Model Answer Paper

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION

B.Sc. (Hons.) Agriculture

Semester	: VI (New)	Term	: II	Academic Year	: 2023-24
Course No.	: ENGG 364	Title	: Protected Cultivation & Secondary Agriculture		
Credits	: 2(1+1)				
Day & Date	:	Time (hrs.)	: 2 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

Q.1. Classifying the greenhouses based on shape, utility, construction and covering materials. 4

Ans: Classification of Greenhouses

i) Based on shape

a. Lean-to type greenhouse b. Even span type greenhouse
c. Un-even span type greenhouse d. Ridge and furrow type greenhouse
e. Saw tooth type Greenhouse
f. Quonset greenhouse

ii) Based on Utility

a. Greenhouses for active heating
b. Greenhouses for active cooling

iii) Based on Construction

a. Wooden framed structures
b. Pipe framed structures
c. Truss framed structures

iv) Based on Covering Material

a. Glass greenhouses
b. Plastic film greenhouses
c. Rigid panel greenhouses
d. Shading nets

Q.2. Enlist the factors responsible for greenhouse environment and explain in brief about Temperature.

Ans: The factors responsible for green house environment are **(Expected any four)** 4

i. Light
ii. Temperature
iii. Relative Humidity
iv. Ventilation
v. Carbon di-oxide

Temperature

Temperature is a measure of level of the heat present. All crops have temperature range in which they can grow well. Below this range, the plant life process stop due to ice formation within the tissue and cells are possibly punctured by ice crystals. At the upper extreme, enzymes become inactive, and again process essential for life cease. Enzymes are biological reaction catalysts and are heat sensitive. All biochemical reactions in the plant are controlled by enzymes.

The rate of reactions controlled by the enzyme often double or triple for each rise of temperature by 100C, until optimum temperature is reached. Further,

increase in temperature begins to suppress the reaction and finally stop it. As a general rule, green house crops are grown at a day temperature, which are 3 to 6^0C higher than the night temperature on cloudy days and 8^0C higher on clear days. The night temperature of greenhouse crops is generally in the range of 7 to 21^0C. Primula, mathiola incana and calceolaria grow best at 7^0C, carnation and cineraria at 10^0C, rose at 16^0C, chrysanthemum and poinsettia at 17 to 18^0C and African violet at 21 to 22^0C.

Q.3. Enlist the properties of ideal covering material for Greenhouse.

Ans: The ideal greenhouse selective covering material should have the following properties. **(Expected Four)** 4

i. It should transmit the visible light portion of the solar radiation which is utilized by plants for photosynthesis.
ii. It should absorb the small amount of UV in the radiation and convert a portion of it to fluoresce into visible light, useful for plants.
iii. It should reflect or absorb IR radiation which is not useful to plants and which causes greenhouse interiors to overheat.
iv. Should be of minimum cost.
v. Should have usable life of 10 to 20 years.

Q.4. Enlist the different types of mechanical dryers. Write in brief about constructional details and working of Buffle dryer with neat sketch.

Ans: Types of mechanical dryers are **(Expected four)** 4

1. Sack dryers

a) Batch dryers b) Flat bed dryers

2. Continuous flow dryers

a) Mixing type : Baffle dryer and L.S.U. dryer

b) Non-mixing type: Recirculatory batch dryer (RPEC dryer)

3. Tray dryer

4. Rotary dryers

5. Solar dryers.

Baffle dryer

This is a continuous flow **mixing type** of grain dryer (Figure). The main advantage with the dryer is uniformly dried product is obtained.

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 devices and (5) hopper bottom. A number of baffles are fitted with the drying chamber to divert the flow and affect certain degree of mixing of grain. The dryer is made of mild steel sheets.

Operation:

Grain is fed at the top in the receiving bin where it is allowed to go downward in a zigzag fashion. Through the dring chamber where it encounters a cross flow oh hot air. This design helps in mixing of dried and undried grains. The partial dried grain discharges from the hopper bottom is recirculated by a bucket lelevaror till the desired moisture content level. These dryers use low air flow rate of 50-95 m3/min-tonne and high drying temperature of 65^0C.

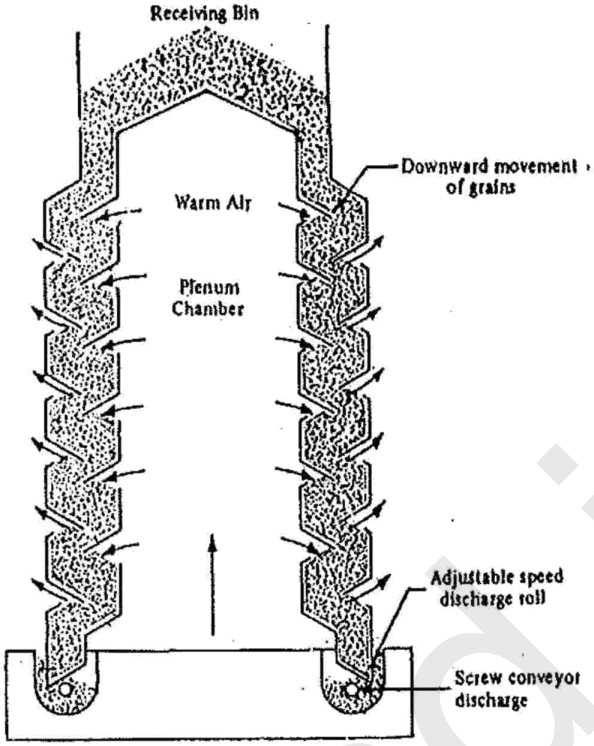


Fig. Baffle dryer

Q.5. Enlist the different irrigation methods used in green house. Explain any two important rules of application of irrigation. 4

Ans: The different irrigation methods used in green house are as follows

(Expected any Four)

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

Rules of Watering (Expected Two)

The following are the important rules of application of irrigation.

Rule 1: Use a well drained substrate with good structure:

If the root substrate is not well drained and aerated, proper watering can not be achieved. Hence substrates with ample moisture retention along with good aeration are indispensable for proper growth of the plants. The desired combination of coarse texture and highly stable structure can be obtained from the formulated substrates and not from field soil alone.

Rule 2: Water thoroughly each time:

Partial watering of the substrates should be avoided; the supplied water should flow from the bottom in case of containers, and the root zone is wetted thoroughly in case of beds. As a rule, 10 to 15% excess of water is supplied. In general, the water requirement for soil based substrates is at a rate of 20 l/m2 of bench, 0.3 to 0.35 litres per 16.5 cm diameter pot.

Rule 3: Water just before initial moisture stress occurs:

Since overwatering reduces the aeration and root development, water should be applied just before the plant enters the early symptoms of water stress. The foliar symptoms, such as texture, colour and turbidity can be used to determine the moisture stress but vary with crops. For crops that do not show any symptoms, colour, feel and weight of the substrates are used for assessment.

Q.6. What is drying? Write the various advantages of sun drying. 4

Ans: Drying:

Drying is the universal method of conditioning grain by removing moisture to a moisture content level that is in equilibrium with normal atmospheric air in order to preserve its quality and nutritive value for food and feed and its viability for seed. In case of cereals the drying is done upto the predetermined level of 12 to 13 % moisture content wet basis.

Advantages of sun drying (Expected four)

The advantages of sun drying are:

i. No fuel or mechanical energy is required.
ii. Operation is very simple
iii. Viability, germination, baking qualities are fully preserved.
iv. Microbial activity and insect/pest infestation are reduced.
v. No pollution
vi. Low capital requirement
vii. Operating costs are considerable.

Q.7. Enlist the engineering properties of grain. Explain in brief about Shape and Size. 4

Ans: Engineering properties: (Expected Four)

1. Size 2. Shape 3. Porosity 4. Coefficient of friction 5. Angle of repose ,
6. Thermal properties: Specific heat and Thermal conductivity.
7. Aero & hydrodynamic properties: Terminal velocity.

Shape and Size:

- Shape of the grain is connected with the geometrical form of the grain.
- Size of the grain refers to the characteristics of an object which in term determine how much space it occupies and, within limits, can be described in terms of length, width, and thickness.
- The Shape and size together with other characteristics of the grains is important in the design of the seed grader.
- These factors determine the free flowing or bridging tendencies of the seed mass, and therefore, determine the suitable handling and feeding equipment.
- Sphericity and equivalent diameters are also used to describe the shape and size, respectively for the grains.

Q.8. What are the principles of selection of the material handling machines and conveyors? 4

Ans: The selection of proper material handling machines and conveyers are important for ease in operation and getting desired capacity for a particular product.

Following are the principles based on which the material handling equipment is selected:**(Expected Four)**

1. Based on the characteristics of the products being conveyed
2. Working and climatic conditions.
3. The capacity of conveying
4. In a conveying system the possibility of use of gravity.
5. The capacity of handling / conveying equipment should match with the capacity of processingunit or units.
6. Spillage of conveyed products should be avoided.
7. Pollution of the environment due to noise or dust by the conveying system should also beavoided.

Q.9. If the initial weight of paddy sample was 30 g after drying the final weight of paddy sample was 26 g as the dry weight. Calculate the moisture content in percentage on wet basis. 4

Ans: Given data: Initial moisture content (Ww): 30 g
Final moisture content (Wd) : 26 g

Calculate the moisture content in percent on wet basis i.e.

$$\text{Moisture content (Wet basis) in percent} = \frac{\text{Initial weight of sample} - \text{Final weight of sample}}{\text{Initial weight of sample}} \times 100$$

$$= \frac{30 - 26}{30} \times 100$$

Ans: **= 13.33 % = 13% (Rounded)**

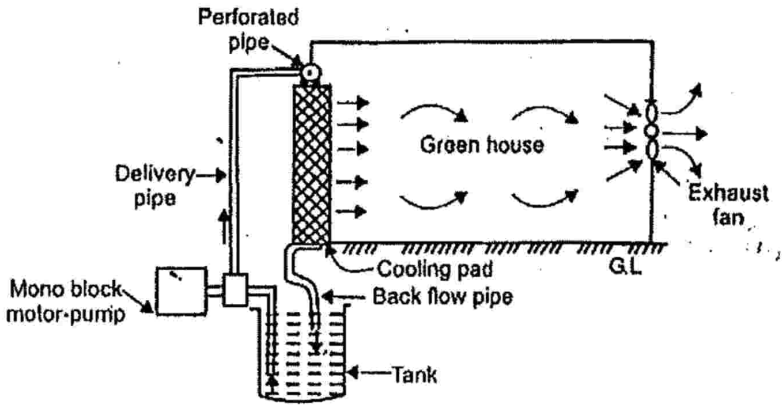
Q.10. Write short notes on (Any Two).

Ans: a) **1. Green House Effect:** 4

The percentage of carbon dioxide in the atmosphere is 0.035% (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.

b) **2. Fan and Pad cooling system:**

The fan and pad evaporative cooling system has been available since 1954 and is still the most common summer cooling system in green houses. Along one wall of the green house, water passes through a pad that is usually placed vertically in the wall. Traditionally, the pad was composed of excelsior (**wood shreds**), but today it is commonly made of a **cross-fluted cellulose material** somewhat similar in appearance to corrugated card board. Exhaust fans are placed on the opposite wall. Warm outside air is drawn in through the pad. The supplied water in the pad, through the process of evaporation, absorbs heat from the air passing through the pad as well as from surroundings of the pad and frame, thus causing the cooling effect. Khus-khus grass mats can also be used as cooling pads.



c) 3. **Belt conveyors:**

A belt conveyor is an endless belt operating between two pulleys with its load supported on idlers. The belt may be flat for transporting bagged material or V-shaped. The belt conveyor consists of a belt, drive mechanism and end pulleys, idlers and loading and discharge devices. On the belt conveyor baggage/ product lie still on the surface of belt and there is no relative motion between the product and belt. This results in generally no damage to material. Belt can be run at higher speeds, so large carrying capacities are possible.

Horizontally, the material can be transported to longer distance. The initial cost of belt conveyor is high for short distances, but for longer distances the initial cost of belt conveying system is low. The first step in the design of a belt conveyor with a specified conveying capacity is to determine the speed and width of the belt. The belt speed should be selected to minimize product spillage or removal of fines due to velocity of the belt. For transportation of grains, the belt speed should not increase 3.5 m/s. Generally, for grain conveying, belt speed of 2.5 to 2.8 m/s is recommended. The selection of belt width will depend upon the capacity requirement, speed of operation. The efficiency of belt conveyor is mainly dependent on idlers. Ideally, the pace between the successive idlers should be approximately equal to the width of the belt (spacing should not exceed 1.2 m). The upper idlers and the return idlers are usually, placed at an equal distance from one another. It may also be necessary to install shock absorbing idlers at the loading points.

SECTION 'B'

Q.11. State True or False. 4

Ans: 1. Quonset type greenhouse is placed against the side of ~~and~~ an existing building.
False

Ans: 2. The value of percentage moisture content on dry basis is higher than wet basis.
True

Ans: 3. The Capacities of bucket elevators may vary from 2 to 1000 t/hr
True

Ans: 4. The ideal greenhouse covering material should have the usable life of 5 to 12 years.
False

Q.12. Fill in the blanks. 4

Ans:
1. **Un-even** type greenhouse is constructed on hilly terrain.
2. The dielectric properties of grain depend on its **Moisture content**
3. The light intensity is measured by the international unit known as **Lux**
4. **Angle of repose** is the angle between the base and the slope of the cone formed on a free vertical fall of the grain mass to a horizontal plane.

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Signature:

Name of **Course Instructor**: Er. H. M. Khobragade
Designation: Assistant Professor (FPM)
Mobile No.: 9422939040
E-mail ID: hitendrakumarmk@gmail.com

Signature of **Head/ Incharge of the Department/ Sec**
Name: Dr S.H. Thakare
Phone No. Head, Mobile No. 97637
Dept. of Agril. Engg.
Dr P.D.K.V., Akola