MAHARSHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE

SEMESTER END EXAMINATION

B.Sc. (Hons.) Agriculture

MODEL ANSWER PAPER

Semester: V (New) **Academic Year:** 2022-2023

Course No: HORT- 354 **Title:** Production Technology for Ornamental Crops, MAP and Landscaping

Credits: 2 (1+1)

Day & Date: **Time:** **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. Discuss importance of ornamental, medicinal and aromatic crops. **4 marks**

Ans:

Ornamental crops: Flowers are associated with the mankind from dawn of civilization. Even nostalgic peoples can't ignore importance of ornamental crops. Daily Indians especially Hindus religious offering flowers to the family deity. Aesthetic value in our daily life can't overemphasize. No social function is complete without use of flowers. Flowers symbolize purity, peace, love, passion and beauty. Floral ornamentals or flower arrangements find a pride of place in social gathering, marriage, birthday parties and honouring dignitaries. Arrivals of newborn rejoiced with flowers, sicks are wished speedy recovery by offering flower, dead are bidden farewell with flowers along with tears. Ornamental crops having potential as an industry. Good demand for quality flower seeds, which are presently in short supply. Nursery stocks such as bulb, budded roses, potted plants have good internal and export market.

Medicinal crops: Plants rich in secondary metabolites. Plants form main basis for manufacturing of drug of Indian system of medicine and homeopathy. Almost all plants cultivated due to diverse climate. India is major exporter of medicinal plants. 80% population of developing countries relies on traditional medicines. Modern medicines containing 25% drugs derived from plants. Foreign exchange earned by India from medicinal plants and byproducts. International market herbal product 62 billion dollars poised to 5 trillion dollars by 2050. India's share in global market is 0.5%. Livelihood option for to millions of tribal rural people. Employment generation 35 million work days $year^{-1}$.

Aromatic plant: Producing essential oils, perfumes, flavours used with civilization. Successful commercial cultivation- vast area and varied climate. Essential oils & aroma – indispensable in different human activity. Used as adjuncts in cosmetics, perfume and pharmaceutical preparation. Many of aromatics are powerful germicide & antibacterial properties.

Q.2. Enlist various garden features and describe about garden feature on which 75% beauty of garden depends. **4 marks**

Ans:

Garden Wall, garden gate, garden lights, arches and pergola, hedges, edges, avenue, roads, paths, drives, steps, rosary, fernery, rockery, lawn, flower beds, hanging baskets,

garden pot stands, garden seats, standards, bridge, fountains, water flow, water pools, channels, ponds or aquaculture, garden statue, garden plays, gently moulded hills, sound and light effect, wild life, garden woods, informative boards and labels.

Lawn- A fairly uniform well maintained dark green ground cover is good asset in binding together the different features. Green carpet of grass for a landscape. **Importance of lawn-** acts as background for the rest of garden features, no garden is completed and beautiful without having a good lawn, 75 % beauty of garden depends on lawn, helps to improve appearance of home, resorts, public parks, increases convenience, provides perfect setting for flower bed, border, shrubbery, a specimen tree or shrub, source of charm, pride, heart of garden. **Various lawn grasses used-** *Agrostis alba, Agrostis canina, Agrostis palustris, Agrostis tenuis, Axonopus affinis, Cynodon dactylon, etc.* **Methods of planting of lawn-** By seed sowing, dibbling, turfing and turf plastering.

Q.3. Discuss in detail protected cultivation of Rose on the following points- 4 marks

Ans:

1. **Different types and varieties:**

A. Long stemmed roses: Shoot length 70-90 cm. Yield 100-150 stem $year^{-1}$ m^{-2}. More flushes. Difficult to handle. Shorter vas life than floribundas type. Varieties- Aalsmeer gold, Ambiance, Baronesse, Bianca, Black magic, Cobra, Dallas, First Red, etc.

B. Medium stemmed roses: Shoot length 50-70 cm, bigger size flowers, yield 200 stem $year^{-1}$ m^{-2}. Varieties- Calibra, Cream prophyta, Escimo, Europa, Flirt, Frisco, Grabriella, Golden times, Kardinal, Kiss, Lambada, Ohio, etc.

C. Short stemmed roses: Shoot length 30-50 cm, yield 250-300 stem $year^{-1}$ m^{-2}. Easy to handle.Good Vase life.

D. Spray roses: More flowers $stem^{-1}$. But low yield. Size is small. More production of flowers i.e. Single to spray.

E. Miniature roses: Stem length 20-40 cm. More smaller flower production. Suitable for pot cultivation. Yield up to 500 flowers $year^{-1}$ m^{-2}.

2. **Bending:** Necessary for keeping enough leaves on plants. Imp. for production of sugars. Mass of leaves- "Lungs of plant". Minimum 4 stems, either flowers or bend shoots must be bend. Take off the buds while bending. Take off growing tips of blind shoots.to avoid new growth on top. Bending as close to the original bush as possible (maximum 5 cm) without breaking branches. Create two 45^0 bends than 90^0 bend.

3. **Planting:** Double row system- Raised bed at 50 cm x 15 cm. 6-7 plants m^2. 30 x 45 cm, 45 x 45 cm, 45 x 60 cm, 60 x 60 cm. Pot culture- 30 cm diameter pot 20 liter capacity. 5000 ft^2 = 3200 pots. Length of iron stand= 28 m 148 pots in one stand double row fashion

4. **Irrigation management:** Two systems- Mist (nozzles) and Drip irrigation. Quantity of water determined by temperature, RH and light. Initially- Less water (4-5 litres m^2). Full grown plant- 5-6 litre m^2 in rainy season, 6-8 litre m^2 in winter season and 8-10 litre m^2 in ummer season.

Q.4. Write protected cultivation of Carnation on following aspects- 4 marks

Ans: 1. Greenhouse environment: Long day flower crop. Plenty of sunshine. Day temperature 20-25 °C, night temperature 10-15 °C. Critical photoperiod (sprays & standard) - 13 hours. RH: 50-60 %. CO_2 500 ppm when GH temperature 14 -15 °C.

1. Propagation: Stem cutting. Soft terminal cutting. Cuttings- healthy, vigorous and free from diseases. 10-15 cm long with four leaves. Lower cut - given below the node. Leaves at the base removed before inserting the cuttings in rooting media. One month's period develop sufficient roots. Cutting treated with 500 ppm NAA for 5 minutes. Higher rooting in winter. Medium- Sand. **Planting:** 20 x 15 cm, 30 plants / m^2. Varies with types of carnation and duration of crop. Avoid deep planting of cutting. Make a hole in bed- rooted cutting as shallow as possible after planting; rooting media containing the white perlite should be visible. Soil temperature: 15 °C for the first few weeks.

2. Nutrient management: Regular nutrient supply. 1st three weeks after planting- No chemical fertilizers. Total nutrition- 250g N : 200g P_2O_5 : 200g K_2O : 125g Ca $year^{-1}$ m^{-2} . 20-24 splits. 15 days interval. Leaf analysis- decides quantity of fertilizers. Part for leaf analysis- 5th pair of leaves from terminal end of primary shoots. Ratio of N:P:K- 1:0.5:1 throughout crop cycle.

3. Harvesting and grading: Standard carnation- at a large bud (tight bud) or at cross bud (petal visible) stage. Spray carnation- When at least two flowers have opened & other buds showing colour. Cut with sharp knife in morning. Place of cutting: where leaves well spaced & where at least 2 axillary shoots appear at every two days interval. **Grading:** Standard carnations: as per Length and strength of stem and flower size. Stem length: 80 cm, bud size: 8-10 cm circumference: Classification spray carnation in quality classes- 3 buds: 50 cm or 4 buds: 60 cm, 3 and 4 buds: 55 cm, 5 or more buds: 70 cm, 5 or more buds: 65 cm.

Q.5. Give detail cultivation of orchids considering following points- **4 marks**

1. Various types: Two - Sympodial and Monopodial. Sympodial- Prostrate rhizome, growth terminates periodically with upright pseudobulb, leaf and flowers. Flower- terminal. After flowering: vegetative bud starts to grow at base of pseudobulb forming prostrate rhizome. Ex. Cattleya. Cymbidium also. Monopodial- Form aerial roots from stem- upward growth. Upright stem continues in uninterrupted terminal growth. Producing closely spaced leaves Flower stalk develops from leaf axil. Ex. Phalaenopsis.

2. Propagation: Seed and vegetative. Cymbidium- division of one or more of pseudobulb in mixture of sand and peat at 18^0C in moist surrounding. Cattleya- Division of pseudobulb. Phalaenopsis- Offsets. Hard wood cutting- Monopodials. Air layers- Vandas and other monopodials. Meristem culture: Tissue culture.

3. Climate for different growth stages:

Growth stage	Day temp ^{0}C	Night temp ^{0}C	Relative humidity %
Seedling planting to bud stage	15	25	70-75
Flower opening	14	21	75-80
Growth of flower stem	10	20	70-80

4. **Harvesting:** Cattleya flower cut from 3-5 days after bud dehisces. Phalaenopsis flower cut: when fully open- either individually or as in entire spray. Cymbidium flowers cut individually but more after entire spike is removed and individual flowers are cut at the time of grading and packing. Dendrobium- 5-10 flower buds on stem. Matures within 3-4 days & ready for harvest. Harvest at 50-80 % opening condition. **Grading and Packing:** Flower stem- stought at harvest 10 flowers- 1 Bundle.

Grade	Flower stem per box	Dimension of CFB box
Super long	400	38x39x75 cm
Long	400-500	38x39x75 cm
Medium	500	38x39x75 cm

Q.6. Write in detail cultivation practices of Tuberose about- **4 marks**

Ans:

1. Soil and climate: Mild climate, high humidity, Average temperature 20^0 to 30^0C. Very low and very high temperature and frost- damage plants and flowers. Temperature above 40 ^{0}C- reduces spike length and quality of flowers. Grows well in sunny situation. Wide range of soil. Loam and sandy loam soil. Good aeration and drainage, pH 6.5 to 7.5 Retain sufficient moisture for proper growth. Use FYM and leaf mould- 2:1:1

2. Varietal wealth: Swarna, Phule Rajani, Shringar, Suvasini, Rajatrekha, Calcutta double, Vaibhav, Hyderabad single, Dhawal, Prajwal, Sikkim local, etc.

3. Propagation: Vegetatively by bulb 10-15 g wt., 1.5 - 2.5 cm diameter. 2.6-3.0 cm- highest yield of spikes and flowers. Division of bulbs, bulbils, Tissue culture. **Planting:** 20 x 20 cm - 2,50,000 bulbs, 30 x 20 cm - 1,66,666 bulbs. Time - Jan- Feb, May- June, Sept- Oct.

4. Harvesting and yield: Table purpose- cutting the spikes from the base. Garland, floral ornaments- individual flower picked from spike. Time- morning or evening. Stage of harvest of Spike for vases- when first pair/one flower fully open. Harvest opened flowers for garlands and venies 80-90 days after planting. **Yield**- 2 to 3 years in the field. 1st year- 4.8 to 9.6 t ha^{-1}. 2nd year- 8.9-12.1 t ha^{-1}.

Q.7. Discuss cultivation of Costus in respect of – **4 marks**

Ans:

1. Plant parts with medicinal uses: Leaves- crushed and used in a poultice applied to head. **Plant**- Decoction - to bathe a patient with high fever, lotion for smallpox. **Stem**- Scrapings of stem - applied to leprous skin. **Shoot**- Juice of tender shoots or pith - squeezed into eye for ailments of eye. **Rhizome**- Juice of fresh rhizome - purgative. For colds, rheumatism and pneumonia. Tonic, depurative and aphrodisiac. Rhizome used after confinement to treat syphilis.

2. Soil and climate: Grown on a variety of soils. Coastal alluvium to heavy brown forest type luxuriantly - alluvial soils having a sandy to clay loam texture. pH- 5.7-7.5 Elevation- 1500 m MSL. Area- situated at elevations between 400 and 600 m MSL. Subtropical climate. Rainfall- 1000 -1500 mm. Dry period between monsoon precipitation results in higher diosgenin in naturally occurring plant populations.

3. Manures and fertilizers: Optimum dose + maximum diosgenin-

15 t FYM + 45 kg N + 30 kg P_2O_5 + 30 kg K_2O ha^{-1}. FYM + ½ phosphorus and potash- 2 split doses. 20 and 60 DAP. ½ phosphorus and potash- given with 2nd dose of N 60 DAP.

4. Harvesting and yield: Stage- when crop is in active stage of vegetative growth when it's 16-17 months old. Two operations- Harvesting aerial shoots and digging out the rhizomes. After harvesting aerial shoots, to dig out rhizomes- run cultivator 2-3 times. Simultaneously collect uprooted rhizomes manually. Spread harvested rhizome for a few days- debris removed.

Wash rhizomes with water. Chopped rhizomes by Hand. 1st season crop- 8-9 months of planting- dormant season- 28-30 t ha^{-1} - diosgenin yield poor. 2nd season crop - 17-19 months- 50 t ha^{-1} fresh rhizomes - 75-125 kg crude diosgenin obtained.

Q.8. Furnish information about cultivation lemon grass pertaining to- **4 marks**

Ans:

1. Ecophysiological requirement: Poor to hill slope soils, well drained sandy loam pH- 4.5-7.5. Cover crop – Barren, naked soil, eroded soil- soil binding nature. Warm humid tropical climate, plenty sunshine, intermittent rainfall – 250-280 cm.

2. Varieties: OD-19, OD-408, OD-440, Ckp-25 – Hy., RRL-16, Pragati, Sugandhi

3. Nutrient management: 100 : 50 : 50 kg NPK ha^{-1}. Four splits.

20 : 50 : 50
40 : 00 : 00 - 45 DAP
40 : 00 : 00 - After each cutting

4. Harvesting and yield:

Harvest 10-20 cm above ground level. 1st harvest - 3-4 months after planting – As per Growth Subsequent – 3-4 ft height – 40-60 days or 2-3 months interval. 1st year – 2-3 harvests. 2nd year onwards – 4-6 harvests. Maximum oil - 3rd and 4th year. **Yield:** 30 t Fresh herbage – 100 kg oil $year^{-1}$. 30-40 t Fresh herbage – 100-125 kg oil $year^{-1}$.

Q.9. Describe the cultivation of aromatic rose on following points – **4 marks**

Ans:

1. Soil and climate: Soil with high amount of organic matter- Best. Grown on all types of soil. Sandy loam to heavy clay soil with high pH (9.0). Ideal pH- 6.0-7.5. Temperate plant. Flowering require a dormant period. Flowers borne on- 60-75 days old shoots. Northern India- temperature does not fall enough to induce dormancy. Plants drastically pruned- to induce artificial dormancy. 15 to 27 °C temperature.

2. Propagation and planting: Cutting and Suckers. Stem cuttings- 15-20 cm length, 0.5-1.0 cm thick, past season's growth at time of pruning. Suckers- Large suckers arises from single bush. Oct- Dec. – make Pits- 0.5 m deep and 0.5 m wide. Separate- rooted suckers from mother plant and plant in pits. **Planting:** Circular pits- 50 cm wide and 50 cm deep. Add- 3 kg FYM + 100 g SSP + 50 g MOP in each pit. Time- December-January. Spacing- 1 x 1 m - 1 ha - 10,000 plants.

3. Manures and fertilizers: Flower yield increased- Apply FYM and NPK. 8-10 t FYM + 200 kg N + 80 kg P + 60 kg K per ha. Full FYM, P, K and ½ N- each year after pruning (Oct) ½ N (100)- at flowering (Jan). Foliar application-1% urea- at flower bud formation. Micronutrients- apply to soil- improves flowering

Flowering and yield of flowers: Light pink and highly scented flowers. Oil- all parts of flower- sepals, petals, stamens and carpels. Weight of single flower- 1.98 to 2.70 g. Size of flower- 4 to 7 cm. No. of petals per flower- 48 to 60. Commercially - 3rd years after planting till 12-15 years. Time- 2nd week of March and lasts 3-4 weeks. Flowers picked- early morning contains more essential oil- better suited to oil extraction. Flowers picked- afternoon not suited for oil extraction. Producing commercial crop - after 3rd year of planting of suckers or root cuttings. **Yield-** 30-40 q flowers ha^{-1}. Favourable climatic conditions- 50 q flowers ha^{-1}.

Q.10. Explain in brief different principles of garden design. 4 marks

Ans:

1. **Initial approach-** Plot size, shapes. Natural undulations. Fencing – look natural, practicable, no obstruction to view. Formal garden having no any tree can be drawn on paper and implemented without any appreciable change.
2. **Axis** – Imaginary line. Around Imaginary lines garden created with striking balance. Formal garden – central line is axis. At end of axis – focal point. At mid point erect – architectural feature - sundial, birdbath
3. **Focal point** – One of the elements of good landscape. Central point of attraction. Generally architectural feature/design. Focused as point of interest.
4. **Mass effect** – Use of one general form of plant material on large scale at one place. Size – varied. Mass arrangement – should not monotonous.
5. **Unity – Important** in garden. If achieved – improve artistic look of garden. Achieve - Unity of style, feeling & function between house and garden. Different garden components merge – harmoniously. Due to this, visitors get overall impression of garden rather than special feature. Achieve harmony between landscape outside & the garden.
6. **Space –** Aim – garden appears larger than actual size – Illusion. Also referred as "Forced Perspective". For this keep vast open spaces – under lawn. Restrict planting in periphery, Avoid planting at center. Illusion of large space – alternate large lawns followed by group of trees.
7. **Divisional lines** – Shouldn't hard & fast divisional lines. Necessity of dividing rather screening. Lawn, shrubbery, gravels, stones – have natural divisional lines. Should be artistic with gentle curves &useful. All lines harmonize with each other.
8. **Proportion and Scale** – Proportion – definite relationship between masses. Ex. rectangle – 5: 8 ratio – pleasing. No set rule. A simple rule – design should look pleasant. Ex. Steps – wider, A tiny pool – midst of large lawn – disproportionate. Small rockery under base of large tree with small thorny plant- ugly
9. **Texture** – Surface character of garden unit – Texture. Texture (ground, tree, leaf, shrub) determines overall effect of garden. Texture of rugged ground – lay small pebbles. Gulmohor - fine textured in full leaf Spathodia - coarse textured tree. Keep all various textures with harmony & contrast - ultimate desirable effect.
10. **Time and Light –** Time factor – imp.
    1. Daily time – during day receiving diff qty & qlty of light. Morning sun – vital for flowers. Design should be – in afternoon its possible to sit in a shaded place where best part of garden should be visible.
    2. Seasonal changes – Keep in mind seasonal movement of sun & shade – light to fall during different parts of season.
11. **Tone and Colour –** Annual flowers – consist of all imaginative hues. Arrangement – doesn't spoil beauty, patchy look but bring harmony. Basic colour – formulate colour scheme viz. Red, yellow, blue - hard/warm colour. Secondary colour – Orange, green, violet – soft/cool colour neutral colour - White, black, gray.

12.Mobility-

Sharp & contrastingly seasonal change in garden colour- mobility or movement. Ex. Leaf colour in autumn – wonderful hues. Shading of leaves in winter – dull & melancholy. New

leaves with in spring - new life. Trees – *Termenalia catappa, Ficus religiosa, Attraction of Birds* – Movement & cluttering of birds – life, mobility. Large trees, Bird bath – Birds, flowering trees – *Bombax malbaricum* – bloom stage. Seasonal flowers – motion & movement of butterflies. Fountain, lawn, sprinkler, stream – movement, lily pool with colourful fish.

13. Style –

It commensurate with budget, taste, and nature of site. Develop own style.

SECTION "B"

Q.11. Define the following terms- **4 marks**

1. **Edge-** Lining of borders of flower beds, paths, lawn and shrubbery with bricks, concrete, living plants, etc is known as edge.
2. **Climber-** Group of plants which have the weak stems and ability to climb up on the support with the help of special modified organs.
3. **Landscape gardening-** Application of garden forms, methods and materials with a view to improving the landscape.
4. **Topiary-** The shaping of the plants into different decorative forms of well geometric shapes, birds, animals, sculpture, etc. is called topiary.

Q.12. Do as directed- **4 marks**

1. Where ICAR Directorate of Medicinal and Aromatic Plants Research is located – **Boriavi, Anand.**
2. How *Asparagus racemosus* propagated? - **Tubers and leaves**
3. Commercially which plant parts of *Cinnamomum zeylanicum* are useful - **Bark, Leaves, Tender fruits**
4. Where ICAR Directorate of Floriculture Research is located at **Pune.**

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