

Semester : I (New)

Course No: HORT-111

Credits : 1+1=2

Day and Date:

Time:

Total Marks: 40

Model Answer sheet

- Note: 1. Solve any eight question from SECTION – “A”
2. All question from SECTION – “B” are compulsory
3. All question carry equal marks.
4. Draw neat diagrams wherever necessary.



SECTION – “A”

Q.1 Define Horticulture. Enlist scope of horticulture in India and Maharashtra and explain better Utilization of land and Government incentives (4)

Ans: - Horticulture: - The word Horticulture is derived from the Latin word: Hortus and Colure meaning garden and to cultivate, respectively. Thus, Horticulture is branch of agriculture which is concerned with cultivation of garden crops. (1)

Scope of horticulture

There is vast scope for horticulture crops in Maharashtra and India because of the following reasons. (1)

- 1) Diverse agro climatic condition.
- 2) Better utilization of land.
- 3) Availability of irrigation facilities.
- 4) Availability of good transport facility
- 5) Market of international repute.
- 6) Availability of improved varieties.
- 7) Availability of good quality planting material.
- 8) Improved techniques in horticulture.
- 9) Availability of cheap labour
- 10) Availability of cold storage facilities and processing technologies.
- 11) Availability of bank loan facilities.

- 12) **Government incentives.**
- 13) **High returns per unit area.**
- 14) **To meet dietary requirements.**
- 15) **Good export potential**

(2)

Explanation

- 1) **Utilization of land:-** The hilly and undulating cultivable waste land in India is about 9.65 lakh hectares can be brought under cultivation by growing dry land fruit crops such as Custard apple, Aonla, Ber, Dates, Tamarind, Pomegranate, Fig etc.
- 2) **Government incentives:** - Realizing the need for area expansion of fruit crops, during 1990, Government of Maharashtra have started a very ambitious program in which gives 100% subsidy to the marginal farmers towards the establishment and maintenance of fruit orchard for a period of three years and National Horticulture Mission during 2005 which is now named as Mission for Integrated Development of Horticulture.

Q.2 Enlist different climatic factors for growing fruit orchard and write in detail rainfall and light factors. (4)

Ans: - The different climatic factors for growing fruit orchard are as under (1)

- (1) Temperature
- (2) Atmospheric humidity
- (3) Rainfall
- (4) Wind
- (5) Hail storm
- (6) Light

Explanation (Climatic factors)

(3)

- 1) **Rainfall:-** The quantity of annual rainfall as well as its distribution plays an important role in the success or failure of fruit growing. Excessive rain occurring in short period is generally unfavorable to fruits as it leads to water logging. Rain at the blooming period may wash away the pollens and thereby inhibit pollination. In low rainfall regions, cultivation of fruit crops is difficult if adequate and cheap irrigation facilities are not available.
- 2) **Light:** - Fruit exposed to light are found to be better in quality than those receiving less light. In banana it has been observed that the fruits borne on upper half of the tree and consequently receiving more light were found to be richer in vitamin C and sugar contents. Fruits exposed to strong sun light are high, as in Vidarbha region the plant stem is likely to suffer from sun burn. In tropical region, the light is not such a problem, but in temperate region, care has to be taken that the trees receive good light for which it is necessary to train and prune the trees in a particular fashion.

Q.3 Define plant propagation. Write merits and demerits of asexual (vegetative) propagation. (4)

Ans: - Plant propagation: - It is controlled reproduction of a plant by a man in order to perpetuate the individuals or group of individuals which have specific value to him. (1)

Merits

1. Progenies raised by asexual methods are generally true to type, uniform in growth, yielding capacity and fruit quality.
2. Asexually propagated plants come to fruiting early i.e. they have less juvenile period.
3. Plants bearing seedless fruit or which are difficult to raise by sexual method can be propagated only by asexual means.e.g. Banana and pineapple
4. Uniformity of fruit quality can be obtained.
5. Budding and grafting to resistant rootstock for vigorous growth and free from pests and diseases is made possible.
6. Budding and grafting to develop the adaptability towards unfavorable soil conditions is made possible e.g. Jamberi and Rangpur lime can be used as rootstock for citrus.
7. The advantage of better rootstock can be conveniently combined with the method to suit the climatic requirements of the area.
8. Modification in the growth habit i.e. tree size and fruit quality is possible.
9. Vegetative propagation makes it possible to convert inferior quality crown into superior quality.
10. Top working improves the bearing capacity of the plants.
11. Vegetative propagation makes it possible to use a desirable plants as a variety directly, regardless of whether it is homozygous or herteozygous.
12. Mutant buds, branches or seedlings if desirable can be multiplied and used directly as varieties.

Demerits

- 1) No new variety can be evolved by means of the vegetative method of propagation.
- 2) Vegetative propagation in many cases is more expensive than seed propagation.
- 3) Vegetatively propagated plants are comparatively short lived.
- 4) Vegetatively propagated plants are comparatively less hardy.

Q.4 Define training. Enlist objectives of training. Explain any two methods of training. (4)

Ans: - **Training:** - Training is a relatively new practice in which tree growth directed in to a desired shape and form. Training young fruit tree is essential proper tree development. (1)

Objectives

(1)

- 1) To admit more light and air in center of tree.
- 2) To expose maximum leaf surfaces to sunlight.
- 3) To control and regulate the shape of tree so that various cultural operations can be carried out easily.

- 4) To develop strong frame work of the tree in order to protect the tree from strong winds.
- 5) To remove the water shoots.
- 6) To develop balance between vegetative and reproductive growth of tree.

Methods of training

(2)

- 1) **Central leader system** –In this training system, the main stem is allowed to grow unchecked. A central leader tree is characterized by one main, upright trunk, referred as the leader. The first branch is kept at 45 to 50 cm, height from ground level and other branches are allowed to grow on the main stem at 15 to 20cm distance. Branching generally begins on the leader 24 to 36 inches above the soil surface to allow movement under the tree. As the main stem grows certainly, the tree attains robust shape. Advantages of this system is development of strong crotches due to junction limbs and trunk however lower branches remains unproductive, fruit bearing on top portion creates problem in harvesting, trees prone to wind damage and this system is not suitable for high altitude and hot wind where there is high wind velocity eg. Sapota, Mango and Jamun.
- 2) **Open center system** – In this system, the plants are de-headed when they attain height of 45 to 50cm. The tree has no main center or main stem but a series of well spaced and distributed all around the main stem. The tree attains less height. Advantages of this system is better penetration of light to inner side of the tree i.e. at the center and all branches bears fruiting and facilitate intercultural operation. However this system is not suitable for high altitude where frost is common e.g. Apple, Pear and peach.
- 3) **Modified leader stem system**- This is an intermediate form of central leader and open center system and having benefits of both system. In this system. The main stem is allowed to grow for 4 to 5 years and headed back at height of 100 to 120cm. The first branch is allowed to grow at 40cm height from ground level 4-5 branches located at distance of 15 to 20cm and placed all around the main stem. In this system due to moderate height of trees easy to carryout intercultural operation, all branches will bear the fruits and suitable for all regions.



Q.5 Enlist different planting system of fruit orchard and explain any two of them.

(1)

Ans:- The planting systems for planting fruit orchards are as under

1. Square system
2. Rectangular system
3. Quincunx or Diagonal or filler system
4. Hexagonal System
5. Contour or Terracing system

Explanation

(3)

- 1) **Square system:** - The square system of planting is the simplest and most convenient for layout. In this system row to row and plant to plant distance is kept similar. The trees are planted exactly at right angle to each other thus every four plants make one square. This system of planting is universally adopted all over India.e.g. Mango, Jamun and sapota.

Advantages

- 1) Irrigation channels and paths can be made straight
- 2) Operations like ploughing, harrowing, cultivation, spraying, harvesting etc. become easy when trees are planted at equal distance from each other in regular lines.
- 3) Better watching of the orchard is possible as any trespasser can be sighted even from the other end of the orchard.

Disadvantages

- 1) Comparatively less number of trees are accommodated in given area.
- 2) Distance between plant to plant and row to row remains the same and hence, certain amount of space in the middle of four trees is wasted.
- 2) **Rectangular system:** - The trees are planted in straight rows running at right angle on the side of field. The distance from plant to plant and row to row is not same and four trees joined at the base make a rectangle. E.g. Grapes, Pomegranate etc.

Advantages

- 1) Intercultural operations can be carried out easily in the early stages.
- 2) Irrigation channels can be made length and breadth wise.
- 3) Light can penetrate into the orchard through the large inter spaces between row.
- 4) Better supervision and easy for intercropping.

Disadvantages

- 1) Inter cultivation is somewhat difficult when the trees have fully grown.
- 2) A large area of the orchard between rows is wasted if intercropping is not practiced.
- 3) Accommodate less number of trees per hectare.
- 4) **Quincunx or diagonal system:** - It is same as in the square system with the additional of a tree in the centre of each square i.e. at the points of diagonal cut. In this case the number of trees is almost doubled but the distance between the tree in the centre and at the corner is much reduced. For this reason the central tree is usually not permanent tree and is planted that trees is known as filler plant. Filler tree serves as a source of additional income till the main tree come into bearing.

Advantages

- 1) Additional income can be earned from the filler tree till the main crop comes into bearing.
- 2) The main advantage of this system is that the plant population is about double than the square system.
- 3) Maximum utilization of the land is possible.

Disadvantages

- 1) Skill is required to layout the orchard.
- 2) The filler tree can interfere with the growth of the main crop.
- 3) The greatest disadvantage of this system is difficult to carry out intercultural operations on account of the filler tree.
- 4) **Hexagonal system:** - This is also called as equilateral system. Sometimes a seventh tree is planted in the centre of the hexagon and then is called as septuplet system. In this system the trees are planted in each corner of the equilateral triangle. This system differ from the square system in which the distance between the row is less than the distance between the trees in a row, but the distance from tree to tree in six directions remains the same.

Advantages

- 1) Compared to square system 15% more trees can be planted.
- 2) It is an ideal system for the fertile and well irrigated land.
- 3) Plant to plant distance can be maintained the same.
- 4) More income can be obtained.

Disadvantages

- 1) Intercultural operations become difficult.
- 2) Skill is required to layout the orchard.
- 3) This system is not generally followed because it is difficult to adopt in practice in the field.

5) Contour or Terracing planting system

It is generally followed on the hills where the plants are planted along the contour across the slope. It particularly suits to land with undulated topography, where there is greater danger of erosion and irrigation of the orchard is difficult. The main purpose of this system is to minimize land erosion and conserve soil moisture as to make fit for growing fruits and plantation crops. The contour line is so designed and graded in such as way that the flow of water in the irrigation channel becomes slow and thus finds time to penetrate into the soil without causing erosion. Terrace system on the other hand refer to planting in flat strip of land formed across a sloping side of a hill and lying level along the contours.

Advantages

- 1) This system can be adopted in hilly regions.
- 2) Contour system can be control the soil erosion.
- 3) It helps simultaneously in the conservation of water.
- 4) Conservation of plants nutrients supplied by manures and fertilizers is possible.

Disadvantages

- 1) Laying out of contour lines is difficult and time consuming.
- 2) Special skill is required to layout this system.
- 3) Special instruments are required for making contours lines

Q.6 Write short notes (Any two)

(4)

- 1) Medicinal and Aromatic plants
- 2) Types of seed dormancy
- 3) Botanical classification of fruit crops

Ans:- 1) **Medicinal and aromatic plants**:- The branch of horticultural science which deals with the cultivation of medicinal plants that provides drugs and aromatic crops which yields aromatic oils(essential oils). Medicinal plants such as opium, chichona, senna, Sarpagandha etc. and aromatic plants like lemon grass, Citronella, Vetiver, Geranium etc.

2) **Types of seed dormancy**: - Failure of the seed to germinate even though they are Placed in favorable conditions for germination are knows as seed dormancy.

The seed germination is hampered due to various types of dormancies.

- 1) Dormancy due to rudimentary embryo- Some plant shed their fruits before the seed has matured enough to germinate; such seeds do not germinate because of immature embryos.
- 2) Seed coat dormancy- The seed fail to germinate due to present of hard seed coat which is impermeable to water and air.
- 3) Dormancy due to physiologically dormant embryo or physiologically dormancy- It is common in the seeds of certain woody plants. The germination is regulated by inner tissue of seed such as embryo and endosperm.
- 4) Double dormancy- Some seed have both seed coat dormancy and embryo dormancy; such seeds require both scarification as well as stratification to overcome the dormancy.
- 5) Secondary dormancy- Failure of seed to germinate due to expire to some unfavorable condition, such as high temperature or high moisture after stratification.

3) **Botanical classification of fruit crops:** - Fruits are classified according to the botanical relationship, physiological characters of plant development, organization and structure, morphological and cytological similarities, place of origin and floral biology. These levels are kingdom, division, class, subclass, order, family, genus, species, variety and structure.

Fruits are coming from plant kingdom spermatophyta and division angiospermae. It is further divided into two class Monocotyledon and Dicotyledon

1) **Monocotyledon:-**

Family

Musaceae- Banana

Bromeliaceae: - Pineapple

2) **Dicotyledon:-**

Family

Rhamnaceae- Ber

Sapotaceae- Sapota

Rutaceae: - Citrus

Annonaceae: - Custard apple

Moraceae: - Fig

Vitaceae: - Grape

Myrtaceae: - Guava, Jamun

Apocynaceae: - Karonda

Anacardiaceae: - Mango

Caricaceae: - Papaya

Punicaceae: - Pomegranate

Q. 7 What is kitchen garden? Enlist the advantages of kitchen gardening and explain in detail the design of kitchen garden. (4)

Ans: - Kitchen gardening is the growing of vegetable around the residential houses to meet the requirement of the family all the year round. (1)

Advantages of kitchen garden are as below. (1)

- 1) Kitchen garden supplies daily fresh vegetable throughout the year to family member.
- 2) This gives exercise and recreation to family member particularly pensioner.
- 3) This gives education to small children about plant life while working with plant.
- 4) Kitchen garden reduces the cost and time on purchasing the vegetables from market.
- 5) The vegetables from kitchen gardens supplies nutrients, vitamins and proteins to kept the healthy to family member.

Design of kitchen garden

The design of kitchen garden depends on the characters of the particular pieces of land, its extend, situation, etc. The following principles should follow in designing the layout of kitchen garden.

- 1) In most cases there is a limited choice for the selection of the site for a kitchen garden. The land is selected usually in the backyard of the house, where possibly a rectangular piece of land rather than square is preferable.
- 2) The layout should be such as to make a garden look attractive and allow access to all parts. As various kinds of vegetables will be grown in different parts of the year, the land will have to be laid out in small plots with narrow paths and borders.
- 3) In homes where no space is available one can grow vegetables in pot or boxes. But preference should be given to such vegetables which produce more numbers of fruits from individual plant, i.e. tomato, brinjal, chillies and cucurbits.
- 4) One or two compost pits can be dug in the corner of the garden.
- 5) The quick growing fruit trees, papaya banana and kagzi lime should be located on north side of the garden so that they may not shade the other crops.
- 6) Climbing type vegetables like cucurbits, peas can be trained on the fences or wall.
- 7) Several sowing or a succession of sowing of one particular crop of short intervals should be done to ensure a steady of vegetables.
- 8) The ridges which separate the beds should be utilized for growing root crop like radish, turnip, beet and carrot.
- 9) Early maturing crops should be planted together in continues row so that the areas may available at once for putting late crops.
- 10) The inter spaces of sum crops which are slow growing and take long duration to mature like cabbage, cauliflower, brinjal should be used for growing for quick growing crops like radish, turnip, palak and lettuce.

Q.8 What is lawn? Explain in detail the planting methods of lawn.

(4)

Ans: - Lawn can be defined as the green carpet for landscape.

(1)

Planting methods of lawn

(1)

- 1) Seed sowing method
- 2) Dibbling method
- 3) Turfing method
- 4) Turf plastering

Lawns can be planted by following methods as below.

(2)

- 1) **Seed sowing method** – The quality seed is essential. Doob grass seed is very light, hence proper care is needed. Soil surface is scratched to depth 2.5cm. Total area of garden is divided in to equal parts of 200 to 300 sq.mt. Seed rate is 500gm/200sq.mt. Seed is mixed with double quantity of fine soil and broadcasted. Seed is mixed in the soil with raking of opposite direction. Watering is done at regular intervals. After germination, when grass becomes 5cm tall, it is clipped with garden shears.
- 2) **Dibbling method** – Well matured uprooted grass cuttings are prepared from lawn or nursery or by lawns scraping. Grass growing in shed having internodes for apart is not suitable. In case of non availability of short node grass, underground stems are used. Dibbling of such grass done in soil when it is slightly moist at a distance 7 to 10cm. Watering is done at regular intervals. The lawn will be ready within four months by this method.
- 3) **Turfing method**- Quickest method of lawn development. Cost is high. Turf is a piece of earth of about 5cm thickness with grass thickly grown over it. The pieces are made of small squares or in rolls. The turf must be free of weeds. Turf is laid closely to each other. Sandy soil is used as packing. Bone meal is spread few days prior to turfing. Turf are made firm with the use of wooden beater. The grass is watered copiously.
- 4) **Turf plastering** – A paste is prepared mixing the garden soil, fresh cow dung and water. Bits of chopped –up fresh roots and stem or rhizomes of doob grass are mixed with this paste and paste spread evenly on the surface of the prepared land after moistening the soil. The pest is then covered by spreading 2cm dry soil. Watering is given at regular intervals. Method is not suitable for dry and variable climate area.

Q. 9 Define unfruitfulness. Write down environmental causes for unfruitfulness. (4)

Ans: - Unfruitfulness: - Unfruitfulness in fruit crops refers to the state where the plants are not capable of flowering and bearing the fruits. (1)

Environmental causes (3)

- 1) Some varieties of a fruit crop do not flower in a locality owing to undetermined environmental factors. e.g. Several north Indian varieties of mango have not flowered in south India.
- 2) Unfavorable temperature may cause failure of any flowering as in the case of apples in Kunoore due to lack of sufficient winter chilling. It has been remedied to certain extent by oil emulsion sprays and DNOC (Di-nitro-ortho cresol)
- 3) In tropics, plants flowering in summer may experience retarded pollen germination due to high temperatures and low humidity. The provision of wind breaks, close planting and cover cropping helps in improving the situation.
- 4) Reduced illumination due to close planting overcrowding of branches or shade will often reduce flowering. Thinning out some trees to increase spacing, pruning trees to reduce overcrowding and removal of shade can meet the situation.
- 5) When long day plants of northern latitudes don't flower owing to the absence of the critical length of day, they can be made to flower by providing artificial light. On an orchard scale such treatments are not practicable.
- 6) Late rains may prolong the vegetative growth and delay or reduce flowering in mango. It can be remedied by drying out the soil by deep ploughing and probably by artificial inhibition of growth by growth regulators.
- 7) Heavy rains may restrict pollinator activity, wash away pollen and prevent pollen germination. Choice of varieties which don't flower at such periods of the year is the best way out. In crops like grapes, the pruning time may be altered to avoid the onset of flowering during the period of the rainy season crop may be avoided by hard pruning.

Q10 Enlist different methods of irrigation in fruit crops and explain Bed system and Drip irrigation system. (4)

Ans. Following irrigation system generally used for irrigating fruit crops. (2)

A) Surface irrigation :

1. Uncontrolled flooding system.
2. Controlled flooding.
3. Basin system.
4. Bed system.
5. Ring system.
6. Furrow System



B) Sub-surface or Drip-irrigation method:

1. Sprinkler irrigation
2. Drip irrigation
3. By wall system.(Underground system)

Explanation (2)

1) **Bed system:** This is a flat rectangular or square bed of size of 1.5 m x 2.0 m, depending on the spacing with 30 cm height. It is generally practiced in heavy soils and in fruit crops like banana. The position of fruit is kept either at the center or at the corners of the beds.

2) **Drip irrigation:** Drip is an irrigation method in which there is no wastage of water by run off, seepage or evaporation. This method is suitable in areas where water is scarce or saline, topography is undulating and spacing of plant is wide. This method is costly and seldom practiced in the fruit orchards.

SECTION - "B"

Q.11. Define the following terms.

- 1. Parthenocarpy:** - Formation of fruit without seed is called as parthenocarpy
- 2. Pomology:** - This is the branch of horticultural science which deals with the cultivation of fruit crops.
- 3. Pruning:** Removal of diseased, dried and unwanted branches to divert the food material to words fruiting area.
- 4. Hedge:** Planting of trees or shrub at regular interval in a series to form a continues screen is called a hedge.

Q.12. Complete the following table

Sr. No	Name of the crop	Botanical name	Fan
1.	Cashew nut	<i>Anacardium occidentale</i>	Anacardiaceae
2.	Custard apple	<i>Annona squamosa</i>	Annonaceae
3.	Potato	<i>Solanum tuberosm</i>	Solanaceae
4.	Bitter gourd	<i>Momordica charantia</i>	Cucurbitaceae