Semester	:	**V**	**Term**	:	I	**Academic Year**	:	2020-21
Course No.	:	**Ele. Hort-355**	**Title**	:	**Protected Cultivation of Horticultural Crops**			
Credits	:	(2+1)						
Day & Date	:	**22.11.2021**	**Time**	:	2.00 Hrs	**Total Marks**	:	80

Note : 1) Solve ANY EIGHT questions from SECTION-A
2) Solve ANY TWELVE questions from SECTION-B
3) ALL questions from SECTION-C are compulsory
4) Send the PDF file of answer sheet to the email id of respective course teacher

SECTION-A

(Write the answers in 4-5 sentences only. Each question carries 4 marks)

Q. 1 Describe the importance and scope of Protected cultivation

Importance and Scope:

1. Cultivation in Problematic Agriculture Zones

There is about 75 mha of land in India comprising of such problematic conditions as barren and uncultivable, cultivable wasteland, fallow land, desert, sever cold. If a small portion of this area put under cultivation using greenhouse technology, then income generation of local habitat could be increased substantially.

2. Greenhouse Complexes around Metropolitan and Other Big Cities

A conservative estimate revels that there is a large and sustained demand of fresh vegetables, fruits and ornamental plants throughout the year in almost every big city. These big cities also experience the need of off-season and high value crops. To meet the city requirement greenhouse cultivation may be a right option.

3. Export of Agricultural Produce

Agriculture in India is being considered increasingly to reduce the foreign trade deficit and there has been good international market for horticulture produce, especially, flowers from India. Promotion and greenhouse cultivation of export oriented crops seems to be possible source of foreign earnings. Such facilities should be constructed near the lifting point to reduce the burden on transportation cost.

4. Greenhouse for Plant Propagation

Greenhouse technology is being, nowadays, considered as a suitable approach for raising of seedlings and cuttings which require control environment for their growth. The existing nurseries without a greenhouse facility could be converted into a greenhouse for improving the capacity as well as quality of the plant material. Even different type of plant material can be propagated using the greenhouse facility. In temperate climatic zone, the plant propagation through greenhouses would mean a considerable reduction in the total time required for preparation of saplings.

5. Greenhouse Technology as Base for Other Biotechnology

The hydroponics or nutrient film techniques require control environmental condition of growing plants. Similarly, material generated though tissue culture and biotechnological methods also need to be propagated in control environment. Greenhouse technology is the best-suited answer to carry out such type of studies.

6. Cultivation of Rare and Medicinal Plants

India has a wide variety of orchids/herbs, which have been identified for large scale

Q. 2	**Enlist the properties of ideal greenhouse covering material.** 1. It should transmit the visible light portion of the solar radiation, which is utilized by plants for photosynthesis. 2. It should absorb the smail of UV in the radiation and convert a portion of it into visible light useful for plants. 3. It should reflect or absorb IR radiation and convert a portion of it into visible light useful for plants. 4. It should be low cost. 5. It should have usable life of 10 to 20 years.
Q. 3	**Give the methods of greenhouse environment control** **A. Temperature control** : **1. Ventilation** **a. Natural convection** : **b. Forced convection** : **2. Evaporative Cooling system** (Active summer cooling system) **a) Fan and pad cooling system**: **b) Fog cooling system** **B. Relative humidity control** **C. Light Control Methods** 1. Artificial shading method 2. Supplemental lighting systems. **D. Carbon dioxide control**
Q. 4	**Give the ideal characteristics of growing media** 1. A desirable medium should have good balance between physical properties like water holding capacity and porosity. 2. Medium should be well drained 3. Too compact medium creates problems of drainage and aeration which lead to poor root growth and causes diseases. 4. Highly porous medium will have low water and nutrient holding capcity,, affects the plant growth and development. 5. The media reaction (pH- 5.0 to 7.0 and soluble salt, EC level of 0.4 to 1.4 ds/m) should be optimum for most of the greenhouse crops 6. A low media pH (less than 5.0) leads to toxicity of micronutrients such as iron, zinc, manganese and copper and deficiency of major and secondary nutrients which high pH (>7.5) causes deficiency of micronutrients including boron. 7. Low pH can be raised by using amendments like lime (calcium carbonate) and dolomite 8. High pH can be reduced by amendments like Sulphur and gypsum. 9. pH of water and mix should be monitored regularly.
Q. 5	**Enlist the advantages of containers in greenhouse production**: (i) Increase in production capacity by reducing crop duration. (ii) Quality production of nursery or crop. (iii) Uniformity of plant growth, and better vigour and survival rates. (iv) Provide quick take-off with little or no transplanting shock. (v) Easy maintenance of sanitation in greenhouse. (vi) Easy to handle, grade and shift for transportation.

Q. 6	**Describe in brief the advantages of fertigation** 1. Increase in yield by 25-30% 2. Saving in fertilizers by 25-30% 3. Precise application and uniform distribution of fertilizers 4. Nutrient can be applied as per plant requirements 5. Acidic nature helps in avoiding clogging of drippers, it clears drip system 6. Minimizes nutrient losses 7. Major and micro nutrients can be applied in ne solution with irrigation. 8. Fertilizers can be injected as per required concentration 9. Saving in time labour and energy 10. Light soil can be brought under cultivation
Q. 7	Describe in brief the cultivation of **Rose** under polyhouse on following points a) Temperature requirement b) Media sterilization c) Planting d) Harvesting & yield **Temperature**: The temperature range in between 15to28^{o}C. When the temp. falls lower than 15^{o}C, bud growth will be slower down considerably. If the temperature raised to about 28^{o}C, humidity must kept high to slow evaporation. If temperature goes upto 30^{o}C then photosynthesis decreased. When temperature is 21^{o}C then there will be better growth with high production. Day temperature 24-28^{o}C and night temperature 18.5-20^{o}C is required. **Soil sterilization**: If certain nematodes, root damaging fungi and bacteria present, thensoil sterilization should be done with any one of following chemical. 1. Formalin (0.3%) 2. Methyl bromide (Banned in India for polyhouse crops) 3. Basamid granules @ 40g/m^2 4. Chloropicrin Sterilization with formalin : It is an aqueous solution (37-40% formaldehyde) and most commonly used in polyhouse for sterilization of growing media. Keep the soil in moist condition. Mix formalin with water (1:10) and drench. Use @ 7.5 lit for 100 m^2 i.e. 37.5 liter of formalin required for 500 m^2. Cover the soil immediately with polythene and edges of polythene be covered with soil and close the greenhouse for 2-3 days. After 2-3 days, remove the polythene cover and flush the soil with water. Planting should be done after 2 weeks. Formalin is not effective against nematodes and not used in standing crop. **Planting :** Shallow planting of rose is to be done. It helps to faster sprouting of roses. At the time of planting if there are more long roots then cut up to certain length. If the roots are coiled and mixed with each other, then while planting that roots should be spread in the growing media. Dig sufficiently deep hole and care should be taken while planting that entire roots should not be bent upwards. Refill the hole and make sure that there is good contact between roots and soil. and press it sufficiently but not to compact . Immediately after planting watering should be done. Small plants are planted in April-May and bigger in August-September **Harvesting** : After two months of planting plant starts commercial flowering. Harvesting should be done during cold morning hours. So that flowers should not be kept for long time in cold storage to reduce the field heat. Use flower cutter for harvesting the flowers. When one or two petal opened, flowers are harvested with its long stalk. **Yield :** Hybrid Tea -130-150 flower stalks/m^2/year. Floribunda - 200-350 flower stalks/m^2/year
Q. 8	Describe in brief the cultivation of **Gerbera** under polyhouse on following points a) Climate b) Bed preparation

	can begin during the day at 18-24°C. Slightly warmer or cooler temperatures will delay the growth of the plant. Humidity below 70% during the day and below 85% at night is ideal. **Bed preparation** Gerberas are grown or raised of size 2 ft. width, 1.5 ft. height and desirable length beds to assist in easier movement and better drainage. Pathways of 1 ft. in maintained after every bed. Organic manure is recommended to improve soil texture and to provide nutrition gradually. The material used for bed preparation is as under: Soil - 35 brass, FYM - 80 brass, Rice husk - 10 brass and Sand - 4 brass . Add single super phosphate (0:20:0) @ 2.5 kg per 100 sq ft. for better root establishment and MgS04 @ 0.5 kg per 100 sq. ft. to take care of deficiency of Mg. **Planting** The crowns of plants should be 1-2 cm above soil level. Two rows should be planted on one bed. Spacing: 30 x 30 cm within the row accommodating 8-10 plants/m^2. Gerbera planting is done in 2 seasons a. Spring (Jan, Feb and March): Spring planting is best for 1.5 year culture. b. Summer (June-July): Suitable for 1, 1.5 and 2 year cultures. In North India optimum time for planting is Sept –Oct. **Harvesting & Yield** Gerbera is a 30 months crop. The first flowers are produced 7-8 weeks after plantation. The flowers are harvested when 2-3 whorls of stamens have entirely been developed. The heel of the stem is cut by giving an angular cut. After harvesting flower stalk is soaked in Sodium hypochloride solution (5-7 ml/lit of water) for 4-5 hours to improve vase life. 175 - 200 flowers /m^2/ year under green house of which 85% of flowers being of I grade.
Q. 9	Describe in brief the cultivation of **Carnation** under polyhouse on following points a) Propagation b) Planting c) Providing support net d) Harvesting & yield **Propagation :** Propagated vegetatively through soft terminal stem cuttings. These cuttings should be healthy, vigorous and free from diseases. Terminal cuttings which have not developed flower buds measuring about 10 to 15 cm with four leaves are to be taken. The lower cut is given below a node and the leaves at the base are removed before inserting the cuttings in the root media. In about months time cuttings developed sufficient roots. For better rooting, cutting should be treated with 200 ppm NAA for 5 minutes. Higher percentage of rooting is observed during winter as compared to summer months. **Planting :** Well rooted cutting should be planted at 15 x 15 cm distance which accommodate 30 plants per sq.m. The planting programme should be planned in such a way that the maximum number of excellent quality flowers could be obtained when the market price is very high. Deep planting of cutting should be avoided to reduce the incidence of stem rot and foot rot diseases. After making a hole in the bed, plant the cutting as shallow as possible. Soil temperature should be in the range of 15°C for the first few weeks. **Providing support nets :** Before planting, first net should be laid out. The carnation plants are then planted within netting with appropriate spacing between them. Then nets are gradually raised with them. In this way 4-5 nets are required. First net should have square of 7.5 x 7.5 cm and fixed at12 cm above the soil. Then place the remaining nets, whose squares should be 12.5 x 12.5 cm or 15 x 15 cm over the first net.

yield the cut blooms. The cut flowers should be immediately placed in clear water.

Yield :

Standard carnation – 12 flowers/plant or 360 flowers/sq.m

Q. 10 **Why leaf pruning is done in cucumber**

1. To help recovery from injury of roots.
2. To remove dead or injured growth.
3. Restrict unwanted growth
4. Train growth where it is desires.
5. To rejuvenate old plants.
6. To promote flower bud production.
7. Light penetration for efficient light use.
8. To expose fruit to light.

SECTION-B

(Write the answers in one sentence only. Each question carries 2 marks)

Q. 6 Define the following terms

a) **Protected cultivation** can be defined as a cropping technique wherein the micro environment surrounding the plant body is controlled partially/ fully as per plant need during their period of growth to maximize the yield and resource saving

b) **Cladding material** : Transparent material mounted on the walls and roof of a green house.

c) **Dead Load** : Weight of all permanent construction, cladding, heating and cooling equipment, water pipes and all fixed service equipment's to the frame.

d) **Live load** : Weights superimposed by use including hanging baskets, shelves and person working on roofs.

e) Growing medium :Substrate or the medium which is used to grow plants is commonly called the growing medium

f) Sterilisation can be defined as the process of removal or destruction of all forms of microbial life.

g) **Topping** :Clipping of main bud on stem is called topping.

h) Pinching : the top of the stem (growing tip) is removed to encourage the growth of the lateral shoots.

i) Disbudding : The lateral flower buds are to be removed at the appropriate time leaving only the one flower bud.

j) **Epiphyte orchids** : Those orchids which are growing on trees and shrubs are called epiphytes or air plants

k) **Lowering of plants :**The indeterminate plants tend to grow upward and they need to be lowered periodically in order to maintain them at required workable height.

l) **Sympodial** : Having more than single flower stem.

m) **Saprophytes** : Plants which grown on decaying organic matter call Saprophytes.

n) **Monopodial** : Having single stem and flowers bear on stem.

SECTION-C

(Choose the correct option. Each question carry 1 mark)

Q. 7 **1)** A ---------- type design is used when a greenhouse is placed against the side of an existing building

a)	Even span	b)	**Lean-to**
c)	Saw tooth	d)	Ridge and Furrow

2) During the night time, air temperature inside greenhouse ----------

a)	**Decreases**	b)	Increases

	c)	Active cooling	d)	Quonset
	4) Light transmission of Polyethylene sheet is about---------- %			
	a)	90-95	b)	50-55
	c)	**65-75**	d)	None of these
	5) If the rate of heating of room temperature becomes higher than the rate of heat removal through roof vents then which of following method is used in greenhouse to remove heat.			
	a)	Natural convection	b)	**Forced convection**
	c)	Ventilation	d)	Active heating
	6) Active summer cooling system effected in poly house due to the principal of ----------			
	a)	Transpiration	b)	Evapo-transpiration
	c)	Photosynthesis	d)	**Evaporation**
	7) The RH in non-ventilated (NV) greenhouse can be increased by providing ----------			
	a)	Drip system	b)	**Fogging system**
	c)	Sprinkler system	d)	None of these
	8) In areas where natural illumination is absent or very low, illumination for plants in polyhouse may be provided by ----------			
	a)	Burning of kerosene	b)	Covering with Fiberglass
	c)	**Artificial lightening method**	d)	Providing ventilation
	9) Low pH of media can be raised by using ----------			
	a)	**Dolomite**	b)	Sulphur
	c)	Gypsum	d)	Phosphate
	10) It is a mica-like mineral which expands to open-flake structures on heating at high temperatures.			
	a)	**Vermiculite**	b)	Perlite
	c)	Rockwool	d)	Sphagnum moss
	11) When the temp. falls lower than 15^{o}C, ---------- growth of rose under polyhouse will be slower down considerably			
	a)	Leaf	b)	Flower
	c)	**Bud**	d)	Stalk
	12) Addition of ---------- improve the structure and increase the efficiency of soil			
	a)	Micronutrients	b)	Major nutrients
	c)	Liguid fertilizers	d)	**Humus**
	13)	For regulation of flowering in rose, which of the following operation need to be carried out.		
	a)	Pinching	b)	De-suckering
	c)	**Stopping of water & fertilizer**	d)	Bending
	14)	-------- is the stem less perennial herbs.		
	a)	Carnation	b)	**Gerbera**
	c)	Rose	d)	Orchids
	15)	Bent neck is the physiological disorder of ----------		
	a)	Orchids	b)	Carnation
	c)	**Gerbera**	d)	Rose
	16)	*Dianthus caryophyllus* is the botanical name of ----------		
	a)	**Carnation**	b)	Gerbera
	c)	Rose	d)	Gladiolus
	17)	-------- are commonly propagated through bulbs.		
	a)	Orchids	b)	**Lilium**

	19)	Hybrid varieties of tomato with ----------growth habit are suitable for greenhouse cultivation		
	a)	**Indeterminate**	b)	Determinate
	c)	Semi-determinate	d)	Self topping
	20)	In which of the following polyhouse crop, lowering operation is carried out		
	a)	Capsicum	b)	**Tomato**
	c)	Cucumber	d)	Bittergourd
	21)	Which type of cumber require hand pollination when grown under polyhouse		
	a)	Gynoecious	b)	**Monoecious**
	c)	Parthenocarpic	d)	Predominantly gynoecious
	22)	Botanical name of bell pepper		
	a)	*Capsicum anuum*	b)	*Copsicum annum*
	c)	***Capsicum annuum***	d)	*Capsicum anum*
	23)	Strawberry belongs to family		
	a)	**Rosaceae**	b)	Apocenaceae
	c)	Malvaceae	d)	Liliaceae
	24)	---------- is the serious disease of vegetable nursery		
	a)	**Damping off**	b)	Phytophthora
	c)	Root rot	d)	Wilt

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