect the radiator pressure cap.
4. Clean the radiator
5. Reverse flush the radiator.
6. Fit the radiator on the vehicle.
7. Inspect the water hose for leakage.
8. Replace the water hose.

**Tools required:**

1. Double End spanner set
2. Ring spanner set
3. Adjustable spanner
4. Cutting player
5. Screw driver
6. Wire brush



**Description:**

1. Unlock and remove the radiator grill with a suitable ring and double end spanner.
2. Remove the front bumper
3. Remove the center piece connecting the front right and left and panels.
4. Remove a radiator cap.
5. Place a suitable container below the radiator and unscrew the drain cock or radiator at elbow and drain the water from the radiator.
6. Open the drain plug at the cylinder block and drain the water from the cylinder block.
7. Disconnect the top and bottom water hoses.

8. Remove the nuts securing the radiator to the mounting bracket on the front cross member.
9. Remove the stay blot at the radiator end.
10. Remove the rubber boot connecting the radiator and the air suction tube.
11. Remove the bracket.
12. Remove the radiator and place it vertically with proper support so that it does not fall ensure that the radiator core does not touch the support.

**Procedure:**

1. Assemble the mounting bracket of the radiator.
2. Mount the radiator on the engine cross member aligning the top and bottom hose connections.
3. Fix the radiator stay bracket.
4. Tighten the radiator mounting and stay bracket with the help of a suitable ring and double end spanner.
5. Connect the water hoses – top and bottom.
6. Tighten the hose clips.
7. Close the radiator drain tap and fill it with a coolant.
8. Start and keep the engine running for approximately one minute at high speed. Check the water level in the radiator and fill it again if required.
9. Start the engine and check for leaks rectify if there is any leaks, replace the water hoses, if they are found leaky.
10. Fit the center piece on the front, right and left hand panels and tighten the four bolts and nuts.
11. Fit the front bumper and tighten the bumper bracket bolts.
12. Fix the front grill.

**Precautions:**

1. Care should be taken about the radiator core, why because it leads any damage, clogging and leakage.
2. Check the soldered joints of the top and bottom tanks as well as the filler neck.
3. Periodically check the radiator mounting brackets, for cracks, damage etc., if it is necessary, replace the damaged parts.

**Data required to be noted:**

<b><u>SERVICE REPORT</u></b>	
Date: _____	
<b>Name &amp; Address of the Client :</b>	<b>Service Man's Name :</b>
<b>Problems Reported</b>	<b>Service rendered</b>
<b>Servicing of a Radiator</b>	i.Dismantling ii.Cleaning with chemicals iii.Reassembling
Materials replaced :	
<b>Customer's comments:</b> Reported problem and rectified to our satisfaction.	
Serviced by	Signature of Client

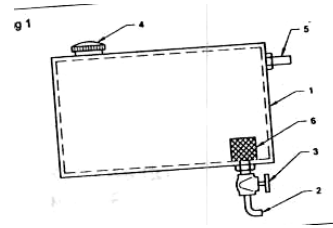


## EXPERIMENT - 10

**Aim:** To service the fuel tank and fuel lines

**Objectives:**

1. Clean the fuel tank
2. Detect fuel leakage at suction pipes
3. Detect fuel leakage at pressure pipes
4. Dismantle the fuel pipes.
5. Replace worn out bolts and washers.



**Procedure: Servicing Fuel Tank**

1. Tank; 2. Suction line; 3. Fuel cock; 4. Tank cap; 5. Over flow line.
1. Dismantle the fuel tank
- 2 Drain out fuel from tank completely.
- 3 Disconnects suction line, over flow line and injector leak off pipe.
- 4 Remove fuel tank from tractor.
- 5 Clean the out side and inside of the fuel tank with diesel.

**Data required to be noted:**

<b><u>SERVICE REPORT</u></b>	
Date: _____	
<b>Name &amp; Address of the Client :</b>	<b>Service Man's Name :</b>
<b>Problems Reported</b>	<b>Service rendered</b>
<b>Servicing of fuel tank</b>	i. Dismantling ii. Inspecting iii. Cleaning iv. Re-installing
Materials replaced :	
<b>Customer's comments:</b> Reported problem and rectified to our satisfaction.	
Serviced by	Signature of Client

## EXPERIMENT – 11

**Aim:** To repair a punctured tube

**Objectives:**

1. Remove a wheel from a tractor.
2. Dismantle the tyre and tube.
3. Locate the puncture in tube.
4. Repair the puncture.
5. Assemble the tyre and tube.
6. Inflate the tyre and tube.
7. Fit the wheel on the tractor.

**Tools used:**

1. Hydraulic or mechanical Jack.
2. Wooden blocks.
3. Wood rough file.
4. Spanner

**Description:**

1. Choke the opposite side of the wheels with wooden blocks.]
2. Loosen the wheel nuts by wheel spanner.
3. Jack up the wheel by hydraulic or Mechanical Jack
4. Remove the wheel nuts.
5. Remove the wheel from the tractor.
6. Put the wheel with tyre on the ground.
7. Deflate air from the inner tube by unscrewing the valve.
8. Depress the tyre on the side facing the valve in to the hollow of the rim.
9. Insert tyre fitting lever in to the rim in the place where the valve is located below the edge of the tyre.
10. Pull out the edge of the tyre above the rim edge and by shifting the tyre fitting levers gradually from place to place.
11. Remove the tube from the tyre.
12. Fix the valve core in the tube.
13. Inflate the tube at a pressure of 3 to 5 lb / in<sup>2</sup>.
14. Dip the inflated tube in the water tub.
15. At the punctured area, air bubbles will come out.
16. Mark the puncture by marking pencil.

**Procedure:**

1. Remove the valve core.
2. Clean the punctured area by cloth.
3. Clean the puncture with wood rough file.
4. Apply vulcanizing cement on the punctured portion.
5. Place a piece of vulcanizing raw rubber on the punctured area.
6. Clamp the puncture area on vulcanizing machine.
7. Switch on the vulcanizing machine.
8. After 15 minutes switch off the vulcanizing machine.
9. Allow 5 minutes to cool down the tube.
10. Unclamp the machine and remove the tube from the equipment.
11. Fix the valve core on the tube.
12. Inflate the tube with low pressure 5 to 10 lbs / inch<sup>2</sup>.
13. Dip the repaired tube in the water tub and recheck for any leakage.
14. Check tyre inner area for nails, stone and damage.
15. Apply french chalk powder inside the tyre and outer area of the tube.
16. Insert the tube in the tyre.
17. Inflate the tube with low pressure 5 to 10 lbs / inch<sup>2</sup>.
18. Insert the valve tube in to the rim.
19. Lock the valve tube with the locking nut.
20. Insert the tyre lever in between the disc and beeding push down the tyre on to rim.
21. Inflate the tube slowly until the beats fully seated.
22. Check the valve core for leakage with soap water and fit the valve cap.
23. Fit the wheel on the tractor.
24. Tight the wheel nuts by hand.
25. Remove the jack with out any jerk.
26. Tighten the wheel nuts with wheel spanner in correct sequence.
27. Remove the chock.

**Precautions:**

1. Tube must be inflated at a pressure of 5 - 10 lbs / inch<sup>2</sup> while puncturing.
2. Do not insert the tyre lever fully inside the disc to avoid damage to the tube.
3. If any bulge is formed on the tube, then we replace the tube.

**Data required to be noted:**

<b><u>SERVICE REPORT</u></b>	
Date: _____	
<b>Name &amp; Address of the Client :</b>	<b>Service Man's Name :</b>
<b>Problems Reported</b>	<b>Service rendered</b>
<b>Repairing of Punctured tube</b>	i.Dismantling of tyre ii.Repairing the tube iii.Re-installing
Materials replaced :	
<b>Customer's comments:</b> Reported problem and rectified to our satisfaction.	
Serviced by	Signature of Client

## EXPERIMENT – 12

**Aim:** To study tillage and classification of tillage

**Tillage:** It is a mechanical manipulation of soil to provide favourable condition for crop production. Soil tillage consists of breaking the compact surface of earth to a certain depth and to loosen the soil mass, so as to enable the roots of the crops to penetrate and spread in to the soil. Tillage may be called the practice of modifying the state of soil to provide favorable conditions for plant growth.

### **Objective of Tillage:**

- i) To obtain deep seed bed, suitable for different type of crops.
- ii) To add fertility to soil by covering the vegetation.
- iii) To destroy the prevent weeds.
- iv) To aerate the soil for proper growth of crops.
- v) To increase water absorbing capacity of the soil.
- vi) To destroy the insects, pests and their breeding places and
- vii) To reduce the soil erosion.

### **Classification of Tillage:**

Tillage is divided into two classes:

- a) Primary Tillage b) Secondary Tillage.

a) **Primary Tillage:** It constitutes the initial major soil working operation. It is normally designed to reduce soil strength, cover plant, materials and rearrange aggregates. 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. Implements may be tractor drawn or animal drawn implements. Animal drawn implements mostly include indigenous plough and mould board plough. Tractor drawn implements include mould board plough, disc plough, subsoil plough etc.

- b) **Secondary Tillage:**

Tillage operations following primary tillage which are performed to create proper soil tilth for seeding and planting are secondary tillage.

These are lighter and finer operations, performed on the soil after primary tillage operations. Secondary tillage consists of conditioning the soil to meet the different tillage objections of the farm. The equipment's used for secondary tillage operations are

called secondary tillage implements. They include different types of harrow, cultivators, levellers etc.

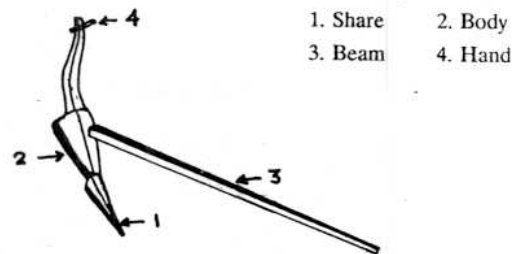
**Objectives of secondary tillage operations:**

- i) To pulverise the soil of the seed beds in the field.
- ii) To destroy grasses and seeds in the field.
- iii) To cut crop residues and mix them with top soil of the field and
- iv) To break the big clods and to make field surface uniform and leveled.

### EXPERIMENTS – 13

**Aim:** To study Indigenous or country plough

**Ploughing:** Ploughing is a primary tillage operation performed to open up the land with a view to prepare seed – bed.



#### Indigenous plough:

Indigenous plough is most commonly used in this country. The shape and size of the plough varies with places and regions due to variation in soil type and tillage requirements. The main parts of plough are

1. Share: It is a narrow steel bar attached to the upper surface of the shoe longitudinally along the center line and projecting slightly out.
2. Body: It is the main frame to which the shoe, beam and handle are attached.
3. Beam; shoe, and Handle: The shoe, beam and the handle are generally attached to the body of the plough. The share is attached to the shoe which penetrates in to the soil and breaks it open. The shoe also helps in stabilizing and balancing the plough while in operation. The plough is provided with a wooden beam and the handle.

## Construction of a mould Board Plough

### EXPERIMENT – 14

**Aim:** To study animal drawn and tractor drawn mould Board ploughs

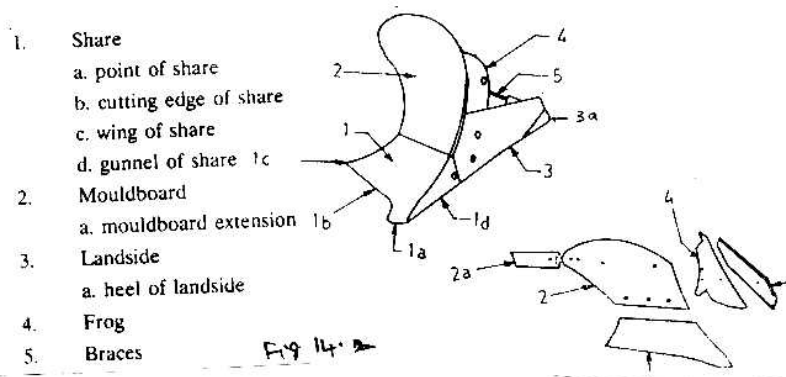
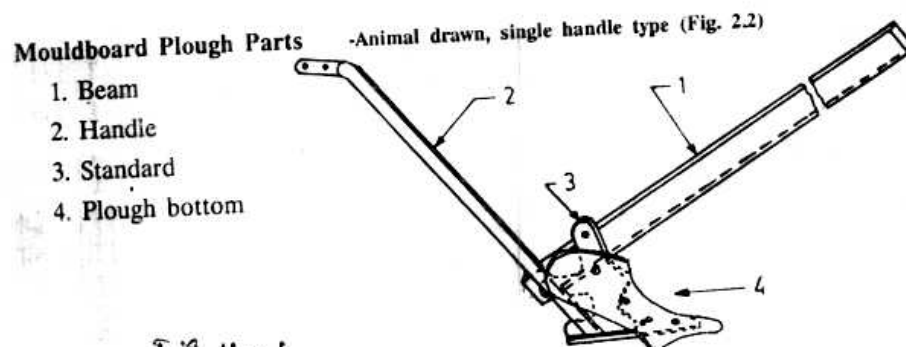
**Mould Board Plough:** It is a soil inverting type implement which cuts the furrow slice and turns it for covering trash into soil.

**Types of Mould Board Ploughs:**

Animal drawn – Trailed type

Tractor drawn – Semi mounted type

- Mounted type



Parts of a mould Board Plough (Definitions):

**Share:** The part of plough which penetrates the soil and cuts the furrow slice.

**Point of share:** The leading end of cutting edge which affects the penetration of share into the soil.

**Cutting edge of share:** The front edge of the share which makes the horizontal cut in the soil.

**Wing of Share:** The end of cutting edge of share.

**Gunnel of share:** The vertical face of the share which slides along the furrow wall.

**Mould Board:** The part of the plough that lifts, pulverises and inverts the furrow slice.

Mould Board Extension: The purpose of mould board extension is to turn soil over more gradually and completely.

Land side: The part of the plough which slides against furrow wall providing lateral stability to plough when in operation.

Heel of land side: The bottom end of the land side which may be replaced when worn out.

Frog: It is that part of plough which joins the mould board, land side and share together.

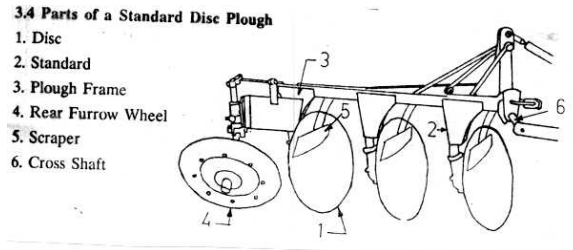
Brace: It is a piece used as support or a stiffner to mould board.

## Construction of a Standard Disc Plough

### EXPERIMENT – 15

**Aim:** To study the construction of a standard disc plough:

**Standard Disc Plough (Def.):** A standard disc plough is used for primary tillage operation and the work performed is similar to a mould board plough. It may have one or several individually mounted and frame supported disc blades, each with its own bearing and slanted at an angle to the vertical.



Parts of a standard disc plough (Definitions):

**Disc:** It is a soil working tool of the plough. Discs on a plough are mounted on bearings.

**Standard:** The standard connects the disc bearing and the plough frame.

**Plough Frame:** The standards are attached with the frame.

**Rear Furrow Wheel:** The rear furrow wheel is fixed at the end of the plough. The purpose is to stabilize the plough and take side draft.

**Scraper:** It is a plough attachment used to keep the disc clean as well as catch and turn the furrow slice before it falls away from the disc.

**Cross shaft:** It is a steel shaft positioned at the extreme front of the plough and arranged at right angle to the frame. The ends of cross shaft is cranked to which tractor lower links are attached.

## **EXPERIMENT – 16**

**Aim:** To study care and maintenance of seed – cum – fertilizer drill

**Care:** The following care should be taken for smooth and efficient functioning.

1. Check the suitability of metering systems in respect of the seed and fertilizers to be used.
2. Ensure the placement of seeds at proper depth.
3. Ensure the coverage of seeds and compaction of soil cover.
4. Check the performance of the attachment.

### **Maintenance Schedule:**

#### **Daily:**

- i) Clean the furrow openers, covering device and seed tube.
- ii) Apply grease to all existing grease points.
- iii) Check that all the nuts and bolts are properly tightened.
- iv) Remove the remaining fertilizer and clean the fertilizer system.
- v) Ensure the replacement of the parts, if any broken.

#### **Periodically:**

- i) At the end of the season check the entire machine and make a list of broken and worn out parts and ensure its repairs or replacements.
- ii) Thoroughly clean the seed and fertilizer hopper and then apply a coating of heavy oil on moving parts.
- iii) Clean the furrow openers, tubes and the metering system.
- iv) Fertilizer system should be thoroughly cleaned by flushing with water, dried properly and a oil. Coating should be applied inside and outside of the fertilizer attachment.
- v) Roller chains should be coated with oil.
- vi) Detachable link chain should be coated with oil.

#### **Precautions:**

1. Operator must ensure the leveling of the seed drill cum fertilizer with respect to the ground.
2. The seed drill should always be operated at optimum speed.
3. Before the operator starts the operation metering mechanism lever should be locked properly at calibrated scale.
4. Depth of sowing should be kept uniform through out the operation by locking the position control lever.
5. Operator should ensure the proper and smooth working of agitator.

6. Check that all working parts have been protected properly by providing the guards or cover.
7. Grain and fertilizers tanks should be checked at regular interval so that they should not become empty during sowing.
8. When the tractor is in operation, the operator should not allow any person to sit on the tractor or to stand on the drill.
9. No adjustment either on tractor or on drill should be made during operation.
10. Operation should be done by the skilled operator only.

## **EXPERIMENT – 17**

**Aim:** To study cultivators and its important functions

**Cultivation:** It is an implement for inter cultivation with adjustable tines or discs to seed bed preparation and for sowing with seeding attachment.

Types of cultivators:

1. Disc Cultivator: It is a cultivator fitted with discs.
2. Rotary cultivator: It is a cultivator with tines or blades mounted on a power driven horizontal shaft.
3. Time cultivator: It is a cultivator fitted with tines having shovels.

The cultivator stirs the soil, and breaks the clods. The tines fitted on the frame of the cultivator. A cultivator performs functions intermediate between those of plough and harrow. destruction of weeds is the primary function of a cultivators.

### **Functions of cultivator:**

- i) Inter culture the fields
- ii) Destroy the weeds in the fields.
- iii) Aerate the soil for proper growth of crops.
- iv) Conserve moisture by preparing mulch on the surface.
- v) To sow seeds when it is provided with sowing attachments.

## QUESTIONS FOR EVALUATION

After performing the practical task the students are required to answer the following questions:

1. Define Engine?

Ans: Any machine which converts heat energy into mechanical energy is called engine.

2. What are the different types of engines?

Ans: a) External combustion engine (E.C.Engine) and  
b) Internal combustion engine (I.C. Engine).

3. What is Internal combustion engine?

Ans: Internal combustion engine or I.C.Engine

Here the combustion of fuel takes place inside the engine cylinder and heat is generated within the cylinder of the engine.

4. What is External combustion engine?

Ans: E.C.Engine: Here the combustion of fuel takes place outside the engine cylinder and heat is generated outside the engine.

5. What are the main parts of I.C.Engine?

Ans: 1.Cylinder; 2.Cylinder block; 3.Cylinder head; 4. Cylinder liner; 5. Piston; 6.Connecting rod ; 7. Crank shaft.

6. What are the different types of piston rings?

Ans: i) Compression rings and  
ii) Oil rings

7. Where the compression rings are located?

Ans: They are placed in the grooves nearest to the piston head.

8. Where the oil rings are located?

Ans: Oil rings are located either in the lowest groove above the piston pin or in a groove above the piston skirt.

9. What is the use of piston pin?

Ans: It is also called wrist pin or gudgeon pin. Piston pin is used to join the connecting rod to the piston.

10. What is the function of crank shaft?

Ans: It is the main shaft of an engine which converts the reciprocating motion of the piston into rotary motion of the fly wheel.

11. What is the function of crank case?

Ans: The crank case is that part of the engine which supports and encloses the crank shaft and cam shaft. It provides a reservoir for lubricating oil of the engine.

12. What are the four strokes of Diesel engine?

Ans: 1. Suction stroke; 2. Compression stroke; 3. Power stroke; 4. Exhaust stroke

13. What is the function of Air cleaner?

Ans: As the name implies it cleans the air going to engine, the atmospheric air contains a lot of minute dust particles if we allow this to go to engine, those dust particles will work as energy paste and the engine will wear out faster.

14. What are the different types of Air cleaners?

Ans: There are two types of air cleaners.

i) Wet type (Oil bath type) and

ii) Dry type air cleaner.

15. What is the use of pre – cleaners?

Ans: Tractors always work in dusty conditions. In order to prolong the engine life, pre-cleaners are fitted in the upper portion of the main cleaner. When the engine is running, the air is drawn through the pre-cleaner to the inlet tube of the main cleaner. Here large dust particles are removed from the air stream, thus reducing much of the load on the main cleaner.

16. What is the function of clutch?

Ans: The clutch is fitted in between engine and gear box. Clutch is a device, used to connect and disconnect the tractor engine from the transmission gears and drive wheels. Clutch transmits power by means of friction between driving members and driven members.

17. What are different types of clutches?

Ans: Clutches are mainly of three types:

1) Friction clutch ; 2) Dog clutch ; and 3) Fluid coupling.

18. What are the different types of engine cooling systems?

Ans: a) Air cooling systems and b) Water cooling systems.

19. What are the advantages of Air cooled engines?

Ans: 1. Its design of air cooled engine is simple.

2. It is lighter in weight than water cooled engines due to the absence of water jackets, radiator, circulating pump and the weight of the cooling water.

3. It is cheaper to manufacture.

4. It needs less care and maintenance.

5. No risk of damage from frost, such as cracking of cylinder jackets or radiator water tubes.

20. What is meant by water cooling system?

Ans: Engines, using water as cooling medium is called water cooled engines.

21. What is Radiator?

Ans: Radiator is a device for cooling the circulating water in the engine.

22. What are the main parts of Radiator?

Ans: i) Upper tank

ii) Radiator core

iii) Lower tank

iv) Radiator cap.

23. What are the main components of the fuel systems in diesel engine?

Ans: 1. Fuel fitter

2. Fuel lift pump

3. Fuel injection pump

4. Atomisers and

5. High pressure pipe.

24. What is meant by fuel filter?

Ans: It is a device to remove dirt from fuel oil. Solid particles and dust in diesel fuel are very harmful for giving a fine degree of filtration.

25. What is meant by fuel lift pump for feed pump?

Ans: It is a pump which transfers fuel from the fuel line to the fuel injection pump. It is mounted on the body of fuel injection pump. It delivers adequate amount of fuel to the injection pump.

26. What is meant by Tillage?

Ans: Tillage is the basic operation in farming. It is generally done to create a favourable condition for seed placement and plant growth physical manipulation of soil in order to get the desired condition of the seed bed for sowing and for good growth of plant may be termed as tillage operation.

27. What are the functions of tillage?

Ans: 1. To obtain seed bed of good tilth.

2. To add fertility to the soil by covering vegetation and manure.

3. To destroy the weeds and to prevent their growth.

4. To leave the soil in such a condition so that air will circulate freely.

5. To leave the soil in a condition to retain moisture from the rain.
6. To destroy insects and their eggs larvae and their breeding places.
7. To reduce the soil erosion.

28. How do you classify Tillage?

Ans: Tillage is divided into two stages:

- a) Primary Tillage, and b) Secondary Tillage.

29. What are the main parts of Indigenous or country plough?

Ans: i) Handle ; ii) Beam ; iii) Shoe ; iv) Share.

30. What are the functions of Mould Board plough?

Ans: A mould board plough is a very common implement used for primary tillage operation.

The functions of M.B. Plough:

1. Cutting the furrow slice,
2. Lifting the soil,
3. Turning the furrow slice and
4. Pulverising the soil.