MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Sc. (Hons.) Horticulture

Semester : V (New)	Term : I	Academic Year : 2019-20	
Course No. : H /FS 359			
Credits : 2 (1+1)	Title : Orchard and Estate Management		
Day & Date : Tuesday, 05.11.2019	Time : 14.00 to 16.00	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"

Q.1 Describe in brief different systems of planting orchard crops.

Q.2 a) Enlist different irrigation methods.

b) Write in detail drip irrigation methods.

Q.3 Describe in brief clean cultivation, sod culture and sod mulch.

Q.4 a) Enlist different methods of grafting used for rejuvenation of fruit tree.

b) Write in detail about cleft grafting.

Q.5 a) Define high density planting.

b) Discuss in brief advantages and disadvantages of high density planting.

Q.6 Write in brief factors leading to unfruitfulness.

Q.7 a) Define Integrated nutrient management.

b) Discuss the importance of INM.

Q.8 a) Define crop model.

b) Write in brief about utility of crop models.

Q.9 a) Define multi-species cropping.

b) Write in short about types of multi-species cropping systems.

Q.10 Write short notes.(Any Two)

a) Wind break

b) Orchard management

c) Crop regulation in mango

SECTION "B"

Q.11 Fill in the blanks.

1) The term _____refers to large area (more than 1000 acres) of sole crop cultivation.

2) Hexagonal system of planting accommodates _____% more plants than square system.

3) Wind breaks are planted on _____direction of orchard.

4) The second crop is planted into the first crop before harvest is called _____cropping.

Q.12 Define the following terms.

1) Orchard

2) Cover crop

3) Top working

4) Integrated pest management

✧ ✧ ✧ ✧ ✧ ✧ ✧ ✧ ✧ ✧ ✧

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, [illegible]
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SECTION "A"

Q.1 Describe in brief different systems of planting of orchard crops

1. **Square system:** This system is considered as the simples of all the system of planting and followed widely. In this system of planting equal spacing is given fir all the trees. In this system the [illegible] into square shape and trees are planted at four corners of the square in straight rows at right angle. Intercrops can be cultivated.
2. **Rectangular system:** Here also, trees are planted on each corner of a rectangle. The distance between any two rows is more than the distance between any two trees in a row. Like in square system [illegible] intercrop's is also possible in this system. The only difference in this system is, more plants can be accommodated in the row, keeping more space between the rows.
3. **Triangular shape:** The trees are planted as in square system but the difference being that those in the even-numbered rows are midway between those in the odd rows instead of opposite to them. It accommodates less number of trees than the square system. It is difficult both to layout and cultivate trees in this system. Only advantage of this system is, more open space is available for the spread of the trees and intercrops
4. **Hexagonal system:** In this system, trees are planted in each corner of an equilateral triangle. Here six trees form a hexagon with the 7th tree at the centre. This system follows alternate row planting pattern as no tree in a row is perpendicular to a tree in the adjacent row. This system can be followed when there is ample supply of water in a highly [illegible] valued land.
5. **Quincunx or diagonal system:** This is nothing but the square system with plants in the centre of the square. Eventhough this system of planting accommodates double the number of plants, it does not provide equal spacing between plants. the central 5th tree, actually a filler is quick and erect growing and early maturing, like pomegranate, papaya which would be removed as soon as the main trees planted at the corners come to bearing.
6. **Contour system:** This system of planting is followed mainly in the areas with slopes, where the land is with undulating topography and the damage of erosion and difficulty of irrigation persist. On such [illegible]

lands, generally bench terracing may be done after the trees are p... Trees can be planted on terraces or along contours. As the tree positi... can be decided only on the spot, the trees will not be equal-distant. This type of system is good for shallow soils where terracing will expose rocky or poor sub soil. Irrigation and cultivation can be done along tree rows only.

Q2 **a) Enlist different irrigation methods and write in detail about drip irrigation method.**

Enlist different irrigation methods:

A. Surface irrigation

Flooding

Check

Basins

Ring

Bed

Furrow

Overhead irrigation

Drip irrigation

b) Write in detail drip irrigation method.

Drip irrigation is known by various names like 'trickle irrigation or high frequency irrigation daily flower irrigation' This is a method of watering plants at a rate equivalent to its consumptive on so that plants would not experience any stress during the growin phase. In this the water is conveyed from a source under low pressure to the root zone of the crop only.

It has the following components

1. Water supply pump at the source of water
2. filters, fertilizer mixing tank,
3. Control system
4. pressure regulators,
5. monitor valve/water meter,
6. head lines or main lines for conveying water from pumpset to the field where water is to be delivered.
7. Laterals to carry water to plant rows and
8. the emitters/dripper through which water is finally released at a distance of 5 to 25 cm from the plant base.

Advantages

1. Water saving – water is applied directly to the root zone, eliminating wastage, 30 to 70 percent water saving
2. Labour saving – This is eliminates the need for constructing borders, bunds and labour intensive works associated with conventional irrigation techniques, there by saving about to 60to90%
3. Use of lower quality water – water is applied continuously and the root zone is kept wet constantly.
4. Increased yield and plant vigor – It maintains soil moisture at optimum

level eliminating water stress resulting in greater vigour, better establishment and high productivity.

5. Reduced weed growth – Since water is applied to the restricted area wide spread weed growth is inhibited due to restricted water supply.
6. Saving of nutrients – nutrients are directly applied to the root zone along with water. Leaching losses are minimized. saving upto 30 to 60%

Disadvantages

1. Higher initial investment
2. Clogging of drippers due to oxidants, bi oxides and algae.

Q.3

Describe in brief clean cultivation, sod culture and sod mulch.

I. Clean cultivation

This type of cultivation is extensively followed in India. This involves regular ploughing and removal of weeds. The clean culture has many disadvantages

1. Humus will be completely depleted rapidly due to frequent cultivation.
2. Frequent cultivation causes injury to the feeding roots and the trees may be short lived or stunted in growth.
3. Clean cultivation aids in more aeration leading to the depletion of nitrogen
4. Hard pan is created in the soil
5. Frequent cultivation causes more soil erosion

Sod culture

In this method, permanent cover of grass is raised in the orchard and not tillage is given. This type of orchard cultivation is followed in USA and Europe. This may be useful in sloppy lands for preventing soil erosion. But they compete for soil moisture and available nitrogen. The drawbacks of this system are the need for increased manuring and water application. They are harmful to shallow rooted trees.

Sod mulch

This is similar to sod and the only difference is that the vegetation is cut frequently and the cut material is allowed to remain on the ground. This is slightly better than the previous one, as the moisture loss is not so great as in sod – in both sod and sod mulch, more nitrogen should be applied to the fruit trees than usual application because the vegetation utilizes more soil nitrogen.

Q.4

a) Enlist different methods of grafting used for rejuvenation of fruit tree.

1. Cleft grafting: Side grafting:
2. Crown grafting:
3. Bridge grafting:
4. Top working:

b) Write in detail about cleft or wedge grafting.

This is one of the oldest methods grafting. It is usually is done during the early spring. In this method, the limb or the main stem is first sawed off and a vertical split of about 5-7.5 cm long is given down the center of the stem to be grafted. The split is then kept open by inserting a screw driver of chisel in the split. The scion is prepared by cutting the end in the shape of wedge of about 5cm in length. The scion should be 7.5-10cm long having at least 2-3 buds. The scions are inserted one in each side of the cleft. If the scion is not held tightly in the cleft, the graft is tied and the grafted portion is covered with grafting wax.

5 a) Define high density planting.

Planting of fruit trees rather at a closer spacing than the recommended one using certain special techniques with the sole objective of obtaining maximum productivity per unit area without sacrificing quality is often referred as 'High density planting' or HDP.

b) Discuss in brief advantages and disadvantages of high density planting.

Advantages:

1) It induces precocity/precocious bearing
2) Higher yields. The average yield in apple is about 5.0 t/ha under normal system of planting and it is about 140.0 t/ha under high density planting.
3) Higher returns per unit area
4) Early returns
5) Easy management of orchard tress
6) Reduces labour cost resulting in low cost of production
7) Enables the mechanization of fruit crop production and facilitates more efficient use of fertilizers, water, solar radiation, fungicides, herbicides and pesticides.

Dis- advantages of high density planting:

1) HDP results in overcrowding, over lapping not only in the tops, but also in the root system and heavy competition for space, nutrients and water.
2) More important is build-up of high humidity, lack of cross ventilation in the orchard, which is more conducive for build-up of pests and diseases.
3) Reduction in yield in the long run after 10-12 years of age.
4) Production of small sized fruits and poor quality fruits.

Write in brief factors leading to unfruitfulness.

Internal

- Evolutionary
- Genetics
- Physiological

External

- Nutritional
- Pruning
- Locality

- Temperature
- Environment
- Insect- pests and diseases

Q.7

a) Define Integrated Nutrient Management.

Integrated Nutrient Management (definition): The combined use of different sources of plant nutrients i.e. organic, biological and inorganic amendments for the maintenance and improvement of soil fertility and plant nutrient supply at an optimum level for desired crop productivity may be termed as integrated nutrient management.

b) Discuss the importance of INM.

Importance of INM

- The INMS helps to restore and sustain soil fertility and crop productivity.
- It may also help to check the emerging deficiency of nutrients other than NPK.
- It brings economy and efficiency in fertilizer use and favourably affects the physical, chemical and biological environment of soil.
- It helps to produce fruits of high nutritional quality in sufficient quantity.
  - Currently, decreasing soil fertility has also raised concerns about the sustainability of agricultural production.
  - Future strategies for increasing agricultural productivity will have to focus on using available nutrient resources more efficiently, effectively than in the past.
  - Integrated management of the nutrients is needed for proper plant growth, together with effective crop, water, soil, and land management.

Q.8.

a) Define crop model.

Crop Model

It is defined as "an attempt to describe a certain process or a system through the use of a simplified representation, preferably a quantitative mathematical expression that focuses on relatively few key variables that control the process or a system"

b) Write in brief about utility of crop models.

Utility of crop models

- Crop models help us to understand the crop production process or system in a more systematic way.
- The process of modeling is often equated to solving of a puzzle. A puzzle has to be considered as a whole even if we need to fit a one small block. Crop models provide us quantitative information about the amount of inputs like the doses of fertilizers, number of irrigations, amount of insecticides/pesticides, etc. required.
- These models also help us to consider various input requirements under different climatic conditions. This means models help us to get reasonably clearer picture of otherwise hazy scene.

- It is also said that models provide us reasonably acceptable answers to questions where we can only have vague answers.
  - So we must be clear that models would not guarantee one hundred per cent accurate answers; even if we take a large number of variables into consideration. This is because crop cultivation is a biological activity and the final output depends on our knowledge of the state of climate that will prevail during the growing season, our knowledge about the appropriate technology required, availability of that technology, about input market conditions, about the biological risk factors associated with the crop, and such other factors.
  - It is clear from this discussion that in finalizing a crop model we have to assume some mean or standard values (based on the past record, experience, expert judgment, etc.) of the variables which we may not be taking explicitly in our model.
  - Since, there can be a large number of factors that may affect the crop, it becomes easier to understand their effect if these variables are grouped on some basis. Thus we may have a group of ecological variables; economic and social variables, technical and climatic factors that may need to be considered in our crop models.

Q.9

a)Define multi-species cropping.

It involves growing of large number of compatible crops in the same piece of land.

b) Discuss in short about types of multi-species cropping systems?

Types of multi-species cropping systems:

i). Inter-cropping
ii). Mixed cropping
iii). Sequence/Sequential Cropping
iv). Relay cropping
v). Ratoon cropping
vi). Multi-storey cropping

i. Inter-cropping

- In plantations of fruit trees, inter-cropping is the practice of growing one or more short duration crops between inter-spaces of trees and rows, to get additional/supplementary income especially during the initial unproductive years of orchard life

ii. Mixed-cropping:

- This cropping pattern is used in vegetable crops, wherein, two or more crops are grown simultaneously without a definite row pattern.
- It is generally practiced with a view to avoid risk in farming.
- It is a type of subsistence farming and ensures different needs of

Q.10 Write short note (any two)

a. Wind breaks

Wind-breaks are strips of trees and/or shrubs planted to protect homes, canals or other areas from wind and blowing soil or sand.

The important reasons for which wind-breaks are planted include:

- to protect livestock from cold winds
- to protect crops and pastures from hot, drying winds
- to reduce/prevent soil erosion
- to provide habitat for wildlife
- to reduce evaporation from farmlands
- to improve the microclimate for growing crops and to shelter people and livestock,
- to retard grass fire for fencing and boundry demarcation

The wind-break height determines the size of the sheltered area. The taller the windbreak, the greater the area it protects. On level ground a windbreak will reduce the speed of wind for about 25 times the tree height on down windside. Maximum reduction of wind speed is in the area 5 to 15 times the tree height away from the wind break. On the upwind side some protection is gained up to a distance of 5 times the tree height away from the windbreak. Thus a wind break 20 m tall will give some protection from 100 m on the upwind side to 500 m on the downwind side. Wind breaks of three to five rows are more effective.

b. Orchard management

Orchard is an area, often enclosed, devoted to the cultivation of fruit trees and as a unit it encompasses various resources like land, water, trees and external inputs. All these resources have to be well utilized to the best advantage for higher production per unit area on sustainable basis without adversely affecting the quality of environment. We should also understand that a good manager is one who gets maximum out of various inputs consistently without any loss of fertilizers and manure, plant, plant protection chemicals, produce etc. Therefore, one should understand the management of these qualities of both resource and output. Various resources are soil and water.

Resources for better comprehension of orchard management are:

(I) Soil management
(ii) Water management
(iii) Nutrition management
(iv) Pruning and training (plant management)
(v) Weed management
(vi) Plant protection against insect pests and diseases.
(vii) Bearing, fruitfulness and causes of unfruitfulness.
(viii) Maturity and harvest.
(ix) Post harvest handling, utilization and marketing.

c. Crop regulation in mango

Fruit drop:

family.

iii. Sequence/Sequential Cropping:

- It refers to growing of two or more crops in quick succession on the same piece of land in a farming year.
- Sequential cropping is also called non-overlapping cropping because there is no overlap between the two or more cropping.

iv. Relay cropping:

- Relay cropping is essentially a special version of double cropping, where the second crop is planted into the first crop before harvest, rather than waiting until after harvest as in true double-cropping.
- In this way, both crops share a portion of the growing season, increasing solar radiation and heat available to each. For examples:
  - Sowing of corn seeds and French beans on the ridges of tomato field in June will give additional crop as the former is harvested in September after the end of tomato growing season in North-western hilly areas of the countries, while the crop of later sown for fresh vegetable matures in September-October.

v. Ratoon cropping:

- A ratoon crop is the new cane which grows from the stubble left behind is harvesting.
- This enables the farmers to get three or four crops from these before they have to replant.
- The principals involved in ratoon cropping, a form of sequential copping, are different from other types of multiple cropping because of such factors as the presence of a well developed root system, earlier maturity, and the perennial nature of the plant.
- **vi. Multi-storied cropping:** Multi-storied cropping is a practice, which is in use in plantation crops in tropical humid climates of India.

- In mango, fruit drop is exceptionally high as only approximately [illegible] of the perfect flowers develop fruits to maturity. There are several causes such as lack of pollination, low stigmatic receptivity, defective perfect flowers, competition between fruit lets, and [illegible] regimes.
- Extent of fruit drop in mango can be controlled by regular irrigation during fruit development period only after fruit set.
- Post setting drop of Alphonso mangoes can be controlled by foliar application of 25 ppm of NAA or 2,4-D.

Biennial bearing:

- Problem of biennial is a major problem in mango associated with climatic factors, age and size of shoots, C: N ratio and hormonal imbalances in the trees. A number of remedial measures have been suggested from time to time, which include

1. Proper upkeep and maintenance of orchard
2. De-blossoming
3. Smudging and crop regulation through chemicals, pruning etc.

SECTION "B"

Q.11 Fill in the blanks	
1. The term **estate** refers to large area (more than 1000 acres) of sole crop cultivation.	
2. Hexagonal system of planting accommodates 15% more plants than square system.	
3. Wind breaks are planted on South- West direction of orchard.	
4. The second crop is planted into the first crop before harvest is called relay cropping.	
Q. 12 Give the uses of following crops	
1. Orchard	Orchard is an area, often enclosed, devoted to the cultivation of fruit trees and as a unit it encompasses various resources like land, water, trees and external inputs.
2. Cover crop	The crop grown to provide a cover to soil to protect it from erosion. It may be green manure crop also.
3. Top working	The conversion of old orchards with by grafting scions from new improved varieties is called as top working.
4.Integrated pest management -	Integrated pest management can be defined as "a sustainable approach of management of pests by the combination of biological, cultural, mechanical and chemical tools in a way that minimize economic, health and environmental risks".