

Practical Manual
on
Recreation and Urban Forestry
FNR-320 2(1+1)

(For Undergraduate Forestry students)

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College of Horticulture & Forestry
RANI LAKSHMI BAI CENTRAL AGRICULTURAL
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Syllabus:

Practical: Preparation, planning and designing the planting pattern for parks, sanctuaries and industrial complexes – familiarise with the components of landscaping – studies on the features of flowering and foliage trees suitable for avenue planting – visit to landscaped areas, parks tourist spots and centres, national parks and sanctuaries., practice planting methods.

Name of Student

Roll No.

Batch

Session

Semester

Course Name :

Course No. :

Credit

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CERTIFICATE

This is to certify that Shri./Km.ID
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the respective lab/field of College.

Date:

Course Teacher

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5.	To study designing of different styles of gardens.	
6.	To study designing of gardens based on different themes.	
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18.	Visit to wildlife sanctuaries	
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**Exercise 2: Arrange the herbaceous borders of annuals according to height and colour scheme.
Write the name of annuals suitable for these purposes and draw layout.**

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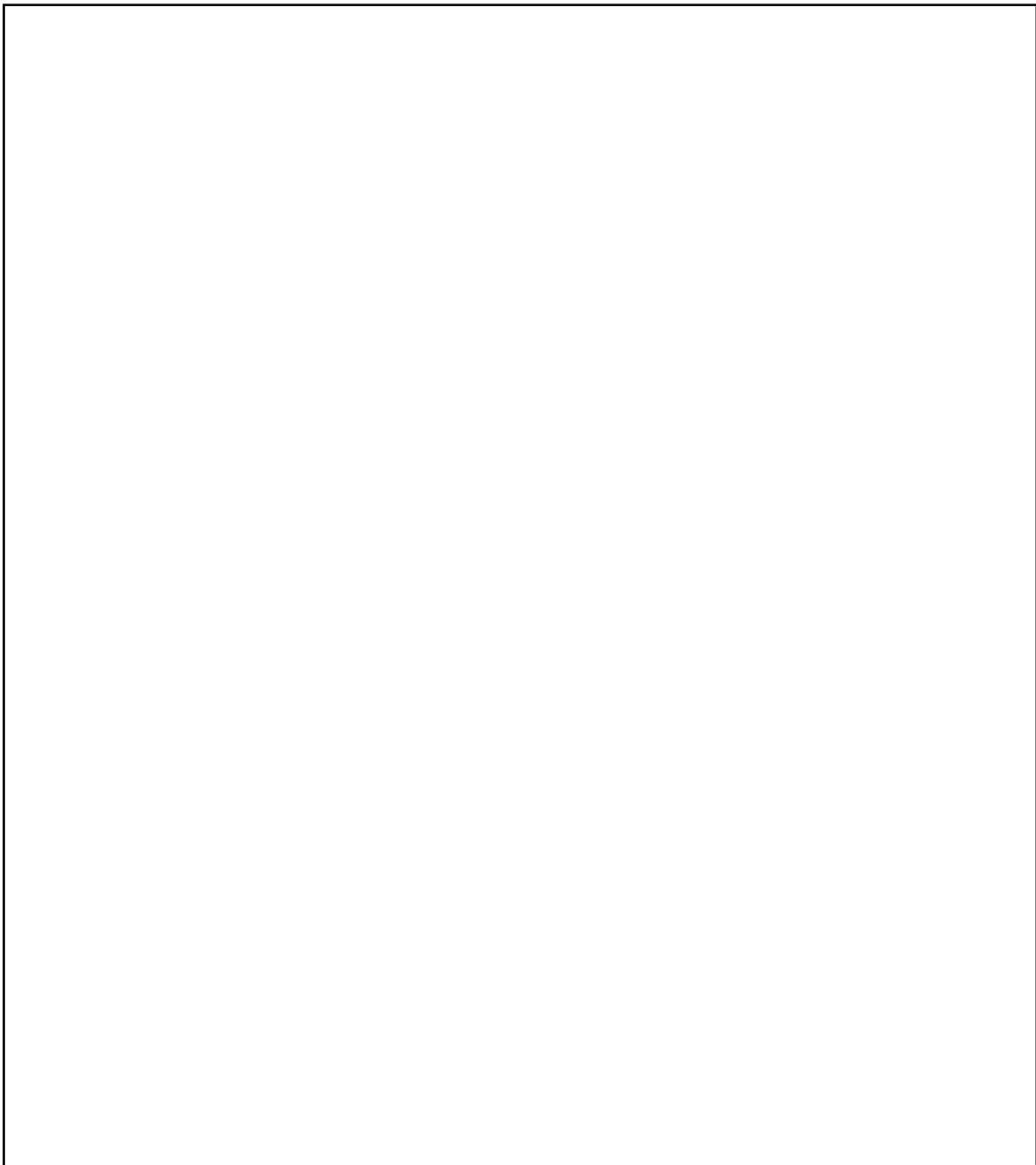
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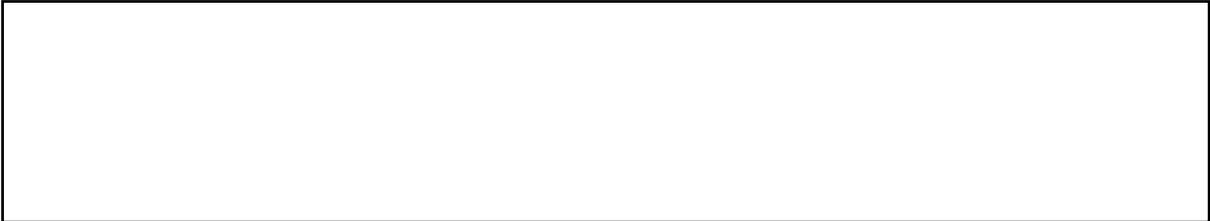


Practical No. 4

Objective: To study different symbols used for making landscape plans.

Exercise: Make neat and clean diagrams of different symbols used for making landscape plans.

1. Needled Evergreens:



2. Broad leaved Evergreens:



3. Deciduous trees:



4. Vines:



5. Trailing groundcovers:



6. Hardscape Materials:



7. Explain the idea of using symbols:

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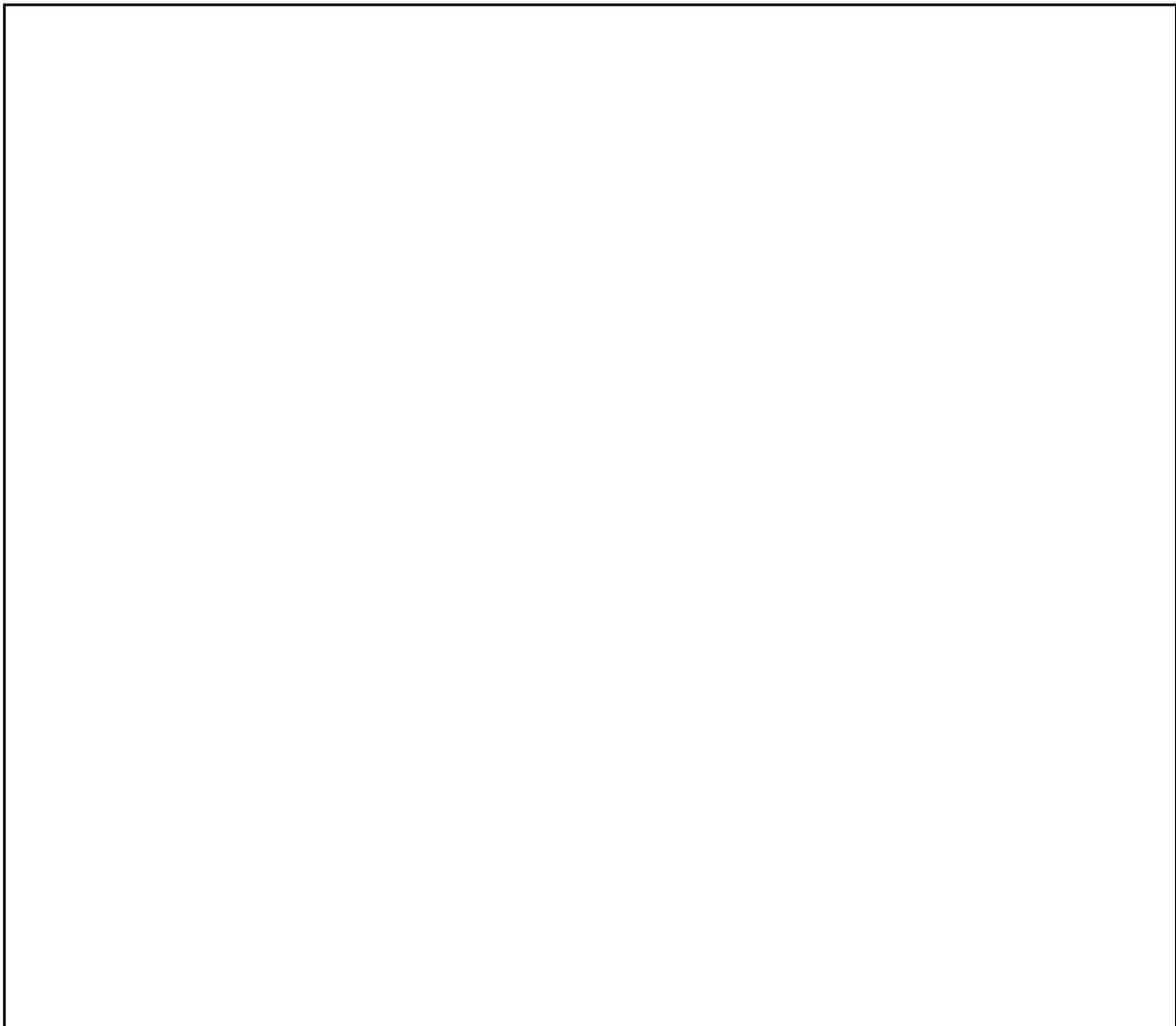
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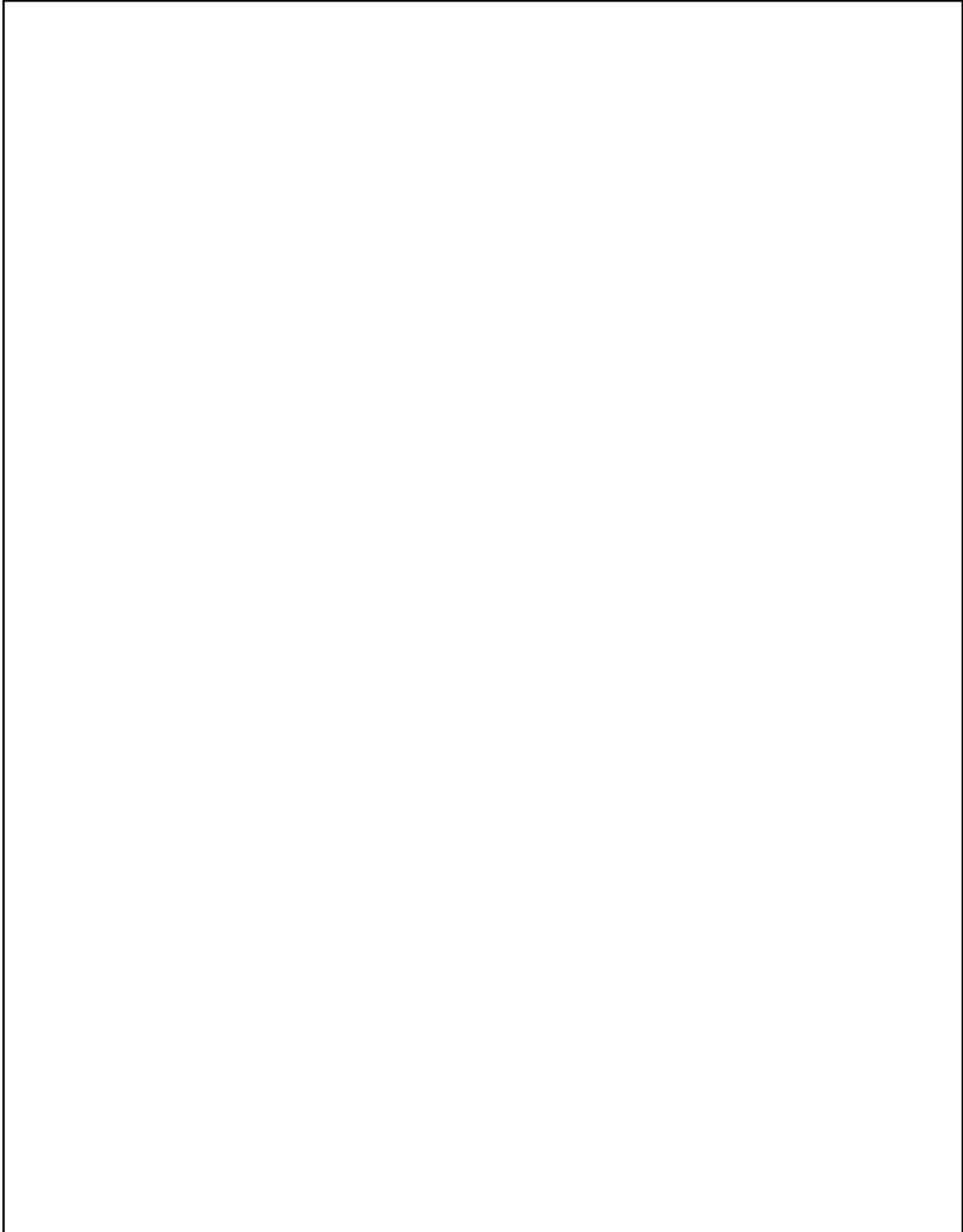


Practical No. 5

Objective: To study designing of different styles of gardens.

MATERIAL REQUIRED:

Exercise: Make a design of garden for given area based on different styles using coloured pencils (use scale 2 m = 1cm)



Practical No. 6

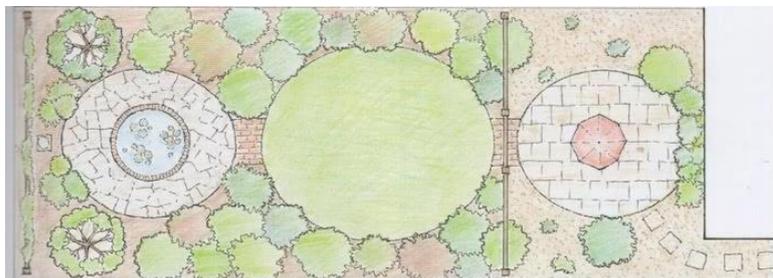
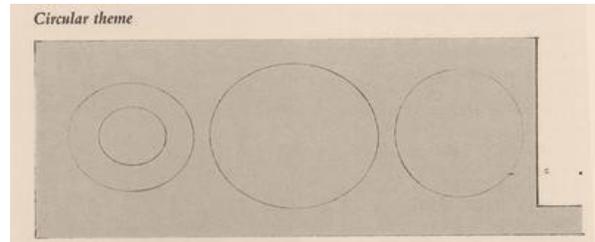
Objective: To study designing of gardens based on different themes.

MATERIAL REQUIRED: Tracing paper, pencil, coloured pencils, eraser

Different themes of gardens: There are three basic garden pattern themes. These can be individually adapted or mixed and matched to create a personalised garden.

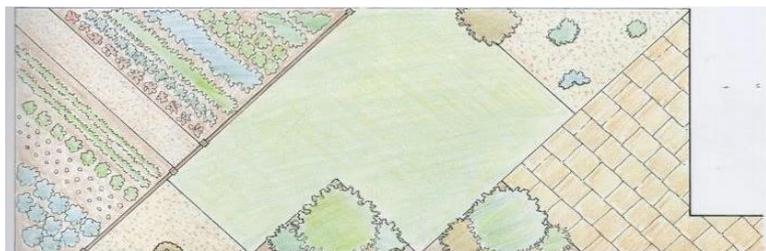
Circular theme:

- These gardens are extremely beneficial if a predictable shape of a garden is to be disguised. These can be used to add a surprise element. The circular beds, patios and beds can be overlapped to create a beautiful garden.
- These patterns should be first captured on paper. One can use a compass to define the shapes by pairing up circles in various forms and styles. The circles need not be exactly same. Different Radii can be used for creating different shapes.



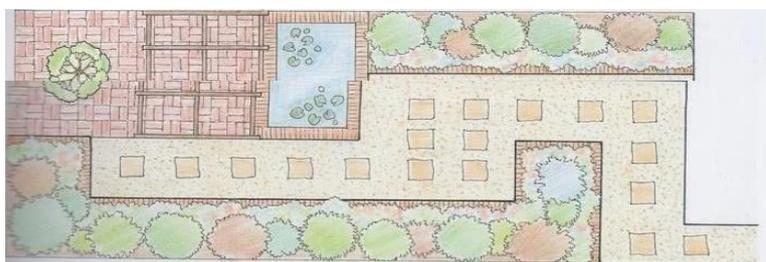
Diagonal theme:

- This theme helps the eye to move all across the garden space. Grid lines drawn at 45 degrees can be used as a guideline to design the garden.

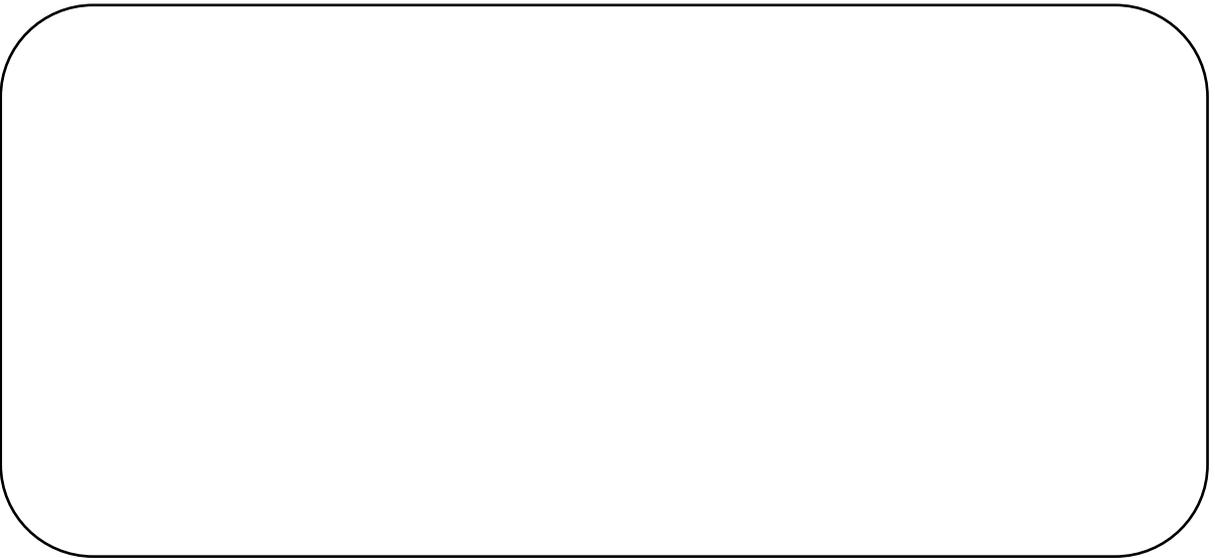
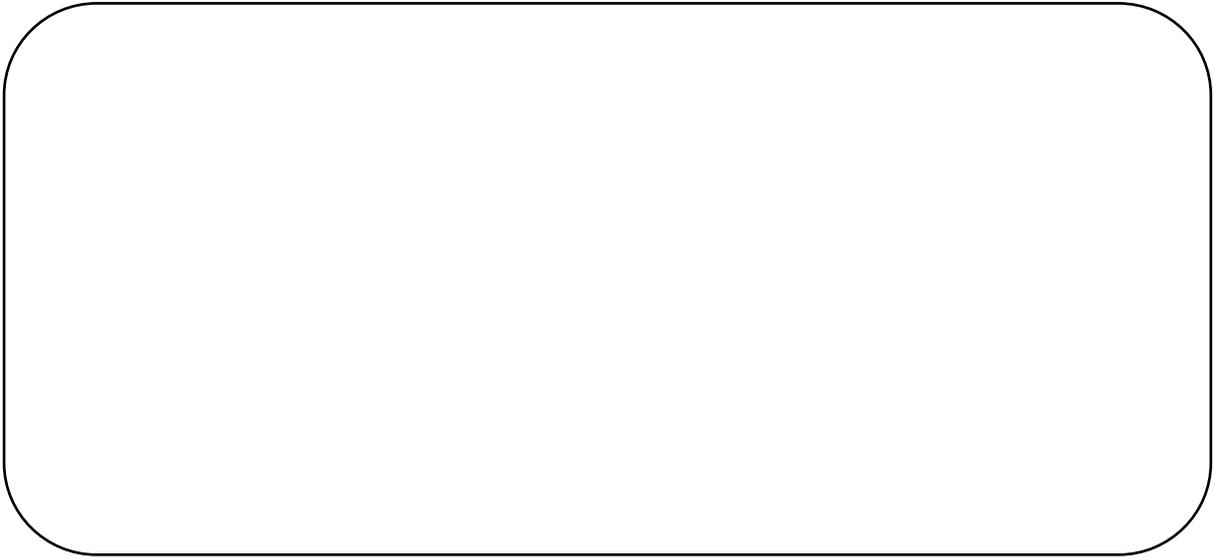


Rectangular themes:

- These are the most popular and widely used. They are adapted to give a formal look to the garden. Long or narrow gardens can be easily divided into even sections using this particular theme.



Exercise: Make a design of garden for given area based on different themes using coloured pencils
(use scale 2 m = 1cm).



Objective: To study nursery raising of Annuals

MATERIAL

REQUIRED:

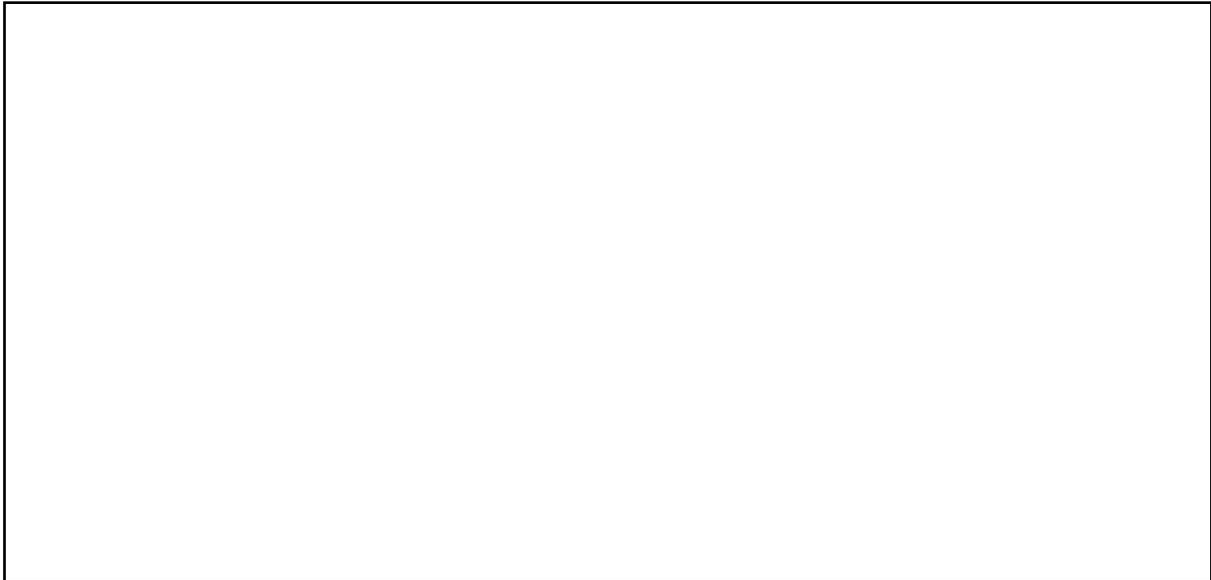
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Steps in preparation of nursery beds and sowing of seeds

- Land is prepared by ploughing or digging upto 30 cm depth and exposed to sun for at least 15 days.
- Well rotten FYM at the rate of 5 kg/ m² should be thoroughly incorporated in the upper 10-15 cm soil of the beds at least 7 days before transplanting.
- Soil is levelled properly and stones are removed. Raised nursery beds up to 15 cm height should be prepared during rainy season.
- Lines of uniform depth are prepared at a distance of 5- 10 cm and seeds are placed in these lines.
- Seeds are then covered with a mixture of soil+ sand+ FYM (1:1:1, v/v).
- Beds are immediately watered with help of watering can using a fine hose.
- Beds are kept moist by sprinkling water as and when required.
- Seedlings of most annual flowers become ready for transplanting between 30 to 40 days of sowing.

Exercise: Prepare a nursery bed of size 5m x 1m (in groups of 5 each) and write the procedure with diagrammatic representation of steps followed.

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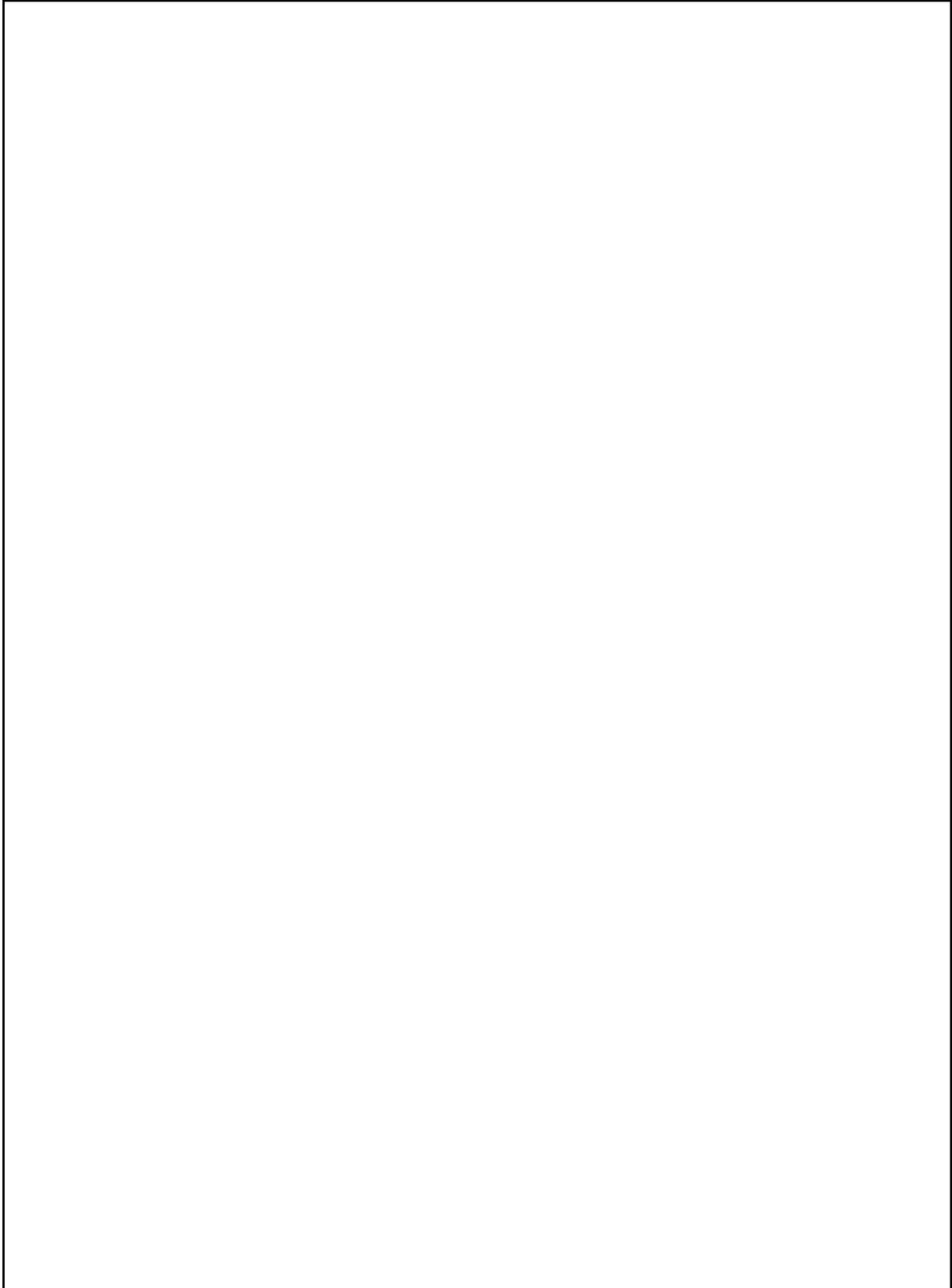
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Practical No. 11

Objective: To study designing of garden for factory.

Exercise: Draw a neat landscape design and planting scheme for factories using coloured pencils.

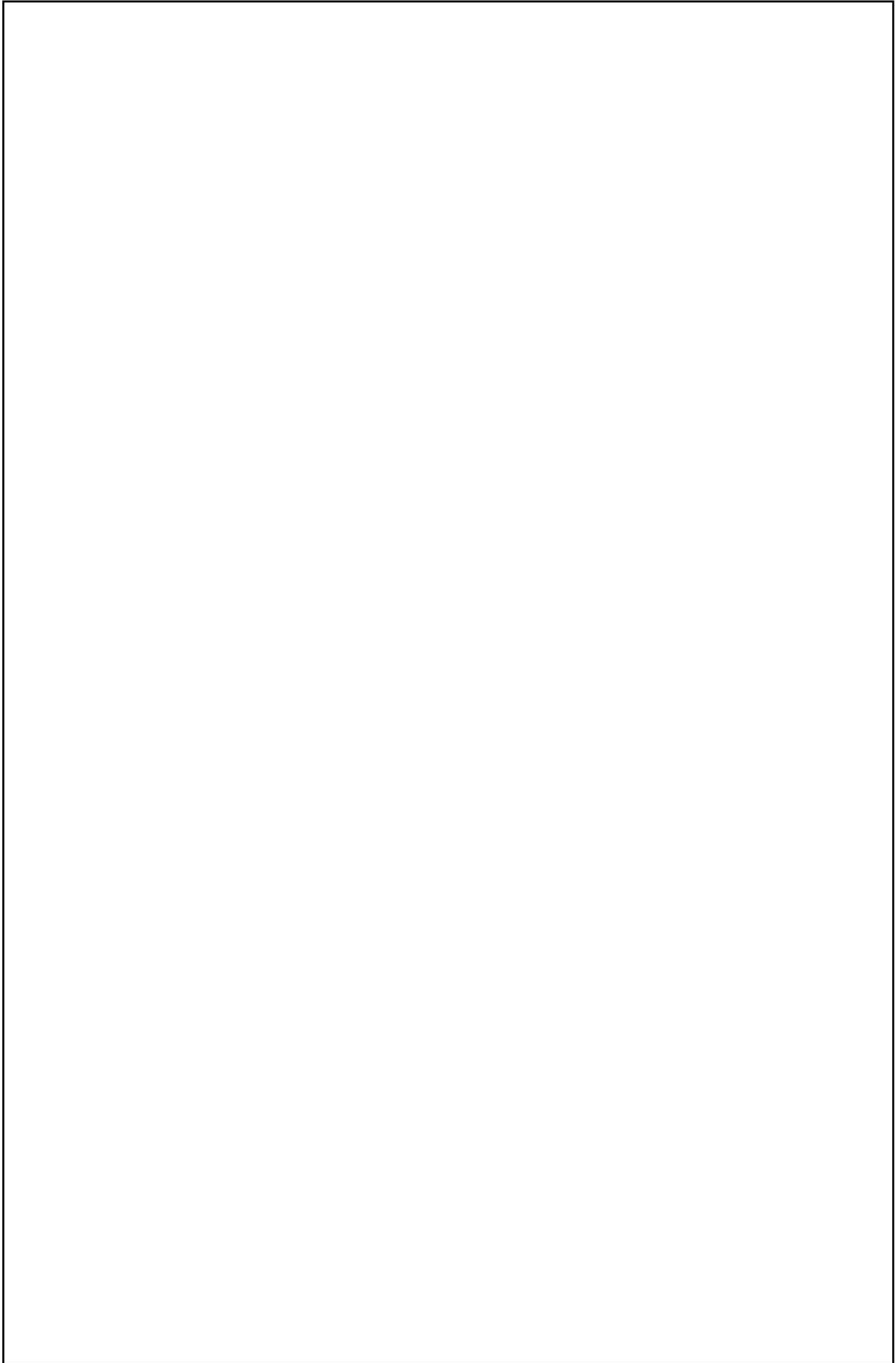


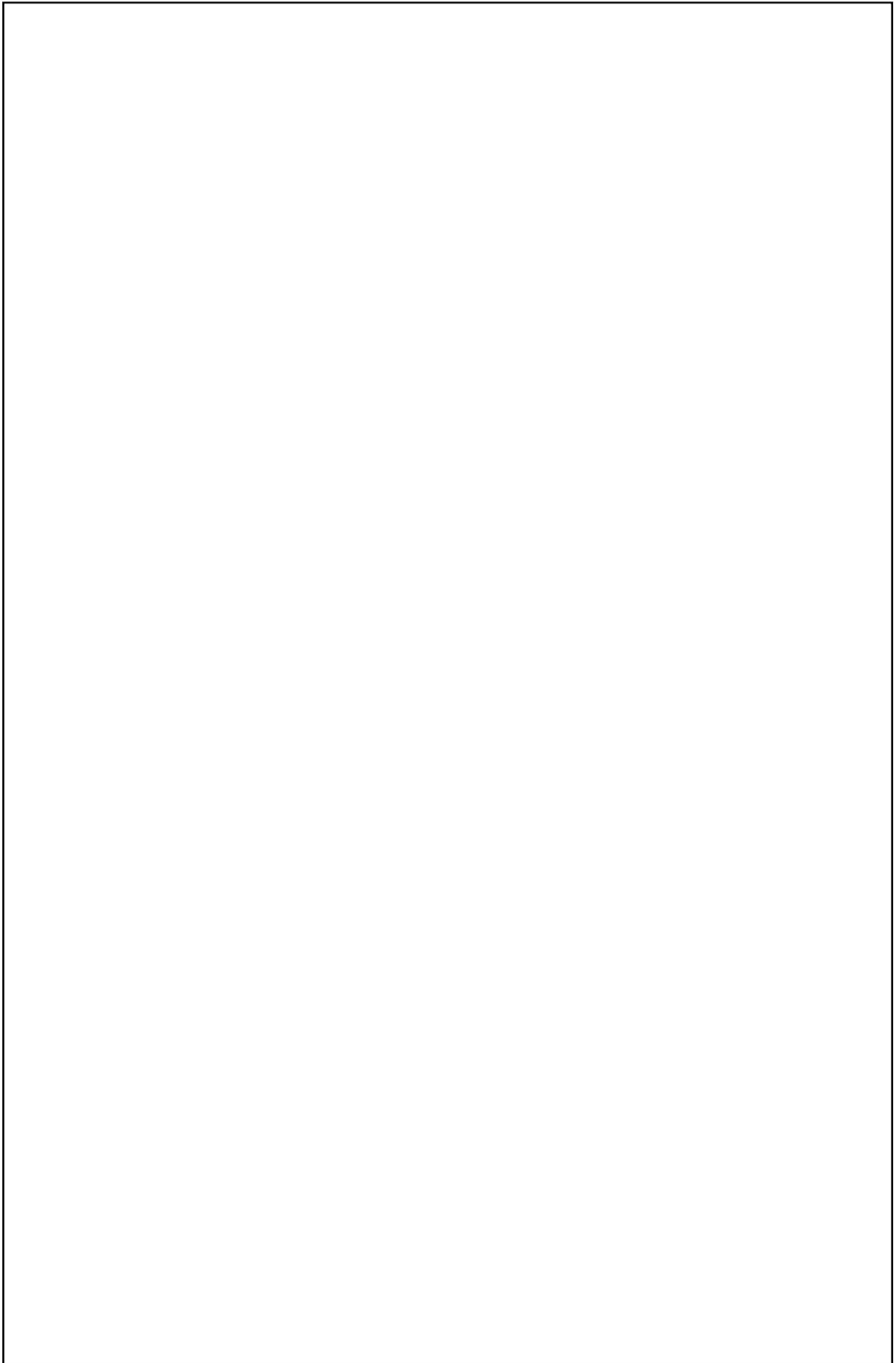
Practical No. 12

Objective: To study designing of garden for Children's park.

Exercise: Draw a neat landscape design and planting scheme for Children's park using coloured pencils.







Exercise-15

Objective: Visit to Urban forestry plantations area

It is the practice of growing trees on non-forest land in urban areas for recreational purposes and aesthetic value.

Establishment and maintenance of urban forest: In urban areas, trees are planted or maintained for many purposes and different situations. Establishment of urban forest involves consideration on planting site, tree species, size of planting stock, maintenance etc.

Planting site: Several types of planting sites are unique to urban areas including street lawn, tree pit, avenue and cluster planting. There is variety of places to plant seedlings or trees such as residential and business yards, parking lots, highway medians, avenues, parks and court yards between buildings.

Field Exercise:

1. Name of the visiting urban forestry sites:
2. Date of visit:
3. Locality:
4. Area (m²):
5. Altitude:
6. Presence of tree species in urban forestry area

S. No.	Characters of Tree Species		Tree Species		No.	Uses	Other Information
			Common Name	Scientific Name			
1.	Grandeur of the size		.....	.....	.....	.....
			
			
2.	Gracefulness of the branching patterns	Round	.....	.....	.....	.....
		Broad	.....	.....	.....	.....
		Square	.....	.....	.....	.....
3.	Tree form	Conical	.....	.....	.....	.....
			
			

		Columnar	.....	.....	.....	.....
		
		Tapering	.....	.....	.....	.....
		
		Arrow form	.....	.....	.....	.....
		
4.	Stem character (basis on bark colour)		.....	.....	.....	.....
		
5.	Harmony of line and symmetry of form		.....	.....	.....	.....
		
6.	Density or pattern of foliage in relation to shade		.....	.....	.....	.....
		
7.	Elegance of foliage		.....	.....	.....	.....
		
8.	Spectacular foliage colour		.....	.....	.....	.....
		
9.	Spectacular floral display colour		.....	.....	.....	.....
		
10.	Attractive fruits		.....	.....	.....	.....
		
11.	Luxury of fragrance		.....	.....	.....	.....
		

7. Achievements of urban forestry plantation area to socio-economic status of local people:

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8. Important schemes being implemented for urban forestry:

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9. Conclusion:.....

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Exercise-16

Objective: Visit to Recreational Forestry areas

It is the practice of forestry with the object of raising flowering trees and shrubs mainly to serve as recreation forests for the urban and rural population. This type of forestry is also known as **Aesthetic Forestry**, which is defined as the practice of forestry with the object of developing or maintaining a forest of high scenic value.

Field Exercise:

1. Name of the visiting recreational forestry site:
2. Date of visit:
3. Locality:
4. Area (m²):
5. Presence of tree species in Recreational Forestry Area:

S. No	Tree Species		No.	Uses	Distance		Other Information
	Common Name	Scientific Name			Rows (m ²)	Plants (m ²)	
1.							
2.							
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6. Achievements of recreational forestry area to socio-economic status of local people:

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Exercise-17

Objective: Visit to National Parks

- A National Park is a natural space that is dedicated for the purposes of conservation, recreation, and protection.
- Different countries have their own national parks and the designation of national parks across the globe depends on each individual country's system and judgment. But most national parks have similar aims – to conserve wild nature in order to protect it for the future as well as allow people the chance to enjoy it.
- National parks are often a symbol of national pride. Most national parks are open to the public and provide opportunities for recreation, camping, and walking. Most national parks have an outstanding level of natural beauty, whether the beauty comes from mountains, lakes, rivers or plains.

Field Exercise:

1. Name of the visiting national park:
2. Date of visit: Day:
3. Locality:
4. Area (m²):
5. Geographical location:
6. Altitude:
7. Slope:
8. Presence of important flora and fauna in national park

S. No	Fauna			Flora			Other information
	Mammals	Birds	Reptiles	Tree Species	Shrubs	Grasses	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							

Exercise-18

Objective: Visit to Wildlife Sanctuaries

- A wildlife sanctuary is an area where animal habitats and their surroundings are protected from any sort of disturbance. The capturing, killing and poaching of animals is strictly prohibited in these regions.
- They aim at providing a comfortable living to the animals. India has beautiful wildlife sanctuaries, with dense forests, large rivers, high and beautiful mountains.

Importance of Wildlife Sanctuaries

- The wildlife sanctuaries are established to protect the endangered species.
- It is quite difficult to always relocate the animals from their natural habitat, therefore, protecting them in their natural environment is advantageous.
- The endangered species are specially monitored in the wildlife sanctuaries. If they reproduce and grow in number while under protection, few specimens can be kept for breeding in the conservation parks for their survival.
- Biologist activities and researches are permitted in the wildlife sanctuaries so that they can learn about the animals living there.
- A few sanctuaries take in injured and abandoned animals and rehabilitate them to health before releasing them in the forest.
- Wildlife sanctuaries preserve the endangered species and protect them from humans and predators.

Field Exercise:

1. Name of the visiting wildlife sanctuary:
2. Date of visit: Day:
3. Locality:
4. Area (m²):
5. Geographical location:
6. Altitude:
7. Slope:
8. Presence of important flora and fauna in wildlife sanctuary

S. No	Fauna			Flora			Other information
	Mammals	Birds	Reptiles	Tree Species	Shrubs	Grasses	
1.							
2.							
3.							
4.							
5.							

APPENDICES

IDENTIFICATION OF ANNUALS

1. Winter season Annuals:

Sr. No.	Botanical Name	Common Name	Family	Colour	Description
1.	<i>Acroclinium roseum</i>	Paper Flower	Asteraceae	Pink & White	Grown for bedding purpose and as dry flowers for decoration.
2.	<i>Alcea rosea</i>	Hollyhock	Malvaceae	Various colours	Can be used for screening purpose, background and borders
3.	<i>Antirrhinum majus</i>	Snapdragon	Plantaginaceae	White, yellow pink, rose mauve	Bedding and pots, good cut flower
4.	<i>Arctotis stoechadifolia</i>	African Daisy	Asteraceae	White	Bedding purpose and herbaceous borders
5.	<i>Brachycome iberidifolia</i>	Swan River Daisy	Asteraceae	White, pink and blue	Bedding purpose and herbaceous borders.
6.	<i>Bracteantha viscosa</i>	Sticky paper daisy	Asteraceae	Yellow	Bedding purpose and good dry flower
7.	<i>Bellis perennis</i>	English daily	Asteraceae	White, pink, red	Bedding purpose
8.	<i>Bromus sp.</i>	-	Poaceae	Green to pale	Used as bedding plant and excellent dry flower
9.	<i>Briza maxima</i>	Greater quacking grass	Poaceae	Green to pale	Used as bedding plant and excellent dry flower
10.	<i>Calendula officinalis</i>	Pot marigold	Asteraceae	Yellow, orange	Bedding and pots
11.	<i>Callistephus chinensis</i>	China aster	Asteraceae	White, pink, blue	Bedding and pots, good cut flower
12.	<i>Centaurea cyanus</i>	Corn flower	Asteraceae	-do-	Bedding purpose
13.	<i>Centaurea moschata</i>	Sweet sultan	Asteraceae	Mauve, white, yellow	Bedding purpose and pots, having scented flowers
14.	<i>Erysimum cheiri</i>	Wall flower	Brassicaceae	Yellow burnt orange	Bedding purpose and pots, having scented flowers
15.	<i>Clarkia elegans</i>	Clarkia	Onagraceae	White, rose, pink, purple	Bedding purpose
16.	<i>Coreopsis tinctoria</i>	Plains tickseed	Asteraceae	Yellow	-do-
17.	<i>Coreopsis lanceolata</i>	Lance-leaved coreopsis	Asteraceae	Yellow	-do-
18.	<i>Cosmos bipinnatus</i>	Garden Cosmos	Asteraceae	White, pink, mauve, magenta	Bedding purpose and can be grown throughout the year
19.	<i>Cosmos sulphureus</i>	Sulfur Cosmos	Asteraceae	Yellow	-do-
20.	<i>Consolida ajacis</i>	Larkspur	Ranunculaceae	Blue	Bedding purpose
21.	<i>Dahlia variabilis</i>	Dahlia	Asteraceae	Various colours	Bedding purpose and pots
22.	<i>Dianthus barbatus</i>	Sweet William	Caryophyllaceae	White, pink and red	Bedding purpose and as cut flower, have scented flowers
23.	<i>Dianthus chinensis</i>	Chinese pink	Caryophyllaceae	-do-	Bedding purpose.
24.	<i>Dimorphotheca sinuata</i>	African daisy	Asteraceae	White	Bedding purpose and pots
25.	<i>Eschscholtzia californica</i>	Californian poppy	Papaveraceae	Yellow and Orange	Medium growing, for bedding purpose
26.	<i>Gazania splendens</i>	Treasure daisy	Asteraceae	Yellow and dark brown	Bedding purpose and pots
27.	<i>Glebionis coronaria</i>	Annual chrysanthemum	Asteraceae	White, yellow	Bedding purpose and good loose flower.
28.	<i>Gypsophila elegans</i>	Annual baby's breath	Caryophyllaceae	White, pink yellow	Bedding purpose, good cut flowers used as fillers.
29.	<i>Helichrysum bracteatum</i>	Straw flower	Asteraceae	Yellow, white, pink	Bedding purpose and good dry flower
30.	<i>Iberis amara</i>	Candytuft	Brassicaceae	White, pink	Can be grown in pots and for edging of herbaceous border
31.	<i>Lagurus ovatus</i>	Hare's-tail or Bunnytail	Poaceae	Green	Bedding purpose, pots and excellent dry flower
32.	<i>Lathyrus odoratus</i>	Sweet pea	Fabaceae	Various colours	Annual climber with fragrant flowers, suitable for screening and trellises.
33.	<i>Limonium sinuatum</i>	Sea-lavender /Statice	Plumbaginaceae	White, pink, yellow purple	Fairly drought resistant, very good cut flower as filler and as dry flower
34.	<i>Linaria bipartite</i>	Toadflax	Plumbaginaceae	Various colours	Can be grown in semi-shady places, good for bedding and pots.
35.	<i>Lobularia maritima</i>	Sweet Alyssum	Brassicaceae	White, lilac	Bedding purpose and pot plants

36.	<i>Lupinus hartwegii</i>	Lupin	Fabaceae	Purplish blue	For bedding purpose and as cut flower
37.	<i>Mathiola incana</i>	Stock	Brassicaceae	White, purple, yellow	For bedding purpose and good cut flower
38.	<i>Dorotheanthus bellidiformis</i>	Ice plant	Aizoaceae	Pink, white, yellow	Leaves are fleshy and have small dew like natural eruptions. For edging, pots, hanging baskets, rockery.
39.	<i>Euryops chrysanthemoides</i>	African bush daisy	Asteraceae	Bright yellow	Edging plant and pots
40.	<i>Mimulus tigrinus</i>	Tiger Monkey flower	Phymaceae	yellow with brown blotches	Partially shady places, suitable, good for pots
41.	<i>Moluccella laevis</i>	Bells of Ireland	Lamiaceae	Green like bells	Used in flower arrangements and good dry flower
42.	<i>Nemesia strumosa</i>	Nemesia	Scrophulariaceae	Yellow, red, orange	Bedding and pots
43.	<i>Nigella damascena</i>	Love-in-a-mist	Ranunculaceae	Blue, white, purple	Sunny areas and pods are used as dry flowers
44.	<i>Petunia hybrida</i>	Petunia	Solanaceae	Various colours	Good for pots, hanging baskets and bedding purpose
45.	<i>Phlox drummondii</i>	Drummond's Phlox	Polemoniaceae	Various colours	Dwarf plants are very showy when grown in borders, baskets and pots
46.	<i>Papaver orientale</i>	Common poppy	Papaveraceae	Red	Good for bedding purpose and herbaceous borders
47.	<i>Primula melacoides</i>	Fairy primrose	Primulaceae	Mauve, pink, white	Good for bedding purpose and pots. Suitable for temperate areas.
48.	<i>Salvia splendens</i>	scarlet sage	Lamiaceae	Scarlet, red, white, purple	Easily grown in shady places and rockery, used as bedding plant and in pots
49.	<i>Senecio cruentus</i>	Cineraria	Asteraceae	Various colours	Grown in shady places, good for bedding purpose and pots
50.	<i>Tagetes erecta</i>	African Marigold	Asteraceae	Yellow, orange	Easily grown, good for bedding, pots and commercially grown for loose flowers
51.	<i>Tagetes patula</i>	French Marigold	Asteraceae	Yellow, orange, red	Hardy annual used for bedding purpose, pots and as loose flower.
52.	<i>Torenia fourmieri</i>	Wishbone flower	Linderniaceae	blue, purple, pink, rose and white	blooms abundantly in shady conditions, good for edging and containers
53.	<i>Tropaeolum majus</i>	Nasturtium	Tropaeolaceae	do-	Mostly grown in rockeries. It has trailing habit, so used as climbers and in hanging baskets.
54.	<i>Verbena hybrida</i>	Verbena	Verbenaceae	Purple, pink, blue, red, white	Good for bedding purpose, pots, hanging baskets, window boxes and rockery.
55.	<i>Viola wittrockiana</i>	Pansy	Violaceae	Yellow, blue, red, purple, violet bicolor	Sunny location is preferred, good for bedding and hanging baskets. Flowers resembles with the butterflies

2. Summer and rainy season annuals

Sr. No.	Botanical Name	Common Name	Family	Colour	Remarks
1	<i>Celosia cristata</i>	Cock's comb	Amaranthaceae	Pink, yellow, orange	Very hardy and longer flowering period and makes good crest
2	<i>Celosia plumosa</i>	Plumed cock's comb	Amaranthaceae	do-	Flowers like plume of ostrich. Good for bedding purpose.
3	<i>Amaranthus caudatus</i>	Love-lies-bleeding	Amaranthaceae	Pink & White	Due to variegated leaves, it is also grown in pots for indoor decoration
4	<i>Gaillardia pulchella</i>	Blanket flower	Asteraceae	Yellow, orange scarlet brown	It can resist dry conditions and can be grown as perennial also. Good cut flower
5	<i>Gomphrena globosa</i>	Bachelor's button	Amaranthaceae	Pink, Magenta	Good for dry conditions and used as dry flower.
6	<i>Helianthus annuus</i>	Sunflower	Asteraceae	Yellow orange	Can be grown throughout the year and sown directly from seeds into permanent places
7	<i>Portulaca grandiflora</i>	Moss Rose	Portulacaceae	Various colours	Easily propagated by cutting, can be grown in pots, hanging basket and small boxes.
8	<i>Bassia scoparia/ Kochia scoparia</i>	Summer Cypress	Amaranthaceae	---	Mostly grown for foliage beauty due to uniform, well-shaped and bushy growth.
9	<i>Impatiens balsamina</i>	Balsam	Balsaminaceae	Various colours	Early flowering and for short duration, Very delicate and needs much care
10	<i>Impatiens walleriana</i>	Impatiens	Balsaminaceae	pink, red or white	Suitable for pots and bedding purpose.
11	<i>Tithonia speciosa</i>	Mexican Sunflower	Asteraceae	Orange, scarlet	Sown directly from seeds
12	<i>Catharanthus roseus</i>	Periwinkle	Apocynaceae	Purple, Pink white	Can be grown throughout the year
13	<i>Zinnia elegans</i>	Zinnia	Asteraceae	Various colours	Very hardy and grown easily for longer duration

CLASSIFICATION OF TREES

Ornamental flowering trees: Grown for the beauty of their showy and ornamental flowers.

Sr. No.	Botanical Name	Common Name	Family	Flower colour and time	Description
1.	<i>Acacia auriculiformis</i>	Earleaf Acacia/ Auri	Fabaceae	Yellow, August-September	An evergreen tree with pendulous branches and phyllodes leaves. The tree is medium sized
2.	<i>Alstonia scholaris</i>	Devil's tree	Apocynaceae	Greenish white, March- April	It is tall, spreading and shady tree. Leaves are shiny and dark green. The tree bears small greenish white flowers during Nov –Dec.
3.	<i>Azadirachta indica</i>	Neem	Meliaceae	White, April- May	10-15 m high, good shady tree. It grows successfully on rocky and alkaline soils. Very good shade tree for tropical/sub-tropical areas
4.	<i>Bauhinia purpurea</i>	Orchid tree/ Purple Bauhinia	Fabaceae	Rosy- purple, Nov – Feb.	A medium sized tree suitable for avenue planting,
5.	<i>Bauhinia tomentosa</i>	Yellow Bauhinia/ Orchid tree	Fabaceae	Yellow , April- June	A small tree with drooping branches which bear showy yellow flowers and suitable for growing in gardens.
6.	<i>Bauhinia variegata</i>	Orchid tree / Kachnar	Fabaceae	White-pink, Feb- April	A small sized tree, bear flowers when the tree is leafless. The flowers are edible and used for culinary purpose.
7.	<i>Bombax ceiba</i>	Silk Cotton tree/ Simbal	Malvaceae	Red , orange, Jan- March	A large deciduous tree, stem is straight and undivided. The young stem is covered with sharp prickles. It bears flowers when tree is leafless.
8.	<i>Butea monosperma</i>	Dhak/Palash/ flame of the forest	Fabaceae	Orange red, March- April	A small deciduous tree having irregular branches. It bears showy flowers when the tree is leafless. It is drought resistant tree and can be grown in alkaline soils
9.	<i>Callistemon lanceolatus</i>	Bottle Brush	Myrtaceae	Red, Round the year	A beautiful small tree having weeping habit, the crowded scarlet flowers are borne in spikes almost throughout the year.
10.	<i>Cassia fistula</i>	Indian Laburnum/ Amaltas	Fabaceae	Yellow, May- June	A medium sized shady tree, bears pendulous racemes of large bright yellow flowers, when tree is leafless. It is drought-resistant and can tolerate quite a high salt levels.
11.	<i>Cassia javanica</i>	Java Cassia	Fabaceae	Pink, May- June	A medium sized tree with spreading crown, bears clusters of pink flowers with the foliage.
12.	<i>Cassia renigera</i>	Burmese Pink Cassia	Fabaceae	Pink, May- July	It bears flowers in clusters giving appearance of bunches of roses on long branches.
13.	<i>Cassia siamea</i>	Kasod tree	Fabaceae	Yellow, Nov- Feb	A medium sized shady tree. It is drought resistant and can tolerate lot of dust. It is suitable for planting along roadside.
14.	<i>Ceiba speciosa</i>	Silk floss tree	Malvaceae	Pink, July- August	It is beautiful tree with a bottle shaped green thorny trunk
15.	<i>Delonix regia</i>	Gulmohar/ Royal Poinciana	Fabaceae	Scarlet red, April- June	A large tree with umbrella like crown and feathery leaves.
16.	<i>Erythrina indica/ E. variegata</i>	Indian Coral tree	Fabaceae	Scarlet, crimson, March- April	A quick growing tree. It bears flowers when the tree is leafless.
17.	<i>Grevillea robusta</i>	Silver oak	Proteaceae	Yellow, April- June	An evergreen tree with a conical crown. The leaves are fern like and silvery from the lower side. It bears coppery yellow flowers in April.
18.	<i>Jacaranda mimosaeifolia</i>	Neeli Gulmohar	Fabaceae	Purple-mauve, March- May	Medium to large sized tree, with feathery bipinnate leaves. Quick growing tree suitable for avenue planting
19.	<i>Kigelia pinnata</i>	Sausage tree	Bignoniaceae	Dark red-maroon, April- May	A large tree with good spreading crown. Sausage like fruits borne on long pendulous stalks can be seen hanging on trees.
20.	<i>Lagerstroemia speciosa/ L. flos-reginae</i>	Giant Crepe Myrtle	Lythraceae	Mauve/ pinkish, April to August	A medium sized deciduous tree. Suitable for avenue planting.
21.	<i>Madhuca indica</i>	Mahua	Sapotaceae	Cream, Feb- March	Fast growing large deciduous tree. The leaves are borne in clusters near the end of the branches and are coppery coloured when young. The flowers are used for making vegetables and wine.
22.	<i>Magnolia champaca</i>	Champak/ Champa	Magnoliaceae	Light yellow, May- September	A medium sized evergreen tree. Bears fragrant flowers
23.	<i>Magnolia grandiflora</i>	Bara champa	Magnoliaceae	White, April- May	A medium sized, evergreen tree with beautiful foliage, large scented white flowers.
24.	<i>Millingtonia hortensis</i>	Tree jasmine/ Indian cork tree	Bignoniaceae	White, April- June	A tall evergreen tree which bears sweet scented flowers. The tree is quick growing.
25.	<i>Milletia ovalifolia</i>	Molumein rosewood	Fabaceae	Light pink, pink, Feb- March	A medium sized tree. Bears profuse flowers when the tree is leafless
26.	<i>Peltophorum pterocarpum</i>	Yellow Flamboyant	Fabaceae	Yellow, Sept- November	Deciduous tree with bipinnate leaves, erect trunk and suitable for avenue planting
26.	<i>Plumeria acutifolia</i>	Pagoda tree/ Temple tree	Apocynaceae	White, April- November	Dwarf evergreen tree with large green leaves with acute tips.

27.	<i>Plumeria alba</i>	Pagoda tree/ Temple tree	Apocynaceae	White, April- November	Dwarf evergreen tree with large glabrous dark green leaves with round tip, bear fragrant flowers
28.	<i>Plumeria rubra</i>	Red Frangipani	Apocynaceae	Pinkish red, red, April- November	Dwarf deciduous tree with large dark green conical leaves, bear red flowers
29.	<i>Saraca indica</i>	Sita Ashoka	Fabaceae	Bright orange- Red, April – May	Evergreen tree with drooping branches, bear fragrant flowers.
30.	<i>Spathodea campanulata</i>	Fountain tree/ African Tulip tree	Bignoniaceae	Red, Feb-May.	Monotypic genus in the family Bignoniaceae, A medium sized tree. Flower on pressing trickles out water like a fountain.
31.	<i>Tabebuia rosea</i>	Rosy trumpet tree	Bignoniaceae	Deep rose pink, Feb- April	Large tree which bears flowers when leafless.
32.	<i>Tabebuia argentea</i>	Silver trumpet tree	Bignoniaceae	Yellow, March- May	Quick growing tree, bears flowers when leafless. Suitable for avenue planting.
33.	<i>Tecomella undulata</i>	Roheda	Bignoniaceae	Orange, March- April	It is dwarf tree, evergreen to semi-deciduous tree suitable for dry and desert areas.

2. Foliage trees: Trees grown for their showy ornamental foliage or for providing shade in garden.

S. No.	Botanical Name	Common Name	Family	Description
1.	<i>Alstonia scholaris</i>	Sat Patia or Devil's tree	Apocynaceae	Bright green leaves borne in cluster of seven. It is good shady tree, used for avenue planting and near parking areas
2.	<i>Araucaria cookii</i>	Monkey Puzzle Tree	Araucariaceae	It has symmetrical growth habit. Good for planting as specimen tree. Propagated from seed.
3.	<i>Casuarina equisetifolia</i>	Australian pine tree	Casuarinaceae	Tall columnar tree with needle like leaves, suitable for wind breaks
4.	<i>Cedrus deodara</i>	Cedar pine/ Deodar	Pinaceae	Evergreen pine tree of temperate areas, suitable for roadside planting and timber.
5.	<i>Cupressus sempervirens</i>	Saru	Cupressaceae	Conical tree with thin foliage and suitable for planting in the graveyard.
6.	<i>Dillenia indica</i>	Chalta	Dilleniaceae	Dwarf slow growing tree with shiny green serrated leaves.
7.	<i>Eucalyptus spp.</i>	Blue gum tree/ Safeda	Myrtaceae	Slender trunk, smooth clean few branches lemon scented leaves. Grow rapidly and planted as avenues on marshy land.
8.	<i>Eugenia jambolina</i>	Jamun/ Java plum	Myrtaceae	Tall and spreading with dark green foliage, suitable for providing shade. It bears fruits and attract birds.
9.	<i>Ficus benghalensis</i>	Bohr or Banyan tree	Moraceae	Tall, round shaped foliage tree, usually grown for providing shade in gardens.
10.	<i>Ficus religiosa</i>	Pipal	Moraceae	Tall, evergreen, round shaped tree usually grown for providing shade in gardens.
11.	<i>Ficus elastica</i>	Rubber tree	Moraceae	Evergreen medium size tree, bright shining blackish green leaves, can be used as a specimen tree and as a pot plant.
12.	<i>Juniperus chinensis</i>	Chinese Juniper	Cupressaceae	Conical growth habit and fine needle like thin green leaves, can be planted as pot plant or as specimen.
13.	<i>Melia azedarch</i>	Chinaberry tree/ Drake	Meliaceae	Winter deciduous tree, light green shiny foliage, suitable for plantation as shady tree
14.	<i>Melaleuca bracteata</i>	Golden Bottle brush	Myrtaceae	Tree with pendulous branches, leaves are golden-greenish in colour.
15.	<i>Mimusops elengi</i>	Spanish cherry. Maulsari	Sapotaceae	Slow growing tree with round canopy and dark green foliage, bears scented flowers
16.	<i>Polyalthia longifolia</i>	False Ashok	Annonaceae	Tall evergreen tree with a symmetrical columnar crown, good for screening and roadside planting.
17.	<i>Pinus roxburghii</i>	Chirpine	Pinaceae	Evergreen pine tree grown in hills. It can be grown as specimen tree.
18.	<i>Pongamia pinnata</i>	Pongam tree	Fabaceae	Medium size shady tree with dark green foliage, bears purplish white flowers.
19.	<i>Pterospermum acerifolium</i>	Bayur tree/ Kanak Champa	Malvaceae	Medium sized evergreen tree with beautiful foliage and creamish yellow scented flower which appears from April to June.
20.	<i>Pterygote alata/ Sterculia alata</i>	Buddha coconut	Malvaceae	Tall slow growing tree with broad leaves, less spreading, suitable for planting as avenue tree.
21.	<i>Putranjiva roxburghii</i>	Putrajiva	Putranjivaceae	Large tree with a semi-globular crown dense glossy, foliage, good for avenues.
22.	<i>Terminallia arjuna</i>	Arjun tree	Combretaceae	Large evergreen shady tree. Flowers are not showy. Suitable for planting along roads and in groups for shade.

IDENTIFICATION OF SHRUBS

1. Flowering shrubs: Shrubs are grown for their beautiful flowers.

S. No.	Botanical Name	Common Name	Family	Flowering time	Identifying characters
1.	<i>Abelia grandiflora</i>	Abelia	Caprifoliaceae	May-June	It grows to a height of 1.5-2m, spreading habit and propagated through cuttings.
2.	<i>Abutilon pictum</i>	Chinese lantern	Malvaceae	Orange-yellow	Short shrub, propagated from seeds and cuttings and prefer partial shade.
3.	<i>Acalypha hispida</i>	Chenille plant/ Cat's tail	Euphorbiaceae	Throughout the year, red	Bushy shrub with dark green foliage and long red coloured fuzzy pendulous inflorescence which looks like cat's tail.
4.	<i>Achania malvaviscus</i>	Sleeping Hibiscus	Malvaceae	Throughout the year, red	Popular shrub used as hedge, easily propagated from cuttings
5.	<i>Asclepias currassavica</i>	Milk weed	Asclepiadaceae	Summer season Orange-yellow	As a specimen shrub, good for border, propagated from seed or cuttings
6.	<i>Barleria cristata</i>	Philippine violet	Acanthaceae	Oct-Dec. Violet blue, pink, white	It is a small shrub, winter deciduous in nature propagated from seed.
7.	<i>Bauhinia tomentosa</i>	Bell bauhinia	Leguminosae	August-October Sulphur yellow	5-8 m high, winter deciduous shrub, quick growing. Grown for foliage and flower beauty. Propagated from seed.
8.	<i>Bougainvillea</i> spp	Bougainvillea	Nyctaginaceae	Red, yellow, white, purple, pink	It is a multipurpose shrub, quick growing. Hardy and can be grown under neglected conditions for screening purpose.
9.	<i>Brugmansia suaveolens</i>	Datura	Solanaceae	Pink flowers	Very good landscape plant, prefers partial shade.
10.	<i>Caesalpinia pulcherrima</i>	Peacock flower	Leguminosae	May-Aug. Scarlet, yellow	It is medium sized shrub grown for foliage and flower beauty. It is a quick growing shrub suitable for dry areas.
11.	<i>Calliandra brevipes</i>	Pink Powder puff	Leguminosae	Red, pink, white	It is medium to tall, evergreen shrub with beautiful foliage.
12.	<i>Camellia japonica</i>	Camellia	Theaceae	April-June Red, Pink	Very good specimen shrub suitable for high elevations.
13.	<i>Carissa carandus</i>	Karonda	Apocynaceae	March-April, white	A good hedge plant and can be planted in a large shrubbery.
14.	<i>Cascabela thevetia/ Thevetia peruviana</i>	Pili Kaner	Apocynaceae	Year round, Yellow	Tall evergreen shrubs with shining leaves, for roadside plantation and screening, propagation is from seed.
15.	<i>Cassia biflora</i>	Desert Cassia	Leguminosae	Feb-April Yellow	It is 6-8 ft. in height propagated from seed and air layering, used as specimen shrub.
16.	<i>Cassia glauca</i>	Scrambled egg bush	Leguminosae	Mar-May, Sept. -Nov., Yellow	It is tall, evergreen, quick growing shrub suitable for arid areas.
17.	<i>Cestrum diurnum</i>	Din ka Raja	Solanaceae	June-Aug White	It is medium sized quick growing, evergreen shrub with blue berries.
18.	<i>Cestrum elegans</i>	Pink Cestrum	Solanaceae	Sept-Dec. Purple red	A plant suitable for temperate climate and high altitudes.
19.	<i>Cestrum nocturnum</i>	Rat ki Rani	Solanaceae	Spring & Rainy season white	It is 5-6 ft high, evergreen, hardy quick growing shrub, propagated from cuttings, fragrant flowers open at night.
20.	<i>Clerodendrum thomsonae</i>	Bleeding heart	Verbenaceae	Rainy season scarlet with white calyx	Very attractive shrub/climber suitable for tropical areas.
21.	<i>Cotoneaster microphyllus</i>	Rockspray Cotoneaster	Rosaceae	White flowers	Prostrate trailing shrubs, climbs over rocks and suitable for rock gardens.
22.	<i>Cuphea hyssopifolia</i>	False Heather	Lythraceae	July-September blue flowers	Evergreen shrub suitable as good edging plant bearing pinkish purple flowers.
23.	<i>Galphimia gracilis</i>	Golden shower	Malpighiaceae	Jul-Nov. Yellow	It is evergreen medium shrub, can be used as hedge. Propagated through seed.
24.	<i>Gardenia jasminoides</i>	Gandhraj	Rubiaceae	March-Sept. White	Evergreen medium shrub. Grown as a specimen shrub, bears sweet scented flowers.
25.	<i>Hamelia patens</i>	Firebush/ humming birdbush	Rubiaceae	Year round Red	Tall shrub. On rockery it can be trained as small bush, grown for the foliage and flower beauty and for screening.
26.	<i>Hamiltonia suaveolens</i>	-	Rubiaceae	Feb-March Lavender	Medium to large shrub 6-8'. Propagated from cutting, used for group plantation.
27.	<i>Hibiscus mutabilis</i>	Changeable Rose	Malvaceae	White to Pink to red	It is tall growing, deciduous shrub with large leaves..
28.	<i>Hibiscus rosa-sinensis</i>	China Rose	Malvaceae	Year round White, pink rose, yellow	Evergreen medium sized. Used for making flowering hedge.

29.	<i>Hibiscus syriacus</i>	Rose of Sharon	Malvaceae	Summers, White & Mauve	Deciduous shrub 5-6'. Propagated from cuttings. Good for temperate climatic areas.
30.	<i>Holmskioldia sanguinea</i>	Cup-n-Saucer	Verbenaceae	Yellow, red	Medium sized shrub. Long branches used for dry decoration.
31.	<i>Ixora coccinea</i>	Jungle geranium	Rubiaceae	Deep scarlet July-Aug	Evergreen specimen shrub. Prefers partial shade for growth.
32.	<i>Ixora parviflora</i>	-do-	Rubiaceae	White, Mar-Apr	Tall evergreen specimen shrub with sweet scented flowers.
33.	<i>Ixora singaporiensis</i>	-do-	Rubiaceae	Pinkish red	Dwarf shrub, used as a specimen bush. Prefers partial shade for growth.
34.	<i>Jacobinia carnea</i>	Jacobinia	Acanthaceae	Orange	4-5' evergreen shrub, bears tubular orange flower, grown for making flowering hedge.
35.	<i>Jasminum humile</i>	Peeli chameli	Oleaceae	Feb-Mar, Yellow	Evergreen shrub. Thrives well in poor soil, can be used as climber.
36.	<i>Jasminum sambac</i>	Motia	-do-	March-Sept. White	Dwarf shrub, planted for sweet scented flowers. Propagated by suckers and cuttings.
37.	<i>Lagerstroemia indica</i>	Sawani	Lythraceae	May-Aug Mauve, pink and white	Tall, winter deciduous shrub, Propagated from cuttings.
38.	<i>Lantana sellowiana</i>	Trailing Lantana	Verbenaceae	Year round Pale mauve	Medium shrub, evergreen, good for planting on mounds and rockeries.
39.	<i>Mussaenda frondosa</i>	Mussaenda	Rubiaceae	Summers White sepals	Evergreen shrub. Long white sepals form a part of flowers.
40.	<i>Nerium oleander</i>	Kaner	Apocynaceae	May-Oct White, pink, Red	Evergreen shrub. Suitable for roadside plantation, screening. Variegated varieties are used as specimen plant.
41.	<i>Nyctanthes arbor-tristis</i>	Parijaat/ Har-Shingar	Oleaceae	October- January White with orange peduncle	Tall evergreen shrub, with numerous sweet scented flowers, propagation is from seed.
42.	<i>Plumbago capensis</i>	Chitra	Plumbaginaceae	Mar.-Oct., White turn light blue	Evergreen shrub, used as ground cover, pot plant or for foundation plantation.
43.	<i>Poinsettia pulcherima</i>	Christmas Flower	Euphorbiaceae	Dec.-Jan Yellow and Red	Deciduous shrub, 5-6 ft height, terminal leaves look like flowers.
44.	<i>Ruellia simplex</i>	Mexican petunia	Acanthaceae	Spring to summers, Purple, pink, white	Thriving best under semi-shade, suitable for shrubbery and hanging baskets.
45.	<i>Russelia juncea</i>	Fire cracker plant	Scrophulariaceae	June to Aug, Coral red	Dwarf, evergreen shrub, used as foundation plant, bears tube like flowers. Used in bouquet making.
46.	<i>Tabernaemontana coronaria</i>	Pinwheel flower/ Chandni	Apocynaceae	Round the year, white	Tall evergreen shrub with glossy leaves used in shrubbery, specimen shrub, avenue and screening.
47.	<i>Tecoma stans</i>	Yellow trumpet bush	Bignoniaceae	Year round, Golden yellow	Dwarf growing shrub grown in shrubbery or as hedge.
48.	<i>Thunbergia erecta</i>	Purple king's mantle	Acanthaceae	Year round Dark blue	Medium sized evergreen shrub, used for making flowering hedge.
49.	<i>Volkmeria inermis / Clerodendrum inermi</i>	Forest Jasmine	Verbenaceae	July-Nov. White	It is evergreen shrub, good for hedge making, can be trained for topiary making and good for dry areas.

2. Foliage shrubs: These shrubs are grown for their foliage either green or variegated

S. No.	Botanical Name	Common Name	Family	Flowering time	Identifying characters
1.	<i>Acalypha wilkensisiana</i>	Acalypha	Euphorbiaceae	-	It is 3-4 ft. in height. It is good for hedge, foundation plantation and pot plant. It prefers partial shade for healthy growth.
2.	<i>Duranta repens</i>	Golden Dewrop	Verbenaceae	May-Jul, Blue	Medium sized, suitable for dry areas, propagated through cuttings. Used for edge & hedge making.
3.	<i>Euonymus japonicus</i>	Privet or Japanese spindle	Celastraceae	-	Medium sized shrub, used for hedge making, as pot plant, foliage is used as cut stem.
4.	<i>Euphorbia cotinifolia</i>	Caribbean copper leaf	Euphorbiaceae	-	Fast growing shrub with reddish foliage, suitable as pot plant, shrubbery and specimen
5.	<i>Excoecaria bicolor</i>	Chinese croton	Euphorbiaceae	-	Attractive leaves, red and green on opposite sides of leaf blade, good shrub for pots.
6.	<i>Ficus benjamina</i>	Weeping fig	Moraceae	-	Shrub with dark green leaves suitable for hedges, specimen and topiary.
7.	<i>Justicia gendarussa</i>	Willow leaved Justicia	Acanthaceae	-	Medium shrub, good for making edges. Can also be grown under partial shade.
8.	<i>Lawsonia inermis</i>	Mehndi	Lythraceae	Creamy white	Medium sized fragrant, quick growing shrub, powder of its leaves used for decorating hand and feet.

9.	<i>Ligustrum ovalifolium</i>	Japanese Privet	Oleaceae	Dull white	It is popular as a hedge plant can be propagated through cuttings.
10.	<i>Malpighia coccigera</i>	Miniature Holly	Malpighiaceae	Throughout the year, White	Evergreen shrub with small dark green spiny leaves. Good for making topiary, hedges, edges and bonsai.
11.	<i>Melaleuca bracteata</i>	Golden bottle brush	Myrtaceae	April – Oct, White	Shrub of weeping habit, most suitable for topiary making, can be propagated from cuttings.
12.	<i>Phyllanthus myrtifolius</i>	Mouse tail plant	Phyllanthaceae	May-Sept., red	Evergreen shrub with small light green leaves borne on drooping branches, producing a dense crown. Suitable for hedges, edges and topiary.
13.	<i>Pseuderanthemum carruthersii</i>	False Eranthemum	Acanthaceae	June-October, White, pink	Medium growing evergreen shrub, with green, dark purple and variegated leaves, suitable as pot plant
14.	<i>Vitex negundo</i>	Nirgundi	Verbenaceae	May-June Lilac	Tall shrub, silvery leaves. Suitable for saline, alkaline soil, drought resistant.
15.	<i>Volkmeria inermis / Clerodendrum inermi</i>	Forest Jasmine	Verbenaceae	July-Nov. White	It is evergreen shrub, good for hedge making, can be trained for topiary making. Propagated from cuttings and is drought resistant.

IDENTIFICATION OF ORNAMENTAL CLIMBERS

S. No.	Botanical Name	Common Name	Family	Flower colour and flowering time	Identifying characters
1.	<i>Allamanda cathartica</i>	Allamanda	Apocynaceae	Yellow, May-September	Light green foliage with narrow pointed leaves arranged in whorl of four. It can be grown as garden shrub or as climber.
2.	<i>Antigonon leptopus</i>	Coral Vine	Polygonaceae	Rose-pink, July-October	Deciduous quick growing climber, good for trellis and cascading
3.	<i>Aristolochia elegans</i>	Duck flower	Aristolochiaceae	June-September	Deciduous quick growing climber, good for trellis and cascading
4.	<i>Bauhinia vahlii</i>	Maljhan, Climbing bauhinia	Caesalpiniaceae	Creamy-white, May-June	Large, evergreen climber/ rambler, good for growing in foothills in drought prone areas.
5.	<i>Beaumontia grandiflora</i>	Nepal trumpet creeper	Apocynaceae	White, January-April	Evergreen quick growing heavy climber with shining coarse textured foliage
6.	<i>Bougainvillea</i> spp	Bougainvillea	Nyctaginaceae	Pink, magenta, white, orange, Throughout year	Evergreen to semi-deciduous climber usually pruned for restricting growth. It is valued for coloured bracts
7.	<i>Clerodendrum splendens</i>	Flaming glory bower	Lamiaceae/ Verbenaceae	Red, January-April	Large evergreen climber with coarse textured dark green foliage.
8.	<i>C. thomsonae</i>	Bleeding Heart	Lamiaceae	White bracts with red flowers, Jan-April	Evergreen climber dark green foliage and suitable for pots.
9.	<i>Clitoria ternatea</i>	Asian pigeon wings/ Butterfly pea	Fabaceae	Blue, white November-March	It is an annual climber, slow growing, can be grown as a pot climber
10.	<i>Combretum indicum/ Quisqualis indica</i>	Rangoon creeper/ Jhumka bel	Combretaceae	Reddish pink, Round the year	Beautiful creeper with moderately scented flowers. Used on long pillars, arches and trellis.
11.	<i>Dolichandra unguicati/ Bignonia unguicati</i>	Cat's claw	Bignoniaceae	Yellow, March-July	Evergreen light climber and have ability to climb over bare walls and pillars, emerging leaves purple-red. Good for making topiary.
12.	<i>Ficus repens</i>	Creeping fig/ Chipku bel	Moraceae	-	Evergreen climber and climbs with help of root exudates on walls, dead trees etc. and cover the wall. Best for growing in shady situations
13.	<i>Hiptage benghalensis</i>	Madhavi lata	Malpighiaceae	Creamy-white, February-June	Heavy woody semi-deciduous climber with shining foliage, emerging orange-red and red purple in autumn and have fragrant flowers.
14.	<i>Ipomoea cairica</i>	Railway creeper	Convolvulaceae	Purple, Throughout year	Evergreen quick growing climber.
15.	<i>Ipomoea learii</i>	Morning glory	-do-	Scarlet-pink, blue, June-September	Annual climber and usually grow in wild as weed.
16.	<i>I. quamoclit</i>	Cypress vine	-do-	Red, Oct-March	Annual climber with fine textured dark green leaves like fern
17.	<i>Jasminum auriculatum</i>	Juhi	Oleaceae	White, April-July	Evergreen climber with fragrant flowers.
18.	<i>J. grandiflorum</i>	Chameli/ Spanish	-do-	White, March-October	Evergreen climber with dark green fine textured foliage and fragrant flowers.

		jasmine			
19.	<i>Lonicera japonica</i>	Honeysuckle	Caprifoliaceae	Creamy-white, Throughout year	Evergreen heavy quick growing creeping plant with fragrant flowers.
20.	<i>Mansoa alliacea/ Adenocalymma alliicum</i>	Garlic Vine	Bignoniaceae	Mauve-purple, March-June	Hardy climber with shining leaves which produce garlic like smell on rubbing. Suitable for pergolas and arches.
21.	<i>Pandorea jasminoides</i>	Australian bower plant	Bignoniaceae	Reddish pink, April-Nov.	Light climber with shining green foliage
22.	<i>Pyrostegia venusta</i>	Golden shower	Bignoniaceae	Orange, February-April	Heavy climber with drooping branches.
23.	<i>Passiflora caerulea</i>	Blue Passion flower	Passifloraceae	White with blue filament, Sept-Nov	Flowers look like clock/ watch, planted on arches and entrances.
24.	<i>Passiflora coccinea</i>	Red passion flower	Passifloraceae	Red, August-November	Tropical climber bears showy scarlet red flowers, suitable for sunny and high humidity.
25.	<i>Petrea volublis</i>	Purple wreath	Verbenaceae	Spring, purple	Creeper with woody stem with drooping long racemes of star like flowers.
26.	<i>Rosa sp.</i>	Climbing rose	Rosaceae	Many colours, Feb-July	Many varieties of climbing rose are suitable for growing in arches, pergolas and trellises.
27.	<i>Rosa banksiana</i>	Banksian Rose	Rosaceae	Creamish white, white, March- April	Trailing type of species which produces small flowers in bunches.
28.	<i>Solanum jasminoides</i>	Potato vine/ Jasmine nightshade	Solanaceae	White, bluish white Sep- Feb	A slender twining shrub suitable for medium to high elevations.
29.	<i>Tecoma grandiflora/ Campsis grandiflora</i>	Trumpet flower	Bignoniaceae	Orange, March-October	Deciduous climber and have ability to climb over walls. Bear glossy dark green leaves.
30.	<i>Tecomera capensis</i>	Cape Honeysuckle	Bignoniaceae	Orange, throughout the year	Evergreen climber, it can be trimmed to give shapes.
31.	<i>Thunbergia grandiflora</i>	Bengal Clockvine	Acanthaceae	Sky blue, Feb-Mar	Dense green foliage, heart shaped. It can cover walls, trees
32.	<i>T. mysorensis</i>	Mysore trumpet vine	Acanthaceae	Orange, red, yellow, Jan- March	Flowers are borne in pendulous racemes, suitable for arches, pergolas and trellis.
33.	<i>Trachelospermum jasminoides</i>	Star jasmine	Apocynaceae	April-June, white	Evergreen climber, suitable for growing in shady situation and bears fragrant flowers.
34.	<i>Wisteria sinensis</i>	Chinese Wisteria	Fabaceae	Purple, white, February- March,	It is a winter deciduous creeper which can be trained over pergolas, fences and trellis.
35.	<i>Tarlmounia elliptica</i>	Curtain creeper	Asteraceae	Foliage shrub with white flowers	It is evergreen climber with drooping branches. Good for covering boundary wall and verandas.

LANDSCAPE SYMBOLS: When preparing landscape designs in plan view, designers use symbols that offer a suggestion of how the proposed or existing features would appear if seen from above. To be functional the symbols must be scaled to their true size. The size is actual in the case of existing objects such as buildings and streets, and eventual with the plants, which are usually drawn to scale their full or near mature size rather than their size at the time of installation or planting.

LANDSCAPE SYMBOLS USED FOR MAKING PLANS

- 1. Needled Evergreens:** these symbols suggest the spiny leaves which are green throughout the year. These symbols can be used to represent both trees and shrubs as long as they are needled and evergreen. A prominent dot at the centre marks the spot on the plan where plant is to be set into the ground.
- 2. Broadleaved Evergreen:** another group of plants are usually green throughout the year, but have wider and usually thicker, fleshy leaves. The symbols used to represent them suggest the larger leaf size and semi rigid growth habit of the plants. As with the needled evergreens, these symbols can be used for both broadleaved trees and shrubs.
- 3. Deciduous shrubs:** the edge of the plant is loose and irregular, suggestive of the plant is loose and irregular, suggestive of less rigid habit of most deciduous shrubs.
- 4. Deciduous trees:** like deciduous shrubs, deciduous trees also lose their leaves during the winter season. Unlike most shrubs, trees usually have only a centre trunk rather than multiple stems. The symbols for trees are usually wider because trees are commonly larger than shrubs. The lines representing them may be thicker and/or darker too, reflecting their greater height and prominence within the design.
- 5. Vines:** Vines grow in linear manner, and they do not hold to predictable shape. Their symbols are shaped to suggest that resembling linearity.

6. Trailing ground covers: Ground covers are those plants, usually 18 inches or less in height, that fill the planting beneath the trees and shrubs. Like vines, many ground covers are shapeless, linear plants that would have little impact on the landscape alone. The symbols used for ground covers are more textural than structural.

7. Hardscape material: Design materials that are not living plant materials are often referred to as hardscape. They include such things as paving, fencing, and wall materials, furnishings, lighting and water features. Like plant symbols, hardscape symbols appear in the landscape.

Explaining an idea with symbols: When one landscape object passes beneath another, the upper symbol is drawn with a wider, darker, and/or solid line, and the symbol for the object hidden beneath it is drawn with a thinner, lighter, and/or broken line. This is termed as line-weight variation.

Labeling: to make the landscape plan as useful and understandable as possible, it is usually necessary to add labeling and other notations to the plan.

Symbol labeling: All the graphic symbols used on the landscape plan must be labeled. Two methods of label placement are commonly used; either within the drawing or outside the drawing. In the latter method all labels are placed around the perimeter of the design and neatly justified, usually on right or left side.

When labeling is done within the drawing, the labels must be on or as close to the symbols as possible. The closer the symbols, the easier the plan will be to read. When scale of the design results in very small symbols, it may be necessary to code the label. That means a number or letter code is used on or near the symbol that corresponds to a lettered label placed elsewhere on the plan.

STYLES OF GARDENS

The different styles of gardening are as follows:

Formal gardens:

- A formal garden is laid out in a symmetrical or a geometrical pattern like with square and rectangular shapes.
- The outline of the garden as well as the outline of different parts like paths, flower beds, hedges and lawns are of geometrical shape.
- If there is a plant on the left-hand side of a straight road, a similar plant must be planted at the opposite place on the right-hand side i.e. both are mirror image of each other.
- In such gardens everything is planted in straight lines.
- The roads cut at right angles.
- It has a sort of enclosure or boundary.
- The arrangement of trees and shrubs are in geometrical shape and kept in shape by trimming and training. The flower beds, borders, and shrubbery are arranged in geometrically designed beds.
- Trimmed formal hedges, Cypress, Ashoka trees, and topiary are typical features of a formal garden.
Examples: Mughal, Persian, Moorish garden of Spain, Italian and French styles

Informal Garden:

- In an informal garden, the whole design looks informal, as the plans and the features are arranged in a natural way and represents natural beauty. The idea behind this design is to imitate nature.
- It is contrast to formal style. Plan is asymmetrical according to the land available for making the garden.
- Smooth curvaceous out lines are more appropriate.
- Water bodies are more irregular in shape.
- Hillock are made, water falls provided, lakes and islands, cascades, rocks, and a rustic hutment are provided to create rural effect.
- Appropriately grouped plants provide living quality and they are not trimmed. Ex: English and Japanese gardens

Freestyle garden:

- In this style of garden design, the good points of both formal, informal as well as naturalistic features are aesthetically mixed so as to create a picturesque scene.
- This style can, however, be adopted to suit the needs of almost all situations.

Wild Garden:

- A comparatively recent style of gardening, namely, “Wild Garden” was given by William Robinson in the last decade of the nineteenth century. His main idea was to naturalize plants in shrubberies.
- Grass should remain unmowed, as in nature, and few bulbous plants should be grown scattered in the grass to create a wild scenery.
- The passage to the garden should be opened in the woodland and the trees, shrubs and bulbous plants should be planted among the forest flora.
- The idea also allows the creepers to grow over the trees naturally imitating those of the forests.

PROPAGATION OF ORNAMENTAL PLANTS THROUGH CUTTINGS

Material required: Secateurs, mother plants, knife, rooting hormones, rooting medium, tags, watering can

Procedure:

a) **Herbaceous cuttings:**

- These are made from succulent, non- woody plants.
- Terminal cuttings or nodal cuttings of 7 to 12 cm long with leaves retained at the upper end are taken.
- Coleus, geranium, chrysanthemum, carnation, *Begonia semperflorens*, *Iresine*, *Alternanthera* etc.

b) **Soft-wood cuttings:**

- Cuttings prepared from soft, succulent, new spring growth of deciduous or evergreen species are softwood cuttings.
- The softwood condition for most woody plants ranges from two to eight weeks.
- The cuttings are usually 8 to 12 cm long with leaves retained at the upper end.
- Examples are *Duranta*, *Ficus benjamina*, *Pseuderanthemum* etc.

c) **Semi-hardwood cuttings:**

- Semi-hardwood cuttings are those made from woody or with partially matured wood.
- Cuttings of broad-leaved evergreen species are generally taken during the summer through early fall from the new shoots just after a flush of growth has taken place and the wood is partially matured.
- Examples are *Bougainvillea*, *Clerodendrum*, *Duranta*, *Hibiscus*, *Hydrangea*, rose, evergreen azaleas are commonly propagated by this method.

d) **Hardwood cuttings:**

- Hardwood cuttings of narrow- leaved evergreens are also dormant and in deciduous plants, their foliage is retained when propagated.
- Examples are *Thuja*, *Juniperus*, *Taxus*, firs, pines, spruce are propagated through hardwood cuttings.

e) **Leaf cuttings:**

- In leaf cuttings, the leaf blade, or leaf blade and petiole, is utilized in starting new plants.
- Adventitious buds, shoots, and roots form at the base of the leaf and develop into a new plant; the original leaf does not become a part of the plant. Examples are *Bryophyllum*, *Portulaca argentea*, *Sedum morgianum*, *Senecio rowleyanus*, *Schlumbergera*, *Saintpaulia*, Gloxinia, Begonias, *Sansevieria* and *Peperomia* are routinely propagated through leaf cuttings.

METHODS OF LAWN ESTABLISHMENT

Material required: Spade, Lawn grass seeds or stolons, FYM, cow dung, soil, watering can

Methods of establishment of lawn:

- 1. Seeding:** The best time for sowing of seed is about end of August or it may be done in February- March. Seed rate is 250-300g/100 sq. m area. The seed should be mixed with small amounts of carrier, which may be top soil or sand, to obtain uniform distribution of the seed. After the sowing is complete, a light covering with dry, sieved, garden compost or weed-free straw helps to retain moisture for longer time and prevents washing of seed during watering or rainfall. The surface soil has to be kept moist until the seeds germinate and seedlings establish. Normally, the seeds germinate in 10-12 days.
- 2. Dibbling:** Dibbling is the most commonly used method for developing lawn. In the month of February- March or July-August runners are obtained by tearing apart or shredding pieces of established sod which are dibbled about 4-6 inches apart. Watering should be one immediately afterwards.
- 3. Turfing or Sodding:** It may be done where immediate effect is required or on steep slopes or terraces. This is the fastest method of establishing lawn. The mats about 1 inch in thickness are cut manually or mechanically and laid like bricks and

fitted as tightly as possible. After laying it should be tamped lightly and top dressed with a small amount of top soil. The sod should be kept moist till the lawn is well established.

- 4. Turf Plastering:** A paste is prepared by mixing garden soil and fresh cow dung and water plus chopped pieces of lawn grass having nodal sections. The paste is spread and covered with 2cm dry soil and irrigated. The soil is kept moist until sprouting of grass. This method is not suitable especially in dry and variable climate.

DIFFERENT GARDEN FEATURES

Material required: Secateurs, Pruning shear, spade, *khurpi*, watering can, plants

Garden features

- 1. Hedge:** Shrubs or trees planted at regular intervals to form a continuous screen is called a hedge. Plants suitable for hedges are as following-
Shrubs: *Acalypha wilkesiana*, *Bougainvillea sp.*, *Carissa carandus*, *Duranta repens*, *Hamelia patens*, *Hibiscus rosa-sinensis*, *Justicia gendarussa*, *Malpighia coccigera*, *Murraya exotica*, *Plumbago capensis*, *Rosa sp.*, *Thuja orientalis*, *Volkemeria inermis*.
Trees: *Pithecellobium dulce*, *Polyalthia longifolia*, *Casuarina equisetifolia*, *Putranjiva roxburghii*
Succulents: *Agave americana*, *Furcraea selloa*, *Euphorbia tithymaloides*
- 2. Edges:** Lining of borders of flower beds, paths, lawn and shrubbery with brick, concrete, living plants is known as edging. Plants suitable for making the purpose of edging are called edge plants, and these should grow very low as the purpose is not for screening but to provide lining only, for the purpose of decoration or demarcation. Plants suitable for edging are *Alternanthera amabilis*, *A. versicolor*, *Cinereria maritima*, *Cuphea hyssopifolia*, *Echeveria*, *Iresine lindenii*, *Ophiopogon japonicus*, *Tradescantia spathecea* etc.
- 3. Arches:** Arches are the structures on which climbers or ramblers are trained in a garden. Arches are generally constructed near the gate or over the paths in the garden. The arch should be 2-2.5 m in height and breadth depends upon the path over which it is constructed but should not be less than 1 m. arches can be made with wooden poles, iron angles or galvanized pipes. Plants suitable for training over arches are *Bougainvillea spp.*, *Passiflora cearulea*, *Rosa banksiana*, climbing rose, *Thunbergia grandiflora*, *Trachelospermum jasminoides*,
- 4. Pergolas:** a pergola may be defined as series of arches joined together. Pergolas are generally constructed over pathways, and climbers are trained over it. Like arches support can be made up of wooden, angle iron, galvanized pipes etc. the width of pergola is generally kept 2-2.5 m and the height is also same or higher than this. Plants suitable for training over pergolas are *Bougainvillea spp.*, *Pyrostegia venusta*, *Thunbergia grandiflora*, *T. mysorensis*, *Trachelospermum jasminoides*, *Wisteria sinensis*,
- 5. Topiary:** It is an art of training trees or shrubs by clipping or trimming the foliage into different shapes like birds, animals etc. the plants used in topiary are evergreen, having small leaves with dense growth habit. Shaped wire cages are sometimes used to make topiary. Examples of plants for making topiary are *Bougainvillea sp.*, *Buxus sempervirens*, *Duranta repens*, *Malpighia coccigera*, *Melaleuca bracteata*, *Murraya exotica*, *Thuja, orientalis*, *Volkemeria inermis*.

LANDSCAPE PLAN FOR FACTORIES

Factory landscaping is not only needed from the point of beautification, but also to fight pollution and dust.

Objectives of factory landscaping:

- To arrest the drifting dust and smoke.
- To minimize the pollution.
- Beautification of factory area.
- To provide ample shade and coolness
- To enhance the productivity of employees

Points to consider:

- In factories such as cement, steel, fertilizers etc., which emit a lot of dust, smoke and harmful chemicals comparatively hardy plants should be selected for plantation. For neat factories such as a plywood factory and a fruit-processing plant, which emit less dust and other polluting materials, a wider range of flowering plants can be used.
- Tall and hardy trees should be planted all around or in the direction of the winds to stop the spread of dust and smoke.
- In a large factory a buffer zone may be created by forestation between the factory and its residential colony.
- A factory can also be beautified with rockeries, statues, water pools or lakes, fountains etc. *Bougainvillea* should be used freely to beautify a factory area. This may be planted in rows along all the roads of the factory spaced at 3-5m and trained as half standards.

- *Canna indica* a hardy plant is also suitable for planting in beds or groups in a factory area for remediation of water pollution.
- Shrubberies consisting of hardy shrubs also beautify factories.
- Lawns add beauty and cut down dust.

Sulphur dioxide tolerant trees

Albizia lebbbeck, *Ailanthus excelsa*, *Alstonia macrophylla*, *A. scholaris*, *Azadirachta indica*, *Lagerstroemia flos-reginae*, *L. thorelii*, *Mimusops elengi*, *Parkinsonia aculeata*, *Polyalthia longifolia*, *Terminalia arjuna*, *T. muelleri*.

Trees for Automobile pollution

Acacia auriculiformis, *Butea frondosa*, *Cassia fistula*, *C. marginata*, *Madhuca latifolia*, *Polyalthia longifolia*, *Putranjiva roxburghii*, *Thespesia populnea*.

Trees for noise pollution

Alstonia scholaris, *Lagerstroemia speciosa*, *Azadirachta indica*, *Madhuca indica*, *Butea monosperma*, *Mangifera indica*, *Erythrina variegata*, *Morus alba*, *Eucalyptus citriodora*, *Pterosprium acerifolium*, *Grevillea robusta*, *Syzygium cumini*, *Kigelia pinnata*, *Terminalia arjuna*

Trees for dust control

Acacia auriculiformis, *Eucalyptus citriodora*, *Melia azedarach*, *Albizia lebbbeck*, *Eugenia cuspidate*, *Millettia ovalifolia*, *Alstonia scholaris*, *Ficus benjamina*, *Millingtonia hortensis*, *Bombax ceiba*, *F. religiosa*, *Pongamia pinnata*, *Cassia fistula*, *Grevillea robusta*, *Syzygium cumini*, *C. javanica*, *Jacaranda mimosifolia*, *Tamarindus indica*, *Cordia dichotoma*, *Kigelia pinnata*, *Terminalia arjuna*, *Dalbergia sissoo*, *Lagerstroemia speciosa*, *Toona ciliata*, *Erythrina variegata*, *Madhuca indica*

WATER GARDENS

Materials required: Spade, tank for formal pool, sticky clay soil, FYM, plants.

Procedure:

- For planting fill the tank to a depth of 30-40 cm with heavy loam or clay mixed with sufficient FYM.
- The lilies and lotus are planted directly in the soil and then water is filled in just to cover the crown of the plants.
- More water is filled in stages as the plant makes new growth.
- In an already filled up pool, the planting procedure is first to plant the water plant in a pot filled with compost and then lowering it in water, keeping in the view that crown remains above the water.

Plants suitable for water garden

1. **Surface flowering plants:** *Euryale ferox*, *Nelumbo lutea*, *Nelumbo nucifera*, *Nymphaea alba*.
2. **Oxygenators/ submerged plants:** *Callitriche autumnalis*, *Elodea canadensis*, *Ranunculus aquatili*, *Vallisneria spiralis*.
3. **Floating plants:** *Azolla Carolina*, *Eichhornia speciosa*, *Lemna gibba*, *Trapa nutans*, *Pistia stratiote*, *Salvinia minima*.
4. **Marginal plants/ Bog plants:** *Acorus calamus*, *Calla palustris*, *Cyperus alternifolius*, *Iris laevigata*, *I. kaempferi*, *Typha angustifolia*/ *T. latifolia*, *Caltha palustris*.

ROCK GARDEN OR ROCKERY

Material required: Natural looking rocks of different sizes, compost, sand, soil, plants, spade, watering can.

Procedure of making rock garden or rockery:

- Rocks should be of local origin, porous, and have a weathered look.
- Stones of uniform size having diameter around 60 cm should be selected or even larger which can be handled without much difficulty.
- A mound is created by putting a good garden loam or a mixture of soil, sand, FYM and leaf mould in equal proportion.
- This compost is spread only on top 15-45 cm of the top layers of rockery, the sub-soil should be well drained and have the property to absorb sufficient water.
- Before placing and setting the rocks, the mound should be allowed to settle for some time or firmed by beating, if needed.
- The stones are placed in slightly slanting position gently leaning backwards, not forwards, so that rain water flows towards plant roots.

- Pockets are created in between stones varying in size from 15-60 cm across. These pockets are created in such a manner that it looks natural and compost inside is not washed away with rain water.
- The rockery is planted with grown up and well-established plants. Dense planting should be avoided rather planting is done at wide distance as with time plants will fill up the space as they grow.

Examples of plants for rock garden:

Cacti and succulents: Cacti like *Opuntia*, *Cereus*, *Mammillaria*, *Hylocereus* and succulents like *Agave*, *Aloe*, *Euphorbia splendens*, *Furcraea*, *Gasteria*, *Howarthia*, *Kalanchoe*, *Euphorbia tithymaloides*, *Portulaca oleracea*, *Sansevieria trifasciata*, *S. cylindrica*, *Sedum*, *Tradescantia pallida*, *T. spathecea*, *T. zebrina*, *Yucca* etc.

Ferns: *Nephrolepis*, *Pteris*, *Polypodium* etc.

Shrubs: *Azalea* sp., *Bougainvillea* sp., *Calliandra brevips*, *Callistemon lanceolatus*, *Cassia biflora*, *Crossandra infundibuliformis*, *Duranta repens*, *Juniperus horizontalis*, *Lantana sellowiana*, *Ruellia simplex*, *Russelia juncea*, *Sanchezia nobilis*, *Thuja occidentalis* etc.

Herbaceous plants: *Catharanthus roseus*, *Dracaena* sp., *Hymenocallis*, *Verbena erinoides*, *Wedelia trilobata*, *Zephyranthes*, etc.

Annuals: *Brachyscome*, *Candytuft*, *Dianthus chinensis*, *Gaillardia*, *Ice plant*, *Sweet Alyssum*, *Phlox*, *Pansy*, *Portulaca grandiflora*, *Verbena*, *Zinnia* etc.