MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE

SEMESTER END EXAMINATION

B.Sc. (Agri.)

Semester	: **VI (New)**	**Academic year : 2022-2023**	
Course No	: **ENGG-364**	**Title:** Protected Cultivation and Secondary Agriculture	
Credits	: **2 (1+1)**	**Total Marks : 40**	
Day and Date	:	**Time:**	

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"

Q.1 What is greenhouse? What are the advantages of using greenhouses? (4m)

Ans: **Green house:**

Greenhouses are frames of inflated structure covered with a transparent material in which crops are grown under controlled environment conditions. These are large enough to allow a person to walk within the structure to carry out cultural and operational activities. Sometimes, it is referred as surfaced covered cultivation.

Advantages of greenhouses:

The following are the advantages of using the greenhouse for growing crops under controlled environment:

1. Throughout the year four five crops can be grown in a greenhouse due to the availability of required plant environmental conditions.
2. The productivity of the crop is increased considerably.
3. Superior quality produce can be obtained as they are grown under suitably controlled environment.
4. Gadgets for efficient use of various inputs like water, fertilizers, seeds and plant protection chemicals can be well maintained in a greenhouse.
5. Effective control of pests and diseases is possible as the growing area is enclosed.
6. Percentage of germination of seeds is high in greenhouses.
7. The acclimatization of plantlets of tissue culture technique can be carried out in a greenhouse.
8. Agricultural and horticultural crop production schedules can be planned effectively to take advantage of the market needs.
9. Export quality produce meeting international standards can be produced in a greenhouse.
10. Self-employment for educated youth on farm can be increased.

Q. 2 Give the detail classification of greenhouses based on shape, utility, construction and covering material with neat diagram. (4m)

Ans: **a. Greenhouse type based on shape**

The greenhouses classified commonly on the basis of shape are

i. Lean-to type green house,
ii. Even span type green house,
iii. Uneven span type green house,
iv. Ridge and furrow type green house,
v. Saw tooth type green house,
vi. Quonset type green house

b. Greenhouse type based on utility

The greenhouse can be used for retail or a wholesale purpose, for academic research interest, public park or gardens. The greenhouse can be utilized for artificial cooling or heating. This classification of greenhouses is based on its different utilities.

c. Greenhouse type based on construction

i. Wooden framed structures
ii. Pipe framed structures
iii. Truss framed structures

d. Greenhouse type based on covering materials

i. Glass greenhouses
ii. Plastic film greenhouses
iii. Rigid panel greenhouses

Q.3 Explain in brief about greenhouse plant response to light and ventilation. (4M)

Ans: **Light:** The rate of photosynthesis is governed by available fertilizer elements, water, carbon dioxide, light and temperature.' The production of carbohydrates from carbon dioxide and water in the presence of chlorophyll, using light energy is responsible for plant growth and reproduction. ' Light energy, carbon dioxide (C02) and water all enter into the process of photosynthesis through which carbohydrates are formed. ' The visible light of the solar radiation is a source of energy for plants. 'LIGHT'.

Photosynthesis does not increase at light intensities higher than 32.3 klux.' Greenhouse crops are subjected to light intensities varying from 129.6 klux on clear summer days to 3.2 klux on cloudy winter days. ' The light intensity is measured by the international unit known as lux. ' If higher than optimal light intensities are provided, growth again slows down because of the injury to the chloroplasts. 'If the light intensity is diminished, photosynthesis slows down and hence the growth.

Ventilation: In case of small greenhouses (less than 6 m wide) natural ventilation can be quite effective during spring and autumn seasons. However, forced ventilation using fans is essential for precise control over the air temperature, humidity and carbon dioxide levels.' The ventilation in a greenhouse can either be natural or forced. ' It is quite possible to bring greenhouse air temperature below this upper limit during spring and autumn seasons by simply providing adequate ventilation for the greenhouse. ' Air temperatures above 35oC are generally not suited to crops in greenhouse. ' A greenhouse is ventilated for either reducing the temperature of greenhouse air, or for replenishing carbon dioxide supply, or for moderating the relative humidity of the air. 'VENTILATION

Q.4 Discuss in brief about the factors considered for site selection of greenhouse. (4M)

Ans: A greenhouse is designed to withstand local wind, snow and crop loads for a specific cropping activity. In this way, the structure becomes location and crop specific. The building site should be as level as possible to reduce the cost of grading, and the site should be well aerated and should receive good solar radiation. Provision of a drainage system is always advisable, because of the extensive use of water in greenhouse operations. Where drainage is a problem, it is wise to install tile drainage below the surface prior to the construction of greenhouse. It is also advisable to select a site with a natural windbreak. Such as a tree line or hill, on the north and northwest sides. In regions where snow is expected, trees should be 30.5 m away in order to keep drifts back from the greenhouses. To prevent shadows on the crop, trees located on the east, south, or west sides should be at a distance of 2.5 times their height. Owing to the limited availability of the agricultural labourers, high wages are to be paid to attract them. Higher wages can be offset by automation,

which reduces the number of employees but increases productivity.

Q. 5 Enlist the covering materials used for greenhouse. State the properties of an ideal greenhouse covering material.

Ans:
1. Glass
2. Plastic films
3. Rigid plastic structured panels:
4. Fiberglass
5. Polyethylene Film

Key characteristics that should be considered in selecting a covering material are the cost, its durability (how long it lasts), its weight and ease of repair or replacement, how much light is transmitted through the material and how much energy moves through the material.

Q.6 List out the different irrigation systems used in green house. Explain the drip irrigation system in detail. (4M)

Ans:
1. Hand watering
2. Perimeter watering
3. Overhead sprinklers
4. Boom watering
5. Drip irrigation

Drip irrigation system for greenhouse.

Greenhouses and drip irrigation are a perfect match.

Plants in a greenhouse are totally dependent on the operator for water. Forget to water once in hot weather and the stress can set plants back enough to slow growth, to drop flowers or fruit, or to reduce the ability of plants to resist pests and disease.

Drip irrigation is a slow water delivery system in which water can be applied, drop by drop, to the soil surface near the base of the plant. A properly designed automatic drip irrigation system can remove much guessing about when to irrigate and how much water to apply. Water is applied whenever the sensor indicates a sub-optimum soil moisture level. Using automatic drip irrigation systems, skilled greenhouse managers can:

- Apply correct water amounts precisely when required to maintain optimum available soil moisture in the root zone.
- Reduce management time required for observing plant water needs and manually controlling irrigation systems.
- Keep leaf surfaces and stems drier because water drips directly on the soil instead of spraying in the air.
- Prevent water puddling and splashing by applying water no faster than it will percolate into the soil.
- Reduce incidence of leaf mold, gray mold-rot and other foliage diseases.
- Reduce evaporation losses and fruit deterioration by keeping more soil surface dry.

Increase production if other factors are not limiting.

Q.7 Define drying. What are the advantages of grain drying? (4M)

Ans: **Drying**: - Drying refers to removal of moisture from grains and other products to a predetermined level. Drying is a thermo-physical and physic-chemical operation by which the excess moisture from a product is removed.

Advantages of grain drying:

1) Drying permits early harvest of crops. This leads to reduction of losses by shattering. This also leads to permit time for preparation of land for sowing of following crop.
2) Drying helps in proper planning of harvesting season. If adequate drying facilities are available then crop can be harvested as per the availability of labourers.
3) Drying of agricultural products to optimum moisture content results in safe storage of products over a longer period. Grains are stored in large quantities for long period in Government warehouses and industries for their subsequent use as and when required.
4) Storage of products after drying makes products available during off

seasons. Selling of grains in off season would fetch additional income to growers as prices remain higher during these periods.

5) When grains are stored, due to increase in the temperature and moisture content, heat of respiration also increases. The heat of respiration can be removed by aeration and drying. Thus the temperature and moisture content of the products can be brought down and the viability of seeds could be maintained.

6) Some agricultural by-products and waste products can also be converted into useful products by proper drying.

Q.8 The moisture content of a paddy sample was determined in dry basis (%) was observed to be 24. Convert the dry basis (%) moisture content to wet basis (%) moisture content. (4M)

Ans: Solution:

MCwb = MCdb/(100+Mwb) x 100%

= 24/(100+24)x 100%

= 0.1935 x 100

= 19.35% wb

Q.9 Enlist different types of dryers. Explain the construction and working of Baffle dryer with neat diagram. (4M)

Ans: Grain dryers can be divided into two broad categories,

(A) Unheated air dryers (Natural air dryer),

(B) Heated air dryers:

(i) Flat bed type batch dryer

(ii) Lousiana State University dryer (L.S.U.)

(iii)Baffle dryer

(iv)Tray dryer

(v) Solar dryer

Baffle dryer

This a continuous flow mixing type of grain dryer as shown in Fig..

Construction

The baffle dryer consists of: (1) grain receiving bin, (2) drying chamber fitted with baffles, (3) plenum fitted with hot air inlet, (4) grain discharge control device, and (5) hopper bottom. A number of baffles are fitted with the drying chamber to divert the flow and effect certain degree of mixing of grain. The two baffle plates with the outer and inner sides are set 20 cm apart for the passage of the grain in the drying chamber. The dryer is made of mild steel sheet

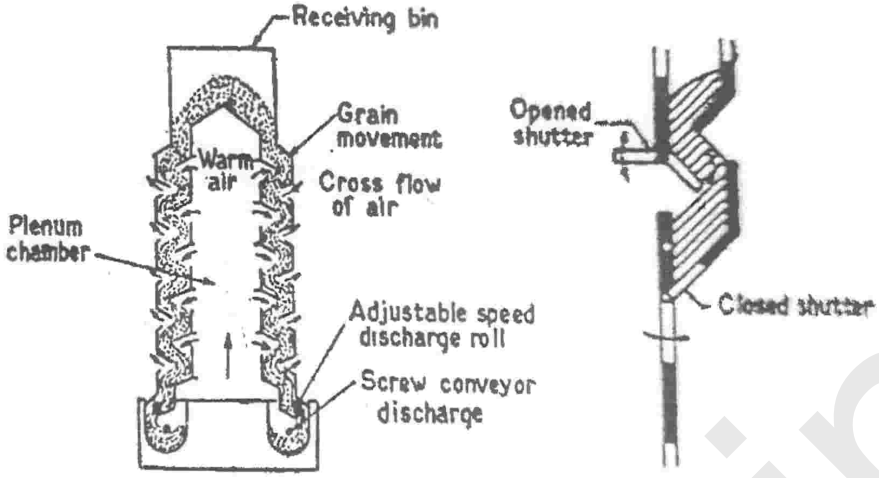

Fig. Baffle dryer

Operation

Grain is fed at the top of the receiving bin and allowed to move downward in a zigzag path through the drying chamber where it encounters a cross flow of hot air. On account of zigzag movement, a certain degree of mixing of grain takes place. The partially dried grain discharges from the hopper bottom is recirculated by a bucket elevator until it is dried to the desired moisture level.

Q.10 Enlist the different material handling equipments. Explain the working principle of screw conveyor (4 M)

Ans: Material handling equipments:

1. Belt conveyor
2. Bucket elevator
3. Screw conveyor
4. Pneumatic conveyor

Screw conveyor

The screw conveyor consists of a tubular or U-shaped through in which a shaft with spiral screw revolves. The screw shaft is supported by end and hanger bearings. The rotation of screw pushes the grain along the trough. A typical screw conveyor is shown in Fig. The screw conveyor is used in grain handling facilities, animal feed industries and other installations for conveying of products generally for short distances. Screw conveyor requires relatively high power and is more susceptible to wear than other types of conveyors. The pitch of a standard screw which is the distance from the Centre of one thread to the Centre of the next thread to the Centre of the next thread is equal to its diameter. For example a 10 cm diameter screw has a pitch of 10 cm.

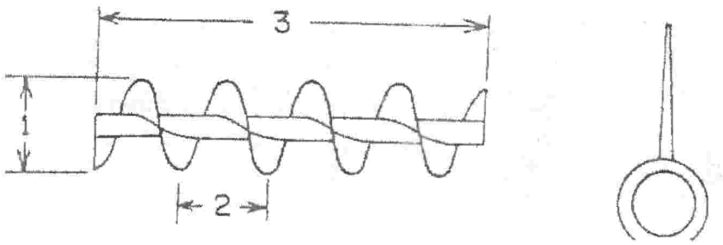

Fig. : Screw conveyor details
1. Screw diameter 2. Pitch of screw 3. Screw length

As the screw conveyor's driving mechanism is simpler, and no tensioning device is required, the initial cost of the conveyor is lower than any other conveyor with the same length and capacity. The main parts of a screw conveyor are, screw blade, screw shaft, coupling, trough, cover, inlet and outlet gates, bearing and drive mechanism.

The screw conveyor is generally used to move grains horizontally. However, it can also be use at any angle upto 90^{o} from the horizontal, but the capacity correspondingly reduces as per the inclination of conveyance.

SECTION "B"

Q.11 Define the following : (4m)

1. **Greenhouse Effect:** In general, the percentage of carbon dioxide in the atmosphere is 0.0345% (345 ppm). But due to the emission of pollutants and exhaust gases into the atmosphere, the percentage of carbon dioxide increases which forms a blanket in the outer atmosphere. This causes the entrapping of the reflected solar radiation from the earth surface. Due to this, the atmospheric temperature increases, causing global warming, melting of ice caps and rise in the ocean levels which result in the submergence of coastal lines. This phenomenon of increase in the ambient temperature, due to the formation of the blanket of carbon dioxide is known as greenhouse effect.
2. **Glazing:** The covering of a greenhouse or any structure with transparent material is known as glazing.
3. **Equilibrium moisture content:** If the vapour pressure of the water present in grains is more than the vapour pressure of water vapours in air, the water present in grain vaporises and diffuses in the atmosphere. Alternatively, if the vapour pressure of water present in grain is less than the atmospheric vapour pressure, grain will absorb moisture from atmosphere. This property of gaining or loosing of moisture as per the atmospheric conditions is known as hygroscopicity.
4. **Dehydration:** Dehydration means removal of moisture to very low levels usually to bone dry condition.

Q.12 Fill in the blanks: (4m)

1 The light intensity is measured by the international unit known as **Lux**.
2 The production of carbohydrates from carbon dioxide and water in the presence of chlorophyll, using light energy is known as **photosynthesis**.
3 In deep bed drying the grains are spread in a layer more than **20 cm**.
4 A **belt conveyor** is an endless belt operating between two pulleys with its load supported on idlers.

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