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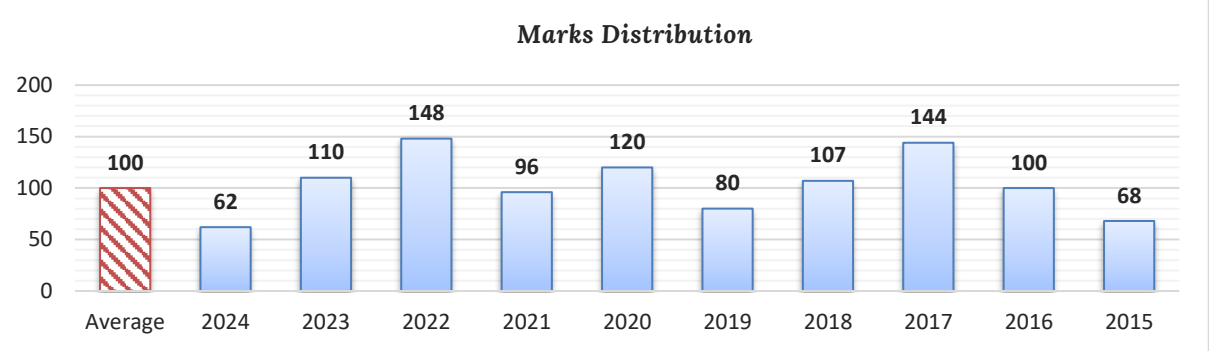
Paper - 1

CONTENTS

CHAPTER 1

SILVICULTURE

General Silvicultural Principles : Ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests; methods of propagation, grafting techniques; site factors; nursery and planting techniques. Nursery beds, polybags, and maintenance, water budgeting, grading and hardening of seedlings; special approaches; establishment and tending.



2024	• What is ***Silvics***? Explain its practical application. Discuss in brief the objects of study of silviculture [P1/4 (b) | 15 M]. • What are ***Ecosystem Services***? Differentiate between use values and non-use values. Explain different methods of valuation of ecosystem services [*Linked Q* | **P2**/Q7 (b) | 15 M]. • Differentiate amongst ***Radiation Frost***, ***Pool Frost*** and ***Advective Frost***. Give at least two examples each for frost hardy, moderately hardy and frost tender tree species [**P2**/6(c) | 10 M]. • Briefly summarize the characteristic features of cold arid forest vegetation. Discuss their mechanism of ***Survival Under Extreme Cold*** temperatures [*Linked* Q : P1/1 (b) | 8 M]. • Give four examples of tree species for each of the following methods by which their flowers are pollinated [P1/1 (c) | 8 M]. (i) Anemophily (ii) Zoophily (iii) Entomophily (iv) Hydrophily • Enumerate the ***Standard Tree Classification*** adopted in Indian Forestry [P1/3 (c) | 10 M]. • "Pruning is an important ***Tending Operation*** in plantation forestry for the improvement of the tree or its timber." Justify [P1/2 (c) | 10 M].
2023	• What is ***Frost Hole***? How does frost affect regeneration? [P1/1 (d) | 8 M]. • What are ***Biofertilizers***? Enlist the factors associated with the ***Mycorrhizal Development*** in trees. Discuss the types of mycorrhizae [15 M] [*Linked Q* | P1/8 (a) | 15 M]. • Explain the following [P1/4 (c) | 15 M].

	(*i*) Lignotuber (*ii*) Root sucker (*iii*) Vermiculite (*iv*) Buttresses (*v*) Ortet and Ramet • The shoot portion of seedlings of some tree species like ***Sal*** and ***Sandal***, under ***Natural Regeneration***, keeps on drying year after year but the roots remain alive. Discuss [P1/1(a) | 8M]. • Write the factors which affect the ***Natural Regeneration*** of Sal (*Shorea robusta*). Discuss the procedure to obtain natural regeneration of *Moist Sal Forests* [P1/2 (b) | 15 M]. • Discuss the significance of ***Exotics*** in tree improvement. Name four exotic tree species [*Linked Q* | P1/5 (b) | 8 M]. • Write the botanical names of three tree species each of [P1/1 (e) | 8 M]. (*i*) Non-coppicers, (*ii*) Poor coppicers, (*iii*) Good (fair) coppicers and (*iv*) Strong coppicers. • Describe the ***Seed Collection*** and ***Storage Methods*** of the following tree species [P1/2(a) | 15 M]. (*i*) *Santalum album* (*ii*) *Chukrasia tabularis* (*iii*) *Cedrus deodara* (*iv*) *Azadirachta indica* (*v*) *Dalbergia latifolia* • Calculate the ***Quantity of Seeds*** (kg) required to establish a teak plantation over an area of 10 ha. [P1/1 (b) | 8 M]. • What is ***Deforestation***? Discuss the impact of deforestation on the environment [*Linked Q* | P1/6 (c) | 15 M]. • Explain the present status, scope and constraints of ***Biofuel Production*** in India. Write the botanical names of five tree-borne oilseeds [*Linked Q* | **P2**/8 (b) | 15 M].
2022	• What is the ***Purpose of Classifying Forests***? How are the forests classified for silvicultural management? [*Linked Q* | **P2**/1 (a) | 8 M]. • How do ***Sacred Groves*** help in conservation of biodiversity? [P 1/5 (b) | 8 M]. • What is ***Precision Silviculture***? Explain the silvicultural techniques for the following [P1/3 (b) | 15 M]. (a) *Dalbergia Sissoo*, (b) *Eucalyptus tereticornis* • "Success of commercial forest plantations depends on ***Site-Specific*** and ***Strategic Planning***" Justify the statement [**P2**/1 (d) | 8 M]. • Describe the ***Adverse Climatic Factors*** causing damage to forests [**P2**/8 (b) | 15 M]. • Explain the ***Role of Mycorrhizae*** in plant growth and development of forest trees [P1/7 (b) | 10 M]. • What are ***Commensalism***, ***Amensalism***, ***Mutualism*** and ***Symbiosis***? Write the function of an ecosystem [*Linked Q* | **P2**/8 (c) | 10 M]. • What are the ***Biotic and Abiotic Stresses*** on trees? Explain the responses of trees to these

	stresses [*Linked Q* | **P2**/5 (a) | 8 M]. • Discuss the significance of ***Bamboo Flowering*** [P1/1 (e) | 8 M]. • How are ***Nurseries Classified*** in India? What is a clonal nursery? Explain the nursery technique for *Casuarina equisetifolia* [P1/3 (a) | 15 M]. • Explain the techniques for upgradation and ***Hardening of Nursery Seedlings*** of *Lagerstroemia lanceolata* [*Linked Q* | P1/1 (d) | 8 M]. • What is ***Root : Shoot Cutting***? Write the names of five tree species which are propagated by this method [P1/4 (c) | 10 M]. • Explain the following – (iv) ***Enrichment Planting*** [P1/2 (c) *iv* | 2.5 M]. • Is coastal rehabilitation using mangrove species a success? Explain the ***Plantation Technique*** for degraded mangrove forest [*Linked Q* | P1/3 (c) | 10 M]. • Differentiate between ***Thinning Cycle*** and ***Thinning Intensity***. Why is thinning essential for the management of ***Forest Stand***? Describe the merits and demerits of French thinning [P1/4 (b) | 15 M]. • Explain the ***Salvage Operations*** for plantation trees after natural disasters [*Linked Q* | **P2**/6(c) | 10 M]. • Explain the silvicultural practices that help in the ***Modification of Site Factors*** in forestry [P1/4(a) | 15 M].
2021 2021	• How are ***Forest Sites Classified*** on the basis of vegetation? [P1/4(c) | 10 M]. • What is ***Site Quality Index***? How does it differ from fractional site quality? Explain any one method used for developing site quality classes with the help of neat diagram [P**2**/3(b) | 15 M]. • Do the trees of same species have different response to ***Light Conditions*** at different ages? [P1/1(e) | 8 M]. • What is the ***Role of Forest*** plantations in carbon sequestration? [P**2**/7(c) | 10 M]. • Differentiate ***Stand Density*** and ***Canopy Density***. Mention Canopy density classification as per Forest Survey of India [*Linked Q* | P**2**/1(d) | 8 M]. • What is meant by ***Climax*** in ecological succession? Give an example and describe types of ecological succession [P**2**/5(b) | 8 M]. • What factors are considered important while ***Choosing a Species*** under ***Avenue Plantation***? [8 M] [*Linked Q* | P1/1(b) | 8 M]. • Are ***Non-Native Tree*** species an option or a threat in forest ecosystem / Plantation under climate change? [P1/1 (d) | 8 M]. • Why is ***Grading*** operation of nursery seedlings essential for successful forest plantations? [P1/3(c) | 10 M]. • What do you mean by ***Tending Operations***? Enumerate various tending operations carried out in forest crops. Discuss improvement felling [P1/3 (a) | 15 M]. • How does soil organic matter decomposition influence ***Forest Productivity***? [*Linked Q* | P1 / 5(d) | 8 M].
2020	• Define ***Silviculture***. Relate the applications of silvicultural to different branches of forestry [P1/1(a) | 8 M]. • ***Frost Resistance*** in trees depends on the internal and external factors. Explain [P1/1(b) | 8 M]. • Write the adaptive characteristics of plant species of ***Cold Desert*** [P 1/1 (d) | 8 M].

	• How does ***Slope Aspect*** impact forest stand characteristics and soil properties? [P**2**/4 (c) | 10 M]. • Describe the following terms [P1/2 (a) | 10 M]. (a) ***Dominant***, (b) ***Dominated***, (c) Crop height, (d) Top height, (e) ***Hardening*** • What are the factors that affect a ***Stand Structure***? Describe in brief the DBH distribution in even, uneven and multi-aged normal forest stands [*Linked Q* | P**2**/2 (a) | 15 M]. • What are the structural and functional changes that occur in a forest ecosystem during ***Succession***? [P**2**/7 (b) | 15 M]. • Describe the methods of ***Artificial Regeneration*** of *Tamarindus indica* [P1/1 (e) | 8 M]. • What are the different factors governing the successful ***introduction of an exotic*** tree species? [P1/6 (c) | 10 M]. • What are ***Orthodox and Recalcitrant seeds***? Give five examples for each of these categories of seeds [P1/8 (a) | 10 M]. • Write down the ***pre-sowing seed treatments*** for the following tree species [P1/3(c) | 15 M]. (a) *Tectona grandis,* (b) *Santalum album,* (c) *Dalbergia sissoo,* (d) *Albizia lebbeck,* (e) *Acacia nilotica.* • Define ***Afforestation***. Discuss in brief the afforestation techniques, including the choice of species, for ravine lands. [*Linked Q* | P1/3 (a) | 10 M]. • In India, large tracts of mixed even or uneven aged forests have been degraded due to biotic interference. Suggest the method and measures to improve their condition and composition. [*Linked Q* | P1/4 (a) | 10 M]. • What is the significance of Afforestation and Reforestration to the ecosystem? How are the National Afforestation Programmme, Green India Mission and Forest Fire Prevention and Management Scheme helping in restoration of forests? [*Linked Q* | P**1**/7 (a) | 15 M].
2019	• Describe various physiological mechanisms underlying drought resistance, drought tolerance and drought avoidance in forest species. [P**2**/Q6 (b) | 15 M]. • Draw a schematic diagram showing ***Altitudinal Zonation*** of forest vegetation [P1/4(a) | 10 M]. • Write scientific names of four major tree species in each of ***southern Tropical Semi-evergreen*** Forest and ***Northern Tropical Wet-Evergreen*** Forest [P1/1 (a) | 8 M]. • Discuss the factors which influence the ***choice between natural and artificial regeneration*** [P1/1(d) | 8 M]. • Describe how controlled ***fire*** can be used as a ***tool in forest*** management [*Linked Q* | P**2**/5(d) | 8 M]. • Explain the ***Modern Nursery Techniques*** for the production of quality planting stock [P1/1 (c) | 8 M]. • What are the different types of ***Grafting***? Explain 'Cleft Grafting' with neat sketches [P1/Q1 (e) | 8 M]. • Explain different ***Grades of Thinning***. Discuss in brief the thinning practices adopted for teak plantations [P1/4 (b) | 15 M].
2018	• Justify that the study of ***Silvics*** is essential for the successful afforestation program in India

	[P1/1 (a) | 8 M]. • Discuss the physiology of **Root Parasitism** in Sandal tree [*Linked Q* | P1/1 (e) | 8 M]. • Explain the **Eco-Physiological Factors** that are more concerned to the silviculturist [P1/Q2 (a) | 15 M]. • Write in detail about the **Influence of Parent Rock** in the distribution of tree species [8 M]. [*Linked Q* | P1/5(c) | 8 M]. • What is **Hydrology**? Describe the role of hydrology in the planning and management of watershed development. Do tree species improve the infiltration rate, soil temperature, water level, and hydrological cycle? Justify with few examples [*Linked Q* | P1/8 (a) | 10 M]. • What is **Succession** and *climax*? Give the causes of forest succession [P2/6 (c) | 10 M]. • Write in brief on the **criteria of selection** of tree for resistance to adverse environments for high-quality timber production [*Linked Q* | P1/5 (a) | 8 M]. • Write the problem and prospects of **Exotic** tree species in India with suitable examples [P1/3 (c) | 15 M]. • Explain **Seed** production and certification system in Indian forestry [*Linked Q* | P1/Q6 (c) | 10 M]. • Enlist different types of **Nurseries** and write different types of nursery beds used in a nursery [P1/4 (c) (i) | 7.5 M]. • Enlist different **types of containers** used in a forest nursery and explain different methods of seed sowing followed in a nursery [P1/4 (c) (ii) | 7.5 M]. • What is a mother tree? How is a plant prepared through **Vegetative Propagation** different from a plant raised through seed? [P1/3 (a) | 15 M]. • Explain different **Kinds of Thinning** and its application in the forest [P1/1 (b) | 8 M].
2017	• Why **Site-Specific Planning** is essential for forest management? Explain different Components of site-specific management. [*Linked Q* | P2/Q1 (a) | 8 M]. • Regulation of **Solar Radiation** given a powerful tool to the forester justify [P1/2 (d) | 10 M]. • Discuss in detail the kind of Soil **Mycorrhizae** and the benefits derived by plant from them [P1/5 (b) | 8 M]. • What is **Sub-Climax**? Explain its importance in the context of Indian forestry. [P1/4(c) | 10 M]. • Explain various types of **Succession**. Describe the major theories explaining succession [P1/8 (b) | 10 M]. • Define **Succession**. Explain different types of succession in details, citing suitable examples. Discuss various theories of succession [P2/6 (a) | 15 M]. • Enlist four groups of **Forest Types** under the moist tropical forest as per the Champion and Seth classification of forest types. [P1/1 (b) | 8 M]. • Explain the classification of *forest types* in India by Champion and Seth. Enlist major forest types and their group [P2/Q7 (c) | 10 M]. • Enlist the general rules governing the felling of bamboo in forests. What are the consequences of **Gregarious Flowering** of bamboo? What special measures would you take in the event of gregarious flowering? [*Linked Q* | P1/3 (c) | 15 M]. • Give four examples of uses of **Pollarding** in Indian forestry [P1/1 (a) | 8 M]. • Enlist the advantages and disadvantages of **Vegetative Propagation**. What future do you foresee for it in forestry? [P1/4 (d) | 10 M]. • Calculate the number of **Seeds Required** to raise a 20-hectare plantation with 4 m x 4 m spacing

	and an extra plant in the centre of each square. Plant percent of the species is 75% [P1/Q1 (e) | 8 M]. • Name the method of ***Thinning*** that best promotes genetic improvement of the regular stand besides controlling density. Give reasons in support of your answer [P1/1 (c) | 8 M]. • Describe the ***Effect of Thinning*** on volume increment [P2/2 (c) | 10 M]. • Some rural communities are opposed to ***Chir-pine*** and advocate removal of ***Chir-pine*** and its replacement with broadleaved multipurpose trees. What is your reaction to this matter? [P1/2 (c) | 10 M].
2016	• How are the forests classified in India? Discuss its significance in forest management [*Linked Q* | P2/1 (a) | 10 M]. • Comment on 'Forest has moderating influences on soil and air temperature' [P1/1 (b) | 8 M]. • Explain the role of forests in environmental conservation. [P1/7 (a) | 10 M]. • Justify the statement "Forest substantially check soil erosion and control run-off" [P1/Q1 (a) | 8 M]. • Enumerate the classification of tropical dry deciduous forests given by Champion and Seth (1964). Mention two species for each forest type [P2/6 (d) | 10 M]. • Discuss the reasons for widespread use of ***Exotics*** for plantations and specific advantages of exotics over native species [*Linked Q* | P1/Q5 (e) | 8 M]. • Provide scientific names of four potential NFTs each suitable for Tropical and Temperate conditions [*Linked Q* | P1/5 (c) | 8 M]. • Write the importance of soil organic matter in the forest. How is ***calculation of number of seedlings*** carried under Line, square, Triangular, and Quincunx methods of planting? [P1/3 (a) | 20 M]. • Write in detail the term ***Girdling*** and ***Pruning***. Write scientific names of five trees/Shrubs each for the cold desert and mangrove forest. [*Linked Q* | P1/4 (a) | 20 M]. • Describe the important ***objectives of thinning***. Differentiating crown thinning from ordinary thinning. Write grades of ordinary thinning. [P1/1 (c) | 8 M]. • Clonal forestry approach proved successful in meeting the industrial wood demand particularly pulpwood. Substantiate your view and perception in this regard [P2/4 (a) | 10 M].
2015	• How can a forest with ***Shade Bearer*** and ***Light Demander*** tree species be managed under *uniform shelterwood system*? [*Linked Q* | P1/2 (c) | 10 M]. • Comment upon the adaptive and ***Survival Strategies*** of the plant species endemic to the cold desert area of the Western Himalaya [*Linked Q* | P1/4 (c) | 10 M]. • Explain How the ***Latitude influences the forest types*** of the earth [P1/4 (a) | 10 M]. • Can you differentiate between the terms mixed plantations in forestry and mixed cropping in agriculture? Justify the differences between them. [*Linked Q* | P2/1 (a) | 8 M]. • Comment upon the ***Dieback*** (dying back) phenomenon in *Shorea robusta*. Is it a problem or an adaptation? [P1/1 (a) | 8 M]. • Describe the methods of ***Pre-sowing treatment of seeds*** for raising Nursery [P1/2 (b) | 10 M]. • Explain the term ***Hardening off***. What are the internal factors affecting forest resistance? [P1/3 (a) | 10 M].

	• Explain the necessity of ***Grading of seedlings*** before plantation [P1/4 (d) | 10 M].
2014	• Why does height of a tree consider a better criterion for a ***Site Selection*** than its diameter? Discuss [5 M]. • How is ***Site Quality*** important in timber production? Discuss the methods used to measure the site quality [Paper – **2** | 15 M]. • Explain the importance of soil and air ***Temperature*** on the growth of forest trees [10 M]. • Explain the importance of ***Snow*** in regeneration of *Cedrus deodara* [5 M]. • Explain the survival strategies of the following group of plants [20 M] - (a) ***Halophytes***, (b) ***Phraetophytes***, (c) ***Xerophytes***, (d) ***Succulent***. • Difference b/w - (1) ***Ectomycorrhizae*** and ***Endomycorrhizae*** [4 M]. (2) Exogenous ***dormancy***, and endogenous dormancy [4 M]. • Describe the characteristics and structure of an ***even-aged stand*** [Paper – **2** | 10 M]. • ***Mixed forest stand*** offers complete utilization of land, Comment [8 M]. • Give a short account on the management of ***uneven-aged forests*** [*Linked Q* | 8 M]. • What is ***Stand Density***? How spacing is used to control stand density? Discuss [Paper – **2** | 15 M]. • Discuss in detail the evolution of the *concept of* ***Plant Succession*** [20 m]. • Discuss the ***Natural Regeneration*** in Sal, give steps recommended for ensuring its successful regeneration [8 M] (A typo : in the actual paper, it is written as "Soil" instead of "Sal" as required) • Do you think that the ***Controlled Fire*** is beneficial to forest vegetation? Discuss [*Linked Q* | 10 M]. • Explain why after ***Gregarious Flowering*** bamboo always die [8 M] • Discuss in detail the objective of ***Artificial Regeneration*** [10 M]. • Explain the following – (a) ***Orthodox*** and ***Recalcitrant*** seeds [5 M]. (b) ***Elite thinning*** are often difficult to execute [5 M]. • ***Exotics*** have potential, do you agree or disagree. Justify your response [5 M]. • Comments on the statement that "***Vegetative Propagation*** is a dead end of breeding" [10 M] • What do you mean by ***Plantation Schedule***? give in detail the factors which decide the success of plantation program [10 M]
2013	• Based on objectives, what are the different ***Classifications*** of the ***Forestry***? [10 M]. • What are the main contributions of ***Dr. D. Brandis*** in Indian forestry? Enumerate the various stages of working plan. What is the role of silvicultural system in the working plans? [*Linked Q* | Paper – **2** | 8 M]. • Write critical notes on any four of the following – (i) Plants of ***Sacred Groves*** with two Examples well-known in the country [Paper – **2** | 2.5 M]. • What are the sources and nature of elements considered as ***Essential Plant Nutrients***? [10 M]. • Discuss the mechanism of ***Drought Resistance***, ***Drought Tolerance***, and ***Drought Avoidance*** in plants [Paper – **2** | 10 M]. • Write a note on 'role of ***Micro-Organism*** and ***Rhizobium*** in amelioration of forest soils [10 M]. • Configuration of the ***Land Surface*** has an impact on local climatic conditions and wind movement, which in turn have a bearing on forest." Comment [8 M]. • Willow is the life line in dry temperate region (Lahaul-Spiti) but its ***large-scale drying*** is

	causing great concern. Give your viewpoints [Paper – **2** | 8 M]. • Explain the evolution of the concept of ***Plant Succession*** [8 M]. • Describe the different theories of ***Climax***. Name different types of climax (plant community) that are observed [Paper – **2** | 8 M]. • Describe flora and distribution of group: ***Type 14/C₂*** East Himalayan sub-alpine birch fir forests [Paper – **2** | 10 M]. • Large-scale ***Mortality*** has been noticed in *Dalbergia sissoo* and *Acacia nilotica.* What could be the possible reasons for this mortality? [10 M]. • Explain various factors affecting the choice between ***Artificial*** and ***Natural*** regeneration with reasoning [10 M]. • Enumerate the factors which decide the ***Choice of Species*** for plantation [8 M]. • Write about species diversity and ***Centre of Origin*** of Willows (Salix species). Describe its various uses under short rotation forestry [Paper – **2** | 8 M]. • Elaborate upon the multipurpose tree species ideotype selection criteria [*Linked Q* | P**1** | 8 M]. • Describe the operational use of ***Vegetative Propagation*** in tree improvement [10 M]. • Explain the role of ***Thinning*** in forestry. What are the different methods of thinning followed in regular crops? Discuss in detail crown thinning [20 M]. • What are the traditional practices and recent advances in tropical silvicultural research? [10 M].
2012	• Comment critically on the following (Each in about 75 Words) :– (a) Failure of forest plantations [5 M]. (b) Recycling of nutrients in Natural Forest [5 M]. (c) Successful regeneration in a forest depends upon silvicultural system [*Linked Q* | 5 M]. (d) Basis of *forest classification* and why there is a need for such classification [5 M]. (e) How *snow* affects the forest vegetation? [5 M] (f) Importance of ***Plant Succession*** in Forestry practices [5 M]. (g) Reasons of *dying Dalbergia sissoo* [5 M]. • Discuss in detail the ***Protective Role*** of national forests in India [10 M]. • Describe the altitudinal variations in flora of ***Eastern*** and ***Western Himalayas*** through a schematic diagram [Paper – **2** | 10 M]. • Differentiate between – (1) Growth and development of trees, (2) ***Ectomycorhizae*** and ***Endomycorrizae*** [5 × 2 = 10 M]. • Explain with the help of suitable examples the various kinds of Population Interactions during their growth period and give difference between ***Commensalism*** and ***Amensalism*** of plant relationship [*Linked Q : Forest Ecology* | Paper – **2** | 10 M]. • Discuss the ***Role of Forest*** in interception, surface runoff, Infiltration of rainfall, regulation of stem flow, and maintaining Soil fertility [5 M]. • Do forests influence the rainfall? If so, how? [75 Words | 5 M]. • Briefly discuss the - ***Canopy Architecture*** in forestry [5 M]. • List the ***pioneer's flora*** of sand dunes under – (i) on dunes, (ii) Spread out sand, and (iii) Stabilized dunes [*Linked Q* | Paper – **2** | 8 M]. • Describe flora and distribution of Group : **16 C₁** of Champion & Seth's Forest Type [Paper – **2** | 8M] • ***Gregarious Flowering*** is an indicator of drought in the area.' Do you agree with this statement? [4 M].

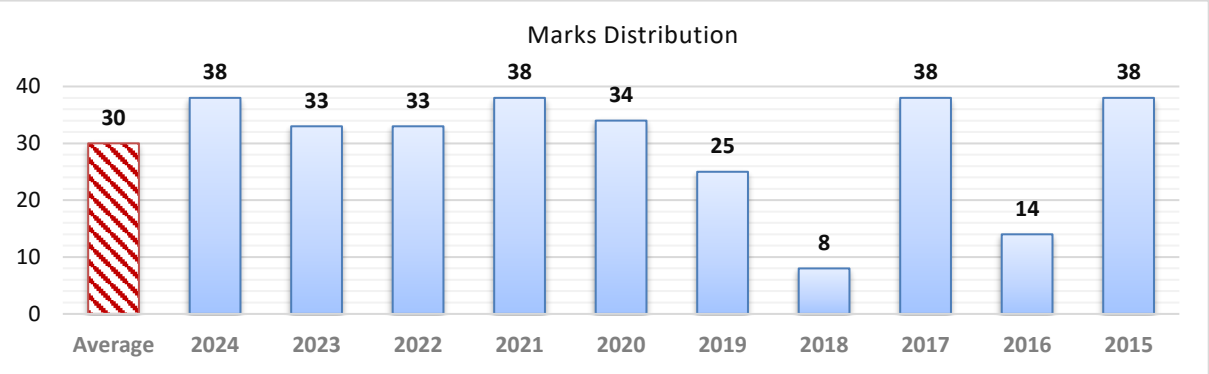
	• Differentiate clearly between ***Natural*** and ***Artificial Regeneration*** of forest. Describe the manner in which natural regeneration of Teak, Sal and Deodars takes places [4+4+4+4 = 16 M]. • What are the ecological aspects for Selecting the tree species? Discuss [8 M]. • Write Short notes on – ***Exotics*** in Indian Forestry [5 M]. • Highlight the salient features of – (1) ***Aerial Seeding*** (2) ***Stump Planting*** [2 × 3 = 6 M]. • What are the major ecological consideration in ***Afforestation*** [75 Words | 5 M].
2011	• Give ***Legal Definition of Forests*** in India. Write about the major groups of forest types of India. [Paper – **2** | 10 M]. • Describe the tangible and intangible ***Benefits of Forests*** [Paper – **2** | 10 M]. • Write Short Notes on – (ii) ***Sacred Groves*** [2 ¼ M] • Why are ***Locality Factors*** considered important for any silvicultural operation? [10 M]. • Explain "***Adiabatic Lapse Rate***" [Paper – **2** | 10 M]. • Define ***Micro-Climate*** giving suitable examples [Paper – **2** | 10 M]. • Differentiate between ***Ectomycorrhizae*** and ***Endomycorrhizae*** with respect to structure and function [Paper – **2** | 10 M]. • Compare ***Nutrient Cycling*** in a natural forest, an agroforestry system and an agricultural field. Discuss how it helps to sustain soil fertility. [*Linked Q* | 10 M]. • Describe the initial causes of ***Secondary Succession***. Write various seral stages of succession leading to the development of *Shorea robusta* forests [Paper – **2** | 10 M]. • Define a ***Forest Type***. Discuss the different forest types found along with tidal swamp forests with their species composition. Give a note on how *Rhizophora racemosa* is managed in the mangrove forest of Sundarbans. [*Linked Q* | 3 + 12 + 5 = 20 M]. • Explain the ***Role of Fire*** in the silviculture of *Shorea robusta* [10 M]. • Differentiate between [5 × 2 = 10 M]. (a) Exogenous ***Dormancy*** and endogenous dormancy (b) Artificial regeneration and Natural ***Regeneration*** • Explain the following points in relation to ***Nursery Management*** – (1) Site selection and layout, (2) Soil working, (3) Methods of raising nursery stock, (4) Plant protection measures, (5) ***Nursery Register***. [4 × 5 = 20 M]. • How do we calculate the ***Seed Requirement*** *of a species* while raising nursery? Also explain the method of calculating the number of plants required per hectare for plantation [10 M]. • Write Short notes on – (i) _____, (ii) ***Cultural Operations*** [P1/3 (b)*ii* | 5 M].
2010	• Why do forest ***Plantations Fail***? cite relevant examples. [P1/1(a) | 5 M]. • What are the different ***Types of Containers*** used in raising forest nurseries? List their advantages and disadvantages [P1/1(c) | 5 M]. • Explain the role of ***Growth Regulators*** in rooting of cuttings [P1/1(e) | 5 M]. • Briefly discuss ***Low-Temperature Injuries*** in forest trees [P1/1 (g) | 5 M]. • Briefly describe the merits and demerits of '***High Density Short Rotation***' forestry. Enlist suitable species in this regard along with their productivity potential [P1/2 (a) | 10 M]. • What do you understand by the term ***Locality Factors***? How these affect the decision of plantations undertaken by the silviculturist? [P1/2 (b) | 10 M]. • Why is ***LAI*** important in deciding the productivity of forest trees? Explain the concept of

	optimum LAI and how it varies with the type of forest and climate [P1/Q2 (c) | 10 M]. • Differentiate between the – (ii) Photosynthetic efficiency and Nutrient use efficiency (iii) ***Site Quality*** and ***Site Index***, (v) ***Gregarious Flowering*** and sporadic flowering in bamboo. [P1/3 (a) | 4× 3 = 12 M]. • Comment on following – (a) ***Pure stand*** of forest result incomplete utilization of the site, (b) Plantation forestry has high production potential but low conservation value [5 × 2 = 10 M]. • Distinguish between "***Tending operations***" and "***Cultural operations***" in forestry [10 M] • Write short notes on – (a) ***Canopy architecture***, (b) Radiation absorption and energy balance in forest, (c) ***Seed coating*** and pelleting, (d) ***Nutrient cycling*** in natural forest [5 × 4 = 20 M]. • Write on tree species for smoke and dust pollution control. [*Linked Q* | P1/7 (c) (i) | 5 M]. • Mention 10 species (Scientific name) of trees tolerant to salinity [*Linked Q* | 10 M]. • What morphological, Anatomical, and physiological features are suited in ***Xerophytic Plants***. [P**2**/Q6 (a) | 10 M]. • What are ***Live Fences***? Name five plant species most commonly used as live fences. How do these differ from other types of fences? [P**2**/Q6 (c) | 10 M]. • How are ***Ectomycorrhizal*** fungi beneficial in managing soil borne diseases of forest nurseries? Give examples. [P**2**/Q7 (a) | 10 M]. • How do variation in density and quality of a forest influence annual yield estimation? [*Linked Q* | P**2**/1 (d) | 8 M]. • Illustrate the succession of mangrove vegetation in sea coast [P**2**/5 (e) | 8 M].

CHAPTER 2

MANGROVES & COLD DESERT

Mangrove : ◈ Habitat and characteristics of mangrove ◈ Plantation – establishment, and rehabilitation of degraded mangrove formations. ◈ Silvicultural systems for mangrove; ◈ Protection of habitats against natural disasters. ***Cold Desert*** – Characteristics, identification and management of species.



2024	• Briefly summarize the ***Characteristic Features*** of cold arid forest vegetation. Discuss their mechanism of survival under extreme cold temperatures [P1/1(b) | 8 M]. • Write in brief on the current scenario of the growth pattern of cold desert areas in India. Describe in detail, the ***Causes of Desertification in cold areas***. Suggest suitable restoration plan [P1/2(b) | 15 M]. • What is the ***Status of Mangrove Forests*** in India? How are they associated with the sustainability of coastal areas? Enumerate the list of challenges faced by mangroves [P1/4 (a) | 15 M].
2023	• What are mangroves? Write their ecological implications [P1/1(c) | 8 M]. • What are the sequences of operations followed in mangrove afforestation? Discuss in detail the ***Fishbone Technique*** of mangrove plantation [P1/3(b) | 10 M]. • What is a cold desert? Describe the ***Distribution Pattern*** of cold desert species in India. How are cold desert areas afforested? [P1/4(a) | 15 M].
2022	• What are the ***Major Threats*** to mangrove forests? [P1/1(b) | 8 M]. • Describe the ***Characteristics of Cold Desert***. How does choice of species play an important role in cold desert afforestation programme? How are cold desert areas afforested? [P1/2(b) | 15 M]. • Is coastal ***Rehabilitation*** using mangrove species a success? Explain the plantation technique for degraded mangrove forest [P1/3(c) | 10 M].

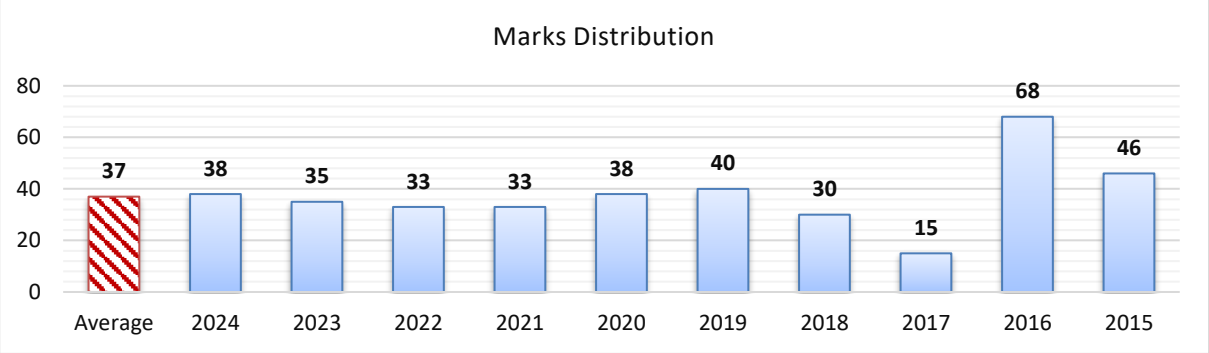
2021	• Why is it difficult to carryout ***Afforestation Programmes*** in cold deserts? [P1/1(a) | 8 M]. • What is the ***Ecological Significance*** of cold deserts? How do plants adapt and survive under cold and harsh desert conditions? Provide a list of common native species of a cold desert [P1/2(a) | 15 M]. • What are the ***Characteristics and Significance*** of mangrove forests ? Discuss important species formation in mangrove forests [P1/3(b) | 15 M].
2020	• Write the adaptive ***Characteristics*** of plant species of cold desert [*Linked* Q | P1/1(d) | 8 M]. • Describe the ***Reforestation Techniques*** of mangrove forests. Explain the following mangrove habitats : (i) Deltaic mangrove habitat, (ii) Coastal mangrove habitat [P1/2(b) | 15 M]. • Describe the various causes of ***Degradation*** of mangrove forests. Discuss the factors responsible for mangrove species regeneration and growth. Write the scientific names of five woody shrubs/tree species of cold desert [P1/4(c) | 15 M].
2019	• What are the ***Major Causes of Degradation*** of mangrove forest? Discuss in brief the methods of rehabilitation of degraded mangroves. [P1/3(c) | 15 M]. • What are the ***Characteristic Features*** of cold deserts of the Himalayas? Write the scientific names of *any 5 tree species* of cold desert. [P1/2(b) | 10 M].
2018	• Define the ***Characteristics*** of mangrove forest [P1/1(d) | 8 M].
2017	• Describe the unique ***Characteristics*** of mangrove forest vegetation. [P1/4(a) | 10 M]. • Enlist ***6 Genera of Mangroves***. Name 2 state and 1 UT with the large area under mangrove forest. [P1/1(d) | 8 M]. • Where are cold desert found in India? explain ***Site Characteristics*** of cold desert and stem suggested to overcome problems in their afforestation. [P1/3(a) | 10 M]. • A soil can be wet, yet ***Physiologically Dry***. How? What steps are suggested to correct the problem? [P1/3(a) | 10 M].
2016	• Write in details the term Girdling and Pruning. Write the ***Scientific name of 5 trees / shrubs*** each for the cold desert and mangrove forest. [*Linked Q* | P1/4 (a) | 20 M]. • Write the ***Characteristics*** of cold desert. Discuss soil working and planting techniques for cold desert. [*Linked Q* | P1/1(d) | 8 M].
2015	• Discuss the ***Sustainable Management*** of mangrove forest in India [P1/1(e) | 8 M]. • How is the accrual of ***Tangible*** *and* ***Intangible*** benefits of mangroves forest being affected by their degradation? [P1/2(d) | 10 M]. • Give the scientific name of – (a) 5 species of mangrove forest, (b) Five tree/Shrub species of the cold desert [P1/3(c) | 10 M]. • Comment upon the adaptation and ***Survival Strategies*** of the plant species endemic to the cold desert area of the western Himalaya. [P1/4(c) | 10 M].
2014	• Discuss the ***Characteristics*** of mangrove forest with examples [P1/5(e) | 8 M].

	• Describe the following – (a) ……, (b) ***Fish Bone Technique*** [P1/6(b) | 2.5 M]. • Discuss the importance of ***Willow Cultivation*** in cold desert [P1/5(c) | 8 M].
2013	• Explain the following mangrove habitat [P1/1(d) | 8 M]. (a) Deltaic mangrove habitat (b) Coastal mangrove habit (both east & west) • Write about the species diversity and centre of origin of Willows (*Salix* species). Describe its various uses under short rotation forestry. [P1/5 (c) | 8 M]. • ***Willow*** is the life line in dry temperate region (Lahul-Spiti) but its large-scale drying is causing great concern. Give your viewpoints. [**P2**/8(c) | 8 M].
2012	• How are the mangrove forest managed in India? [P1/1 (c) | 5 M].
2011	• Suggest measures to ***Rehabilitate*** degraded mangroves forest. [P1/1 (c) | 10 M]. • Define a forest types, Discuss the different ***Forest Types*** found along tidal swamp forest with their species composition. Give a note on how *rhizophora racemosa* in mangroves is managed in mangrove forest of Sundarbans. [P1/3 (a) | 3+12+5 = 20 M].
2010	• Comment on - Mangrove ecosystems have ***Physiologically Dry*** soil [P1/4 (a) *ii*| 5 M]. • Give the ***Zonation of Land-Sea*** interface in a typical mangrove eco-system with its characteristics [P1/1 (d) | 5 M]. • How and why should cold desert forest ecosystem be conserved? [**P2**/7(c) | 10 M].

CHAPTER 3

SILVICULTURE SYSTEMS

Silviculture Systems : ◈ ***Clear feeling***, ***Uniform*** shelter wood, ***Selection***, ***Coppice*** and ***Conversion*** systems. ◈ ***Management of silviculture systems*** of temperate, subtropical, humid tropical, dry tropical and coastal tropical forests with special reference to plantation silviculture, choice of species, establishment and management of standards, enrichment methods, technical constraints, intensive mechanized methods, aerial seeding, and thinning.



2024	• What is ***Conversion*** in silvicultural systems? Explain with two examples [P1/1(e) | 8 M]. • Describe the following [P 1/2(a) | 15 M]. (*i*) Regeneration felling (*ii*) Felling Series (*iii*) Seedling Felling (*iv*) Secondary Felling (*v*) Felling Cycle • Give a detailed account of ***Indian Irregular Shelterwood System*** and its applications [P1/3(b) | 15 M].
2023	• What are ***Accessory Systems***? Describe the two-storeyed high forest system [P1/2(c) | 10 M]. • Who developed the ***Andaman Canopy Lifting Shelterwood System***? Describe the different operations being followed in the system. [P1/3(c) | 15 M]. • What is ***Clear Felling System***? Describe the pattern of felling and methods of obtaining regeneration under clear felling system. [P1/4(b) | 10 M].
2022	• ***Improvement Felling*** is not considered as a silvicultural system. Why? [P1/1(a) | 8 M]. • Differentiate between ***Coppice with Standards*** and ***Coppice with Reserves***. Explain in detail the coppice with two rotations and pollard system [P1/2(a) | 15 M]. • Explain the following – (a) Selection felling, (b) Regeneration felling, (c) Selective felling, (d) Enrichment planting [P1/2(c) | 10 M].

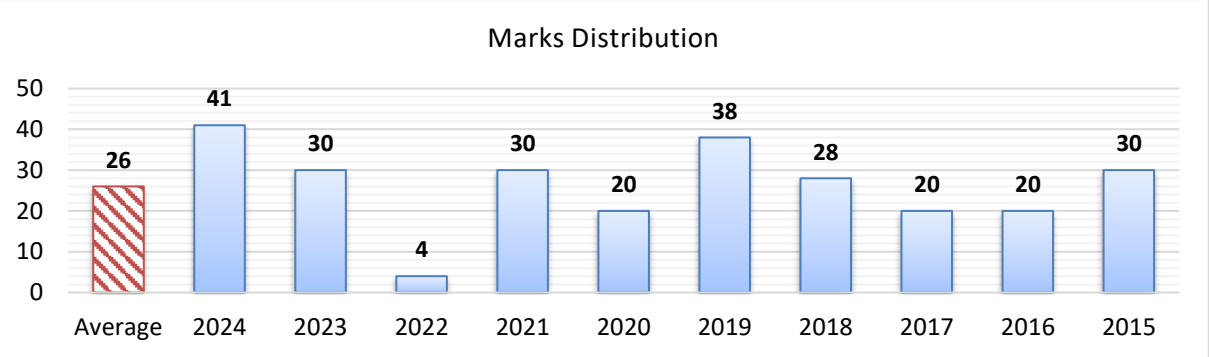
2021	• 'An appropriate silviculture system promotes better regeneration of forest stand' Comment. [P1/1(c) | 8 M]. • Elucidate the pattern of felling and mode of regeneration adopted under ***Selection System*** of management [P1/2(c) | 10 M]. • What are the conditions on which the ***Choice of a Particular Silvicultural System*** to be adopted for specific species in any locality depends? [P1/4(a) | 15 M].
2020	• Explaining the factors which affect the ***Length of Regeneration Period*** in a periodic block [P1/1(c) | 8 M]. • Define ***Coppice With Standard*** system. What are the advantages and disadvantages? Differentiate it from ***Coppice with Two Rotation System***. [P1/3(b) | 15 M]. • Enumerate the objectives of ***Management of Canal Plantations***. Explain the silviculture system to manage them. [P1/4(b) | 15 M].
2019	• Write the special characteristics of ***Indian Irregular Shelterwood System*** and differentiate it from Uniform System. [P1/2(a) | 15 M]. • "Felling height and felling intensity play a major role in the advantages sustainability of clumps of bamboo species" Comment. [P1/3(a) | 10 M]. • Explain the ***Alternative Strip System*** and the clear strip system. Write the advantages and disadvantages of clear-felling system. [P1/3(b) | 15 M].
2018	• Enlist the ***Classification of Silvicultural Systems*** on the basis of mode of regeneration and pattern of felling. [P1/2(b) | 15 M]. • What is ***Conversion***? Discuss the need of conversion of one silvicultural system to another [P1/4(a) | 15 M].
2017	• Enlist the general rules governing the ***Felling of Bamboo*** in forests. What are the consequences of gregarious flowering of bamboo? What special measures would you take in the event of gregarious flowering? [P1/3(c) | 15 M].
2016	• Define ***Clear Felling System***. How is Saransa sal (*Shorea robusta*) forest managed under clear felling followed by natural regeneration? [P1 / 1(e) | 8 M]. • Describe the silvicultural system which may be introduced to manage a plantation forest of *Azadirachta indica* [P1 / 2(a) | 20 M]. • Discuss in brief the ***Simple Coppice System***. Write different types of Coppice System [20 M]. • Describe kinds and pattern of fellings followed in ***Shelterwood Uniform System***. Explain Uniform System which is followed to manage (*Pinus roxburghii*) forests of Himachal Pradesh [P1/3(b) | 20 M].
2015	• Describe the major factors which affect the ***Length of the Regeneration*** period in a Periodic Block [P1/1(b) | 8 M]. • Comment upon the variations practised in the silvicultural system of *Shorea robusta* in the States of UP, Bihar, Odisha and West Bengal [P1/1(c) | 8 M]. • How can a forest with shade bearer and light demander tree species be managed under

	Uniform Shelterwood System? [*Linked Q* | P1/2(c) | 10 M]. • Describe the silvicultural system which is introduced to manage *Shorea robusta* forest after the failure of Uniform System [P1/3(b) | 10 M]. • How is *Tectona grandis* forest managed under ***Clear Felling followed by Artificial Regeneration***? [P1/4(b) | 10 M].
2014	• Discuss the ***Uniform System*** with artificial regeneration [P1/3(c) | 10 M]. • Explain the forest conversion process of ***Coppice System to Uniform*** broad-leaved high forest by natural regeneration [P1/6(a) | 20 M]. • Discuss ***Two Stories High Forest*** and explain its advantages [P1/7(b) | 10 M].
2013	• Explain the factors which affect the ***Length of Regeneration Period*** in a Periodic Block. What is the effect of regeneration period on the form of crop? [P1/1(e) | 8 M]. • How is allotment of areas made in Permanent and Floating ***Periodic Blocks***? [P1/3(a) | 10 M]. • Describe the method followed to introduce the ***Uniform Shelterwood System*** in a forest where *Cedrus deodara* is mixed with *Pinus wallichiana* [P1/3(b) | 10 M]. • Write about the impact of ***Felling Height*** and ***Felling Intensity*** on the sustainability of bamboo's clump [P1/3(c) | 10 M].
2012	• Successful regeneration in a forest depends upon silvicultural. System [P1/1(d) | 5 M]. • How will you classify a silvicultural system? Discuss important features of ***Uniform System*** with 'reference to *Pinus roxburghii* and give its merits and demerits [P1/2(a) | 4+8+4 = 16 M]. • briefly describe the ***Clear-Felling Silvicultural System*** with particular reference to – (a) Nature of crop produced, (b) Felling system, (c) Tending, (d) Regeneration, (e) Advantages and disadvantages [P1/4(b) | 10 M].
2011	• Define forest ***Conversion***. Explain the adverse situations under which conversion is advisable. Write in brief the general techniques of forest conversion [P1/2(a) | 2+4+4 = 10 M]. • Briefly describe the selection system with particular reference to the following - (i) Character of crop produced, (ii) Felling cycle, (iii) Tending, (iv) Regeneration, (v) Advantages and disadvantages [P1/2(c) | 2 × 5 = 10 M].
2010	• Briefly discuss a silvicultural system in which equal or equi-productive areas of mature crops are successfully felled [P1/1(b) | 5 M]. • Successful regeneration in a forest stand depends upon judicious choice of a silviculture system. Comment [P1/2(d) | 10 M]. • Comment upon, "***Conversion***" is an accepted silvicultural system [P1/4(a) *iv*| 5 M].

CHAPTER 4

IMPORTANT INDIAN TREE SPECIES

Silviculture of Trees : ◈ Traditional and recent advances in tropical silvicultural research and practices. ◈ Silviculture of some of the economically important species in India such as **A**cacia *catechu*, *Acacia nilotica*, *Acacia auriculiformis*, *Albizzia lebbek*, *Albizzia procera*, *Anthocephalus Cadamba*, *Anogeissus latifolia*, *Azadirachta indica*, **B**amboo *spp.*, *Butea monosperma*, **C**assia *siamea*, *Casuarina equisetifolia*, *Cedrus deodara*, *Chukrasia tabularis*, **D**albergia *sissoo*, *Dipterocarpus* spp., **E**mblica *officinalis*, *Eucalyptus spp.*, **G**melina *Arborea*, **H**ardwickia *binata*, **L**agerstroemia *Lanceolata*, **P**inus *roxburghii*, *Populus spp.*, *Pterocarpus marsupium*, *Prosopis juliflora*, **S**antalum *album*, *Semecarpus anacardium*, *Shorea robusta*, *Salmalia malabaricum*, **T**ectona *grandis*, *Terminalia tomemtosa*, *Tamarindus indica*.



2024	• Elucidate the phenology, silvicultural characters and artificial regeneration of ***Bamboos*** [P1/1(a) | 8 M]. • Write in detail the distribution and importance of ***Prosopis juliflora*** and ***Emblica officinalis*** [P1/1(d) | 8 M]. • Write the economic importance of the following tree species [P1/3(a) | 15 M]. (*i*) ***Salmalia malabarica*** (*ii*) ***Acacia nilotica*** (*iii*) ***Largerstroemia lanceolata*** (*iv*) ***Pterocarpus marsupium*** (*v*) ***Chukrasia tabularis*** • Discuss the distribution and regeneration of ***Cedrus deodara*** and ***Pinus roxburghii*** [P1/4(c) | 10 M].
2023	• The shoot portion of seedlings of some tree species like *Sal* and ***Sandal***, under natural regeneration, keeps on drying year after year but the roots remain alive. Discuss [*Linked Q* | P1/1(a) | 8 M]. • Write the factors which affect the natural regeneration of ***Sal (Shorea robusta)***. Discuss the procedure to obtain natural regeneration of moist Sal forests [*Linked Q* | P1/2(b) | 15 M].

	• Write the economic importance of the following tree species [P1/3(a) | 15 M]. (*i*) ***Acacia catechu*** (*ii*) ***Casuarina equisetifolia*** (*iii*) ***Hardwickia binate*** (*iv*) ***Butea monosperma*** (*v*) ***Tamarindus indica***
2022	• Explain the techniques for the upgradation and hardening of nursery seedlings of ***Lagerstroemia lanceolata*** [*Linked Q* | P1/1(d) | 8 M].
2021	• Discuss the phenology, Silvicultural characters and regeneration methods of – (i) ***Gmelina arborea***, (b) ***Pinus roxburghii***. [P1/2(b) | 15 M]. • Elucidate the distribution, Nursery techniques and economic importance of – (i) ***Cedrus deodara***, (ii) ***Acacia catechu***, (iii) ***Casuarina equisetifolia***. [P1/4(b) | 15 M].
2020	• Describe the methods of artificial regeneration of ***Tamarindus indica*** [*Linked Q* | P1/1(e) | 8 M]. • Give a brief account of the silvicultural characters and regeneration methods for the following species - (a) ***Acacia catechu***, (b) ***Populus deltoides*** [P1/2(c) | 15 M].
2019	• Write a brief account of the phenology, silvicultural characters and methods of regeneration of ***Dalbergia sissoo*** [P1/1(a) | 8 M]. • Discuss in details silviculture of ***Albizzia lebbeck*** [P1/2(c) | 15 M]. • Give a brief account of origin and natural distribution of the following - (a) ***Adina cordifolia***, (b) ***Cedrus deodara*** and (c) ***Santalum album*** [P1/4(c) | 15 M].
2018	• Discuss the physiology of *root parasitism* in **Sandal Tree** (8M). [P1/1(e) | 8 M]. • Write the *phenology* of the following (5M) – (a) ***Tectona grandis***, (b) ***Melia dubia***, (c) ***Shorea robusta***, (d) ***Cedrus deodara*** [P1/3(b)*i* | 5 M]. • Can climate-change change the period of phenology? Share with examples [P1/3(b)*ii* | 5 M]. • Give the *silvicultural characteristics* and *economic importance* of the following [P1/4(b) | 10 M]. **(a)** ***Azadirachta indica*** **(b)** ***Acacia catechu***
2017	• Describe the natural distribution of – (*i*) ***Shorea robusta***, (*ii*) ***Azadirachta indica*** [P1/2(a) | 10 M]. • Write silvicultural characters of – (*i*) ***Casuarina equisetifolia***, (*ii*) ***Abies pindrow*** [P1/2(b) | 10 M].
2016	• Describe in brief the distribution, phenology, silvicultural characteristics, artificial regeneration and uses of the following species - (a) ***Techtona grandis*** (2) ***Santalum albus*** [P1/4(b) | 20 M].
2015	• Explain how the knowledge about the silvicultural characteristics of a tree enables us to manage the species in a better way [P1/1(d) | 10 M]. • Describe in brief the phenology, silvicultural characteristics and artificial regeneration of the following tree species – [P1/2(b) | 10 M]. (a) ***Pinus roxburghii***, (b) ***Cedrus deodara***, (c) ***Albizia lebbeck*** • Briefly Describe the silviculture characters and natural regeneration of the following – (a)

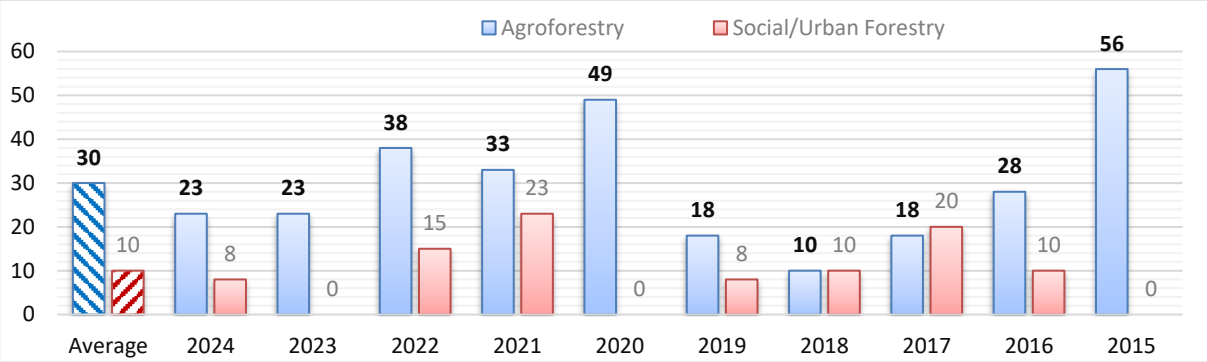
	Dendrocalamus hamiltonii, (b) ***Acacia auriculiformis***, (c) ***Dalbergia sissoo*** [P1/3(d) | 10 M].
2013	• Write critical notes on – (ii) Importance of ***Butea monosperma*** [**P2**/8(b) ii | 2.5 M].
2012	• Give *distribution*, *phenology*, *method of regeneration* and brief silvicultural management of two tree species belonging to each family below - (a) *Melieceae* (b) *Papilionaceae*, grown in India [P1/2(b) | 4 x 4 = 16 M]. • Discuss in brief the *silviculture* of the following species - (a) ***Shorea robusta*** (b) ***Bamboo species*** [P1/4(c) | 2 x 4 = 8 M]. • Describe the economic importance of ***Acacia nilotica***, ***Terminalia belerica***, ***Vitex negundo*** and ***Madhuca latifolia*** in detail [P1/7(d) | 10 M].
2011	• Describe the silvics of ***Tectona grandis*** under the following heads [P1/4(a) | 5 x 4 = 20 M]. (a) Distribution and morphology, (b) Silvicultural characters, (c) Silvicultural system and management, (d) Utilization. • Describe the silvics of ***Casuarina equisetifolia*** under the following heads [P1/4(b) | 5x4 = 20 M]. (a) Ecology and distribution, (b) Propagation and management, (c) Functional uses, (d) Pests and disease.
2010	• "Indian Sandalwood (***Santalum album***) is the most valuable wood in India. However, silvicultural production of this species is not satisfactory." Discuss the above in relation to the phenology of Santalum album and the forest laws governing its cultivation and trade [P1/3(b) | 20 M]. • Give climatic requirement, rotation age, spacing, tending operations and yield of the following forest species – (a) ***Populus deltoides***, (b) ***Casuarina equisetifolia*** [P1/4(b) | 10 M].

CHAPTER 5

AGRO-FORESTRY, SOCIAL & URBAN FORESTRY

Agroforestry : ◈ ***Scope and necessity***; role in the life of people and domestic animals and in integrated land use, planning especially related to (i) soil and water conservation; (ii) water recharge; (iii) nutrient availability to crops; (iv) nature and eco-system preservation including ecological balances through pest-predator relationships and (v) Providing opportunities for enhancing biodiversity, medicinal and other flora and fauna. ◈ ***Agroforestry systems*** under different Agro-ecological zones; Selection of species and role of multipurpose trees and Non-Timber Forest Products (NTFPs), techniques, food, fodder and fuel security. ◈ ***Research and Extension*** needs.

Social / Urban Forestry - Objectives, scope and necessity; People's participation.



AGROFORESTRY

2024	• How is ***Shifting Cultivation*** related with tribal society? Is it a good practice or bad, under present situation? Justify your claim [P1/5(c) | 8 M]. • What is agroforestry? Elucidate the scope, importance and ***Role of Agroforestry*** in climate amelioration [P1/7(a) | 15 M].
2023	• Explain the ***Role*** of ***Windbreaks*** and ***Shelterbelts*** in Agroforestry. Name two tree species for each [P1/5(a) | 8 M]. • Discuss the role of Agroforestry in the well-being of mankind. [P1/6(a) | 15 M].
2022	• How does agroforestry help to achieve the *United Nations*' ***Sustainable Development Goals***? [P1/5 (a) | 8 M]. • What are the differences between ***Traditional Agroforestry*** and ***Ethno-Agroforestry***? Explain in brief, below-ground and above-ground, tree-crop interactions in agroforestry systems [P1/6(a) | 20 M]. • What are the constraints in the ***Value Chain*** under ***Industrial Agroforestry***? [P1/6(b) | 10 M].

2021	• How do agroforestry wood perennials protect the understorey crops? [P1/5(e) | 8 M]. • How does agroforestry promote the ***Sustainable Livelihood*** of marginal farmers? [P1/6(c) | 10 M]. • How does ***Crop Rotation*** and mixed farming improve soil productivity? [P1/8(b) | 15 M].
2020	• "Agroforestry system ***Conserves Soil*** *and* ***Moisture***" Justify the statement [P1/5(b) | 8 M]. • Write the ***Tangible*** *and* ***Intangible Benefits*** of agroforestry. [P1/5(d) | 8 M]. • "***Taungya Cultivation*** is a type of traditional agroforestry system" Justify the statement. [P1/6(b) | 15 M]. • Write the scientific names of any five multipurpose tree species suitable for agroforestry system in (i) Arid and semi-arid and (ii) Sub-tropical Hills of India. [P1/7(c) | 10 M]. • How does ***Shifting Cultivation*** support community livelihood and biodiversity conservation? [**P2**/5(a) | 8 M].
2019	• Agroforestry is a better land-use system for ***Climate Change Mitigation*** and adaptability. Justify. [P1/5(a) | 8 M]. • What are ***Multipurpose Tree Species*** (MPTs)? explain their role in social forestry [P1/7(c) | 10 M].
2018	• Write about the ***Diagnostic*** and ***Design Survey*** of agroforestry. Can it help the farmers in the integration of tree with crops to enhance the crop productivity in agroforestry system? Justify. [P1/6(a) | 10 M].
2017	• Discuss the impact of agroforestry practices on the environment in general and on soil properties in particular, with a suitable example. [P1/5(e) | 8 M]. • Differentiate between ***Windbreaks*** and ***Shelterbelts***. Discuss in brief, their impact on the environment [P1/7(c) | 10 M].
2016	• Discuss the role of agroforestry in nutrient cycling and soil conservation. How is saline soil reclaimed? [P1/7(c) | 20 M]. • Provide scientific names of four potential **NFTs** each suitable for Tropical and Temperate conditions [P1/5(c) | 8 M].
2015	• Discuss the needs and scope of agro-forestry for the benefits of people [P1/5(a) | 8 M]. • Elaborate upon the social ***Objectives*** of agroforestry [P1/5(e) | 8 M]. • Discuss why ***Land-Use System*** is often more appreciated in agroforestry than in pure agriculture [P1/6(a) | 10 M]. • The adoption of agroforestry practices by the farming community is the result of increasing human and cattle populations. Discuss [P1/7(a) | 10 M]. • Outline the role of ***Tree Architecture*** in agroforestry [P1/8(b) | 10 M]. • Can you differentiate between the terms mixed plantations in forestry and mixed cropping in agriculture? Justify the differences between them [**P2**/1(a) | 10 M].
2014	• Describe the ***Benefits*** and ***Constraints*** of agroforestry [P1/1(d) | 8 M]. • Why are agroforestry systems becoming ***Popular in Himalayan Tarai*** regions, Western plains and Southern parts of India? Discuss your answer with reasons and tree-crop combinations

	adopted in these regions and parts of the country [P1/8(b) | 20 M].
2013	• What are the unique requirements for tree improvement in agroforestry? [P1/5(a) | 8 M]. • Elaborate upon the multipurpose tree species ideotype selection criteria [P1/5(c) | 8 M]. • Describe tree-crop ***Allelopathy*** in agroforestry [P1/5(e) | 8 M]. • What are the fundamental bases of ***Classification*** of agroforestry systems? [P1/7(b) | 10 M].
2012	• Differentiate between the – (i) Agroforestry and Silviculture [P1/3(a) i | 5 M]. • How ***Shelterbelt*** and ***Windbreaks*** are helpful in sand dune stabilization and desert control? [P1/5(a) | 5 M]. • Describe the extent, method of cultivation and effects of ***Shifting Cultivation***. Suggest some suitable alternatives to shifting cultivation [P1/5(d) | 5 M]. • What do you know about recent progress in Agroforestry ***Research*** and development in our country for sustainable development? [P1/5(g) | 5 M]. • what is ***D & D*** ? Who can make use of D & D and How? [P1/7(a) | 10 M].
2011	• While selecting the species for agroforestry, the below-ground and above ground interaction between the component species need to be considered. Discuss [P1/5(a) | 10 M]. • Write short notes on – (i) ***Aquaforestry***, (iii) Water Use efficiency, (iv) ***Home Gardens*** [P1/6(a) | 2 ½ × 3 = 7.5 M]. • Explain the various components of a ***Hydrological Model*** for an agroforestry system [P1/6(b) | 10 M]. • Compare ***Nutrient Cycling*** in a natural forest, an agroforestry system and an agriculture field. Discuss how it helps to sustain soil fertility [*Linked Q* | P1/7(a) | 10 M].
2010	• *Acacia Catechu* and *Prosopis juliflora* have emerged as important species for marginal lands. Discuss briefly [P1/1(h) | 5 M]. • Differentiate between the following – (i) ***Shelter Belts*** and ***Wind Breaks*** [P1/3(a) | 4 M]. • What is integrated land use management? Give a plan of integrated land use management for 10 ha. of land in tropics and sub-tropics parts of India [P1/6(b)ii | 10 M]. • Comment on the needs of ***Research*** in Agroforestry in India [P1/7(b)ii | 5 M]. • Write short notes on - ***Diagnosis*** and ***Design*** in Agroforestry [P1/5(c) | 5 M].

SOCIAL/URBAN FORESTRY

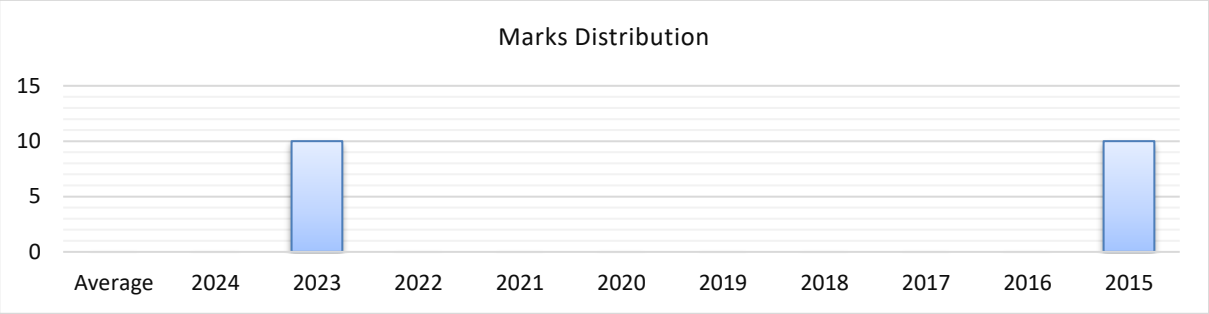
2024	• What do you mean by ***Urban Forestry***? Discuss the choice of species for environmental conservation in these areas. [P1/5(a) | 8 M].
2022	• Discuss the key problems to expand tree cover in urban areas. Explain the role of urban trees in abating soil pollutants [P1/8(a) | 15 M].
2021	• Discuss the problem of commons in social forestry. Suggest some effective strategies to overcome these problems [P1/6(b) | 15 M]. • What factors are considered important while choosing a species under ***Avenue Plantation***?

	[P1/1(b) | 8 M].
2019	• Briefly describe the ***Aim, Objectives*** *and* **Scope** of urban forestry in India. [P1/5(b) | 8 M].
2018	• What is ***Farm Forestry***? Write about the objectives, difficulties and financial return from the farm forestry [P1/8(c) | 10 M].
2017	• Explain the scope and aims of ***Urban forestry***. Discuss the need of urban forestry in the improvement of city environment [P1/6(b) | 20 M].
2016	• Briefly discuss aims, objectives and scope of social forestry. Why is people's participation must in social forestry? [P1/8(b) | 10 M].
2012	• How social forestry differs from other types of forestry? [P1/1(f) | 5 M].
2011	• Management challenges in the urban forestry are unique as compared to other social forestry programs. Discuss [P1/6(c) | 10 M].
2010	• Write Short notes on – (a) Management of urban forestry [P1/5(a) | 5 M]. • Discuss the following – (iv) Drawback of social forestry programs in India [P1/6(a) iv | 5 M].

CHAPTER 6

TRIBOLOGY

Tribology : Tribal scene in India; tribes, the concept of races, Principles of social grouping, stages of tribal economy, education, cultural tradition, customs, ethos and participation in forestry programs.

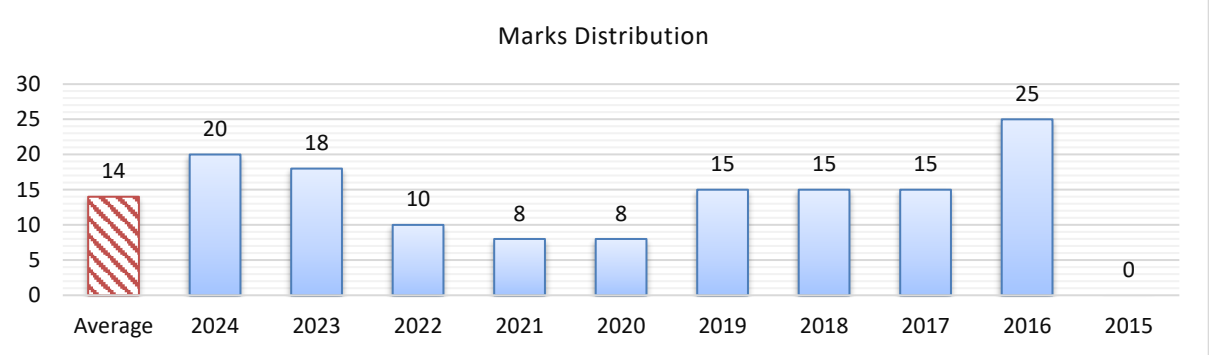


2023	• Enlist the ***Problems Faced*** by the tribal communities in India [P1/7(a) | 10 M].
2015	• Enumerate and discuss the ***factors responsible for restricting*** tribal population in the national parks [P2/8(c) | 10 M].
2014	• ***Name*** different tribes of India ***State-Wise*** and their specific ***Characteristics***. How can we make use of their ***Traditional Knowledge*** in forest conservation (flora and fauna) ? [P1/8(a) | 20 M].
2013	• Give the fundamental ***Characteristics*** of the tribal economy in India [P1/5(b) | 8 M].
2011	• Write short notes on (i) Tribal economy, (ii) Chola Naickans, (iii) Gujjars, (iv) Gonds [P1/5(b) | 10 M]. • Discuss the ***Characteristics*** which are shared by the diverse tribal groups all over India [P1/6(d) | 10 M].
2010	• How can we make use of the ***Traditional Knowledge*** of the major tribes of India in forest conservation (both flora and fauna) ? [*Linked Q* | P1/1(b) i | 10 M].

CHAPTER 7

JOINT FOREST MANAGEMENT

JFM : Details of steps involved such as the formation of Village Forest Committees, Joint Forest Participatory Management. Principles, objectives, methodology, scope, benefits and role of NGOs.



2024	• Elucidate the impact of ***Joint Forest Management*** on the conservation of natural forests and improvement of rural environment [P1/7(c) | 10 M]. • What is ***Eco-Development Committee*** (EDC)? Explain its role in forest conservation and mitigation of human-wildlife conflict [P2/3(c) | 10 M].
2023	• Write a note on the gender issues in Joint Forest Management (JFM). [P1/5(d) | 8 M]. • What is ***Village Forest Committee***? Explain its role in forest management. [P2/2(c) | 10 M].
2022	• "Participatory Forest Management is a success". Illustrate with examples [P2/4(c) | 10 M].
2021	• How do the ***Ownership Rights*** of forests ***Influence the Success*** of joint forest management? [P1/5(b) | 8 M].
2020	• How does collaborative forest management ensure community and household resilience? [*Linked Q* | P2/1(c) | 8 M].
2019	• Why are ***Participatory Rural Appraisal*** (PRA) techniques important for planning and execution of Joint Forest management (JFM) Activities? Explain the ***tools and techniques of PRA***. [P1/6(a) | 15 M].
2018	• Explain the environmental and economic role of community forestry in India [P1/5(d) | 8 M]. • What are the ***Objectives*** of Joint Forest Management (JFM)? Give ***Methods*** used for preserving forest resources through JFM [P2/7(b) | 15 M].
2017	• Write in detail as to why the Joint Forest Management Policy was initiated and what are its ***Constraints*** in implementation? [P2/4(b) | 15 M].

2016	• Trace the ***History of JFM*** in India, narrate any one success story with details [P**2**/3(a) | 15 M]. • Describe the role of ***Corporate Social Responsibility*** (CSR) towards sustainable forest production through Public-Private Partnership (PPP) approach [P**2**/8(a) | 10 M].
2014	• Introduction of JFM in various states in India was found ***Positive in biodiversity conservation***, discuss in details. [P**2**/1(d) | 8 M].
2013	• Describe constitution of ***JFM Network*** by MOEF, GOI with its terms of reference [P**2**/4(b) | 7 M]. • What entry point activities are recommended in joint forest management? [P1/5(d) | 8 M].
2012	• What shifts in attitude among Forest Personnel from the present are required for better success of Joint Forest Management? Discuss [P**2**/4(c) | 10 M].
2010	• How can we make use of the traditional knowledge of the major tribes of India in forest conservation (both flora and fauna) ? [P1/6(b) ii | 8 M]. • How can NGOs, Schools, Banks and Industry help to carry out an afforestation programme? [P1/8(c) | 20 M].

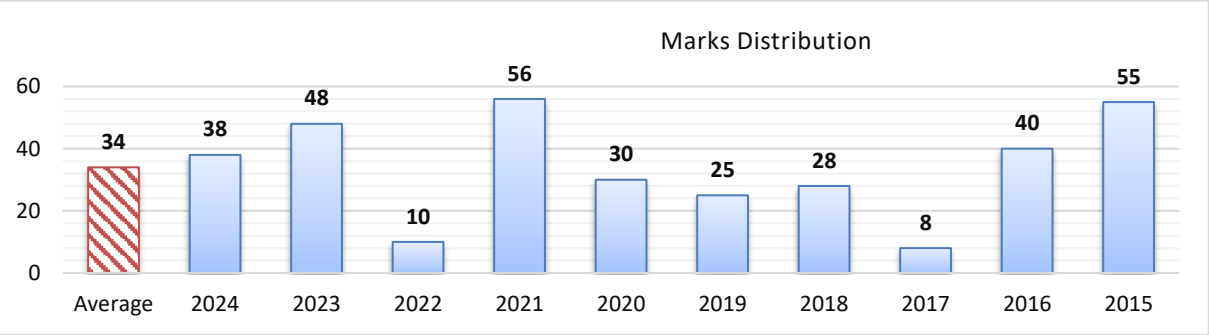
CHAPTER 8

POLLUTION, CLIMATE CHANGE & ENVIRONMENTAL CONSERVATION

ENVIRONMENTAL CONSERVATION AND BIODIVERSITY

Environment - components and importance, principles of conservation, impact of deforestation; forest fires and various human activities like mining, construction and developmental projects, population growth on environment.

Pollution - types, global warming, greenhouse effects, ozone layer depletion, acid rain, impact and control measures, environmental monitoring; concept of sustainable development. Role of trees and forests in environmental conservation; control and prevention of air, water and noise pollution. Environmental policy and legislation in India. Environmental Impact Assessment. Economics assessment of watershed development *vis-a-vis* ecological and environmental protection.



2024	• What is the ***Greenhouse Effect***? Define it. Describe in detail, accounts of its causes, sources and environmental impact [P1/5(e) | 8 M]. • Explain the concept of ***Sustainable Development*** of forests. How is it associated with the biodiversity, forest ecosystem conservation and forest ecosystem health? [P1/6(c) | 15 M]. • Critically analyse the impact of mining, construction projects and human population on ***Environmental Degradation***. Analyse comparatively the management practices followed in India and China [P1/b) | 15 M].
2023	• ***Greenhouse Gases*** result in global warming. Discuss [P1/5(e) | 8 M]. • What is ***Environmental Impact Assessment*** (EIA)? Describe the activities involved and general procedure in EIA [P1/8(c) | 15 M]. • Write on ***Carbon Sequestration*** and discuss the role of afforestation in absorptions of carbon dioxide (CO_2) from atmosphere [P1/6(c) | 10 M]. • Write the components of vehicular air pollution and list the damages caused to roadside trees. [P2/5(c) | 8 M].

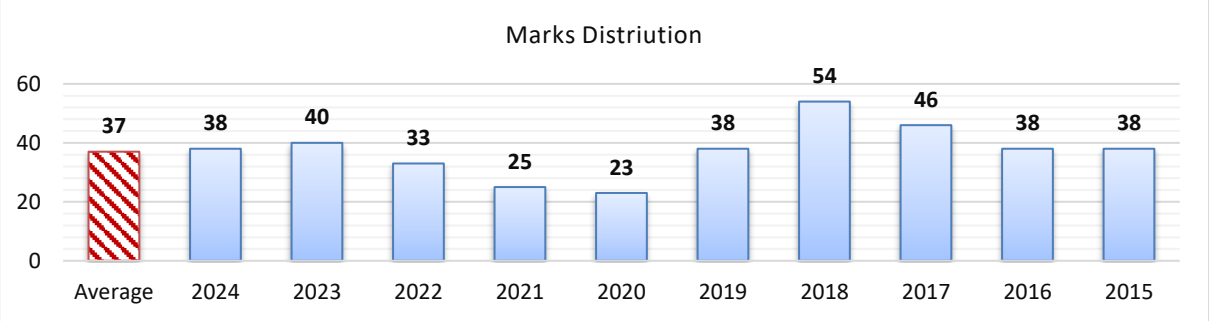
	• What is deforestation? Discuss the impact of deforestation on the environment [*Linked Q* | P1/6(c) | 15 M].
2022	• How do tree and shrub mass influence the mitigation of ***Particulate Matter*** and noise in urban settings? [P1/6(c) | 10 M].
2021	• What is the ***relationship between air pollutants and climate change***? How does forest vegetation abate different types of pollutants? Describe Air (Prevention and Control of Pollution) Act, 1981 in relation to pollution management. Suggest name of suitable plant species. [P1/7(a) | 15 M]. • Explain the ***role of trees and forests in Environmental conservation*** [*Linked Q*| P1/6(a) | 15M]. • What are the ***impacts of COVID-19 pandemic on environment and biodiversity*** [P1/5(a) | 8]. • What id REDD⁺? How does clean development mechanism help in sustainable management of forests? (8m) [P**2**/5(c) | 8 M]. • What is the role of forest plantations in ***Carbon Sequestration***? (10 m) [P**2**/7(c) | 10 M]. • Describe the criteria and indicators of ***Sustainable Forest Management*** [P**2**/1(a) | 8 M].
2020	• Explain the methods of ***Environmental Impact Assessment*** [P1/8(b) | 15 M]. • What is the significance of Afforestation and Reforestation to the ecosystem? How are the National Afforestation Programme, Green India Mission and Forest Fire Prevention and Management Scheme helping in restoration of forests? [P2/7(a) | 15 M].
2019	• List out the *greenhouse gases* that contribute to ***Global Warming***. What are the effects of global warming? Explain the role of trees and forests in combating environmental degradation. [P1/7(b) | 15 M]. • Explain the concept of ***Sustainable Development***. Discuss in brief the agenda for sustainable development. [P1/8(b) | 10 M].
2018	• Write the salient features of the ***Solid Waste Management Act****, 2000 and 2016*. What new initiatives have been taken *in the solid waste management* rules, 2016? [P1/5(e) | 8 M]. • Write about the ***pre- and post-Environmental Impact Assessment*** *(EIA)* of any mining area of India. Does GIS help in EIA? Write the name of the software used in Environmental Impact Assessment for the mining areas [P1/6(b) | 10 M]. • What is ***Sustainable Development***? Write about the criteria and indicator of sustainability fulfilling the needs and demands of growing population of India [P1/8(b) | 10 M].
2017	• Comment on the possible ***Impact of Greenhouse Gases*** on the global environment [P1/5(d) | 8 M].
2016	• Define ***Global Warming***. Explain in brief the principle behind greenhouse effect. Write the consequences of global warming on forest, wildlife and the human health. [P1/6(b) | 20 M]. • What are the objectives of carrying out **EIA**. Discuss sequentially, the different phases of an EIA study. [P1/6(c) | 10 M]. • How are "Environment", Environmental pollutant" and "Hazardous substance" narrated in environment (protection) act, 1986? [P1/7(b) | 10 M].
2015	• What is the penalty prescribed in section 15 of the environmental (Protection) act, 1986 for

	contravention of the provisions of the environmental act, rules and orders? [*Linked Q* | P1/5(c) | 8 M]. • Write the ***Chemistry of Ozonosphere*** and list the adverse effects of ozone layer depletion [P1/6(c) | 10 M]. • Briefly explain the process of acid rain formation and its adverse effects on buildings and aquatic bodies [P1/7(c) | 10 M]. • What is ***Arsenic Pollution***? Discuss the strategies to mitigate it [P1/8(c) | 10 M]. • Growth and productivity of forest plants are affected by different types of air pollutants. What are those? Suggest suitable remedies [P**2**/6(d) | 10 M]. • Narrate how ***Sustainable Forestry*** accounts for the ecological, economic, social and cultural values of forests. Give your opinion [P**2**/7(b) | 15 M].
2014	• What do you understand by the term ***Greenhouse Gases***? Explain how these gases disturb the ecological balance of nature and suggest suitable remedies. [P1/7(d) | 10 M]. • Why is a balance between production, social and environmental objectives necessary in ***Sustainable Forest Management*** plans? [P2/7(a) | 20 M].
2013	• What is ***Global Warming***? Discuss how it disturbs the ecological balance of nature, and suggest suitable remedies. [P1/6(a) | 20 M]. • Explain the following – (i) Criteria pollutant, (ii) Pollutant standard index, (iii) Severance tax, (iv) Smog. [P1/6(b) | 2 ½ × 4 = 10 M]. • How would you view the Indian initiatives for ***Sustainable Forest Management***? Discuss [P**2**/1(c) | 8 M].
2012	• No Direct Question
2011	• Write short notes on – (i) ***Carbon Sequestration***, (ii) Riparian buffers, (iii) ~~Forest decline~~, and (iv) Nitrate pollution. [P1/7(c) | 2 ½ × 3 = 7.5 M]. • What are the effects of particulate ***Air Pollutants*** on the regeneration of a forest ecosystem? Discuss. [*Linked Q* | P**2**/7(b) | 10 M].
2010	• Discuss the following - Rio conference [5 M]. • How is ***Forest Certification*** done in developed countries? Comment on its present status in India. [P**2**/6(d) | 10 M]. • Write on tree species for smoke and dust pollution control [*Linked Q* | P1/7(c) | 5 M].

CHAPTER 9

TREE IMPROVEMENT & SEED TECHNOLOGY

Tree Improvement And Seed Technology : General concept of tree improvement, methods and techniques, variation and its use, provenance, seed source, exotics; quantitative aspects of forest tree improvement, seed production and seed orchards, progeny tests, use of tree improvement in natural forest and stand improvement, genetic testing programming, selection and breeding for resistance to diseases, insects, and adverse environment; the genetic base, forest genetic resources and gene conservation in situ and ex-situ. Cost benefit ratio, economic evaluation.



2024	• Compare the ***Clonal Seed Orchard*** and ***Seedling Seed Orchard***. Which one is preferred to get increased genetic gain? [P1/5(d) | 8 M]. • What do you mean by ***Mating Design***? Describe the complete pedigree designs with their utilities [P1/6(a) | 15 M]. • Explain the genetics of ***Disease Resistance***. Describe the methods of breeding for disease resistance in tree crops [P1/8(a) | 15 M].
2023	• Explain the following – (a) __, (b)__, (iii), (iv), (v) ***Ortet*** and ***Ramet*** [*Linked Q* | P1/4(c) | 15 M]. • Discuss the significance of ***Exotics in Tree Improvement***. Name four exotic tree species [P1/5(b) | 8 M]. • Define ***Heritability*** and its types. How does Narrow Sense Heritability differ from Broad Sense Heritability? [P1/7(c) *i* | 10 M]. • Discuss the scope and future of hybrids in applied tree improvement [P1/7(c)*ii* | 10 M]. • Discuss the ***Significance of Variation*** in tree improvement [P1/8(b) | 10 M].
2022	• Why is ***Conventional Breeding*** that has a much better role to play in genetic improvement of trees not given much importance in research? [P1/5(e) | 8 M]. • What are the objectives of ***Progeny Testing***? Discuss the advantages and disadvantages of different methods of progeny testing [P1/8(b) | 15 M]. • Discuss the *important considerations* that are made before choosing a tree improvement approach [P1/8(c) | 10 M].

2021	• What are the advantages and disadvantages of ***Tree-Breeding Methods*** over biotechnological methods? [P1/7(c) | 10 M]. • Give an overview of forest genetic resources and ***Gene Conservation Programmes*** in India. Suggest effective practices for sustainable management for quality improvement in Indian Forests. [P1/8(a) | 15 M].
2020	• What is meant by ***Accompanied*** and ***Unaccompanied Clonal Seed Orchards***? Why are the gains from the two types so different? [P1/5(a) | 8 M]. • Describe the advantages, peculiar problems and various ***Steps in Tree Improvement***. [P1/7(a) | 15 M].
2019	• What are the ***Objectives*** *of tree improvement*? Explain in Details the ***Five Essential Steps*** of tree improvement [P1/5(e) | 8 M]. • Define : (i) Variation, (ii) Selection differentiation, (iii) Selection intensity, (iv) Heritability. How do you increase the genetic gain for a given trait in tree breeding? [P1/6(b) | 15 M]. • Name the ***Two Phases of tree improvement***. as a tree breeder, how do you use these two phases simultaneously to meet the short-term demand of wood-based industries and the long-term demand of establishing seed orchards for a given tree species [P1/8(a) | 15 M].
2018	• Write in brief on the criteria of selection of tree for resistance to adverse environments for high quality timber production [*Linked Q* | P1/5(a) | 8 M]. • How would you develop ***Tree Improvement Programmes*** for raising productivity in forestry? [P1/8(d) | 10 M]. • What is the importance of ***Heritability*** and how can genetic gain be estimated in tree improvement programme? [P1/6(d) | 10 M]. • Describe incomplete ***Mating Designs*** used in tree improvement [P1/7(b) | 10 M]. • What are the different ***Selection Methods*** used by the tree breeders? [P1/7(d) | 10 M]. • Explain seed production and certification system in Indian forestry [P1/6(c) | 10 M].
2017	• Write in brief on ***Advanced Generation*** tree improvement. [P1/5(a) | 8 M]. • Explain ***General Combining Ability*** (GCA), ***Specific Combining Ability*** (SCA) and their utility [P1/5(b) | 8 M]. • What are ***Seed Production Areas*** (SPA)? Explain the purpose of establishing them. Briefly highlight the advantages and disadvantages of SPA. List the steps involved in establishing SPA. [P1/7(a) | 20 M]. • List the different components of ***Phenotypic Variation***. How are they important for tree breeders? [P1/8(c) | 10 M].
2016	• List the basic causes and kinds of ***Variations*** in tree populations. [P1/5(a) | 8 M]. • Define ***Provenance***. Discuss the role of Provenance trial in tree improvement and mention different phases of a Provenance trial [P1/6(a) | 10 M]. • Define the ***Seed Orchard***. Write types of seed orchard. List the various aspects considered prior and after establishment of seed orchards for its management. [P1/8(a) | 20 M].
2015	• How can magnitude and ***Type of Variability*** be manipulated to obtain good gains in some tree characteristics? [P1/5(d) | 8 M]. • Suggest suitable steps to select ***Exotic Species*** or provenances for plantations. [P1/6(d) | 10

	M]. • As a community of ***Interbreeding Individuals***, what parameters would need to be known to describe a population of forest trees? [P1/7(d) | 10 M]. • Comments upon the relationship of ***General Combining Ability*** and breeding value in forest tree improvement programmes. [P1/8(d) | 10 M].
2014	• Discuss the ***Role of Provenance Tests*** in tree improvement [P1/1(b) | 8 M]. • State genetic drift. Discuss Hardy-Weinburg law with its significance [P1/3(b) | 10 M]. • Explain the possible causes of genetic variation in forest trees [P1/5(b) | 8 M]. • Discuss the important factors while planning of ***Seed Orchard*** [P1/7(c) | 10 M].
2013	• Write a note on ***Pollen Dilution Zone*** in seed orchard. Discuss various factors affecting their effectiveness. What are the options available in lieu of pollen dilution zones? [P1/8(b) | 10 M]. • What is ***Genetic Drift***? State and discuss Hardy-Weinberg law with its significance [P1/7(d) | 10 M]. • Describe the operational use of vegetative propagation in tree improvement [*Linked Q* | P1/8(c) | 10 M]. • How is the knowledge of Forest Genetics essentially needed for the management of forest plantations? Explain [P**2**/3(a) | 15 M].
2012	• Discuss the *use of tree improvement* in natural forest and stand improvement [P1/5(h) | 5 M]. • Write short notes on – [P1/8 | 4 × 5 = 20 M]. (b) ***Breeding Arboretum*** (c) ***Seed Orchard***, (d) Distinction between Selection Intensity and heritability (h) ***Exotics*** in Indian forestry
2011	• Discus the importance of ***Tissue Culture Techniques*** as a tool in tree improvement. [P1/5(e) | 10 M]. • Describe the ***Regression Selection Method*** for plus tree selection in uneven-aged stand. [P1/8(a) | 10 M]. • Describe the various approaches for obtaining ***Genetically Superior Seed***, giving advantages of each [P1/8(b) | 10 M]. • Discuss the statement, even in large experiments with many families, ***Heritabilities*** are not estimated without error (10 m). [P1/8(c) | 10 M].
2010	• Strategies for conventional tree improvement programme [P1/5(g) | 5 M]. • Discuss the following – (i) selection as a method of tree improvement, (ii) ***Selection Intensity*** affects the genetic gain. [P1/6(a) | 10 M]. • What do you understand by the term "***Provenance Trial***"? Explain the stepwise procedure for this trial followed in a forest species. [P1/8(a) | 10 M]. • Discuss the possibilities of ***Biotechnological Interventions*** in tree improvement programmes (10m). [P1/8(b) | 10 M].

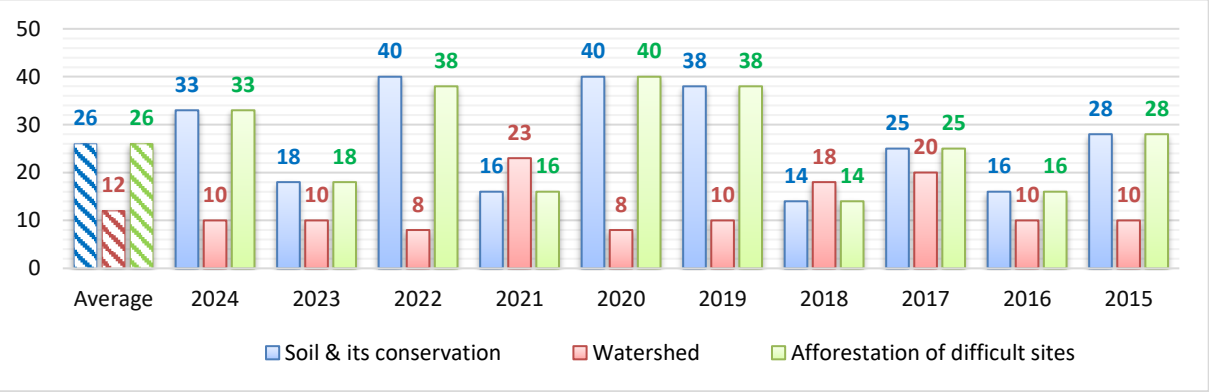
CHAPTER 10

FOREST SOIL, ITS CONSERVATION & WATERSHED MANAGEMENT

Forests Soils : Classification, factors affecting soil formation; physical, chemical and biological properties.

Soil Conservation : Definition, causes for erosion; types – wind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; sand dunes; reclamation of saline and alkaline soils, water logged and other waste lands. Role of forests in conserving soils. Maintenance and build-up of soil organic matter, provision of lopping's for green leaf manuring; forest leaf litter and composting; Role of micro-organisms in ameliorating soils; N and C cycles, VAM.

Watershed Management : Concepts of the watershed; the role of mini-forests and forest trees in overall resource management, forest hydrology, watershed development in respect of torrent control, river channel stabilization, avalanche and landslide controls, rehabilitation of degraded areas; hilly and mountain areas; watershed management and environmental functions of forests; water-harvesting and conservation; groundwater recharge and watershed management; the role of integrating forest trees, horticultural crops, field crops, grass, and fodders.



FOREST SOIL, & ITS CONSERVATION

2024	• Describe in brief the types of forest soils existing under diverse ecological zones. Suggest suitable techniques for the conservation measures followed under ravines, water logged, hot deserts and coastal areas [P1/8(b) | 10 M]. • Explain the concept of soil biological fertility. Suggest a suitable plan for the restoration of soil biological fertility through the use of eco-friendly sources [P1/8(c) | 15 M]. • Briefly describe the current scenario of the ***Saline*** and ***Alkaline Soils*** in India. Draw a management plan using suitable plant species [P1/5(b) | 8 M].
2023	• How does moisture influence the soil formation and growth of vegetation? [P1/5(c) | 8 M]. • Explain the theory of humus formation predominant in forested vegetation [P1/6(b) | 10 M].

2022	• How does C: N ratio of plant residue in soil influence the rate of decomposition and nitrogen availability to plants? [P1/5(d) | 8 M]. • Give a detailed profile of a soil showing various zones and explain the function of each soil zone [P1/7(c) | 10 M]. • Explain the principles of ***Bioengineering*** measures for soil and water conservation. Write in brief four common bioengineering techniques for hill and slope stabilization works using plants [P1/7(a) | 20 M]. • Discuss the components of ***Desert Ecosystem***. Write steps to control shifting of sand dunes [*Linked Q* | P**2**/6(b) | 15 M].
2021	• How does soil organic matter decomposed influence forest productivity? [P1/5(d) | 8 M]. • Explain the terms – (a) Cation Exchange Capacity, (b) Salinity & Alkalinity [P**2**/5(a) | 8 M].
2020	• Write short notes on the following – (a) Soil texture and structure, (b) Soil organic matter, (c) Carbon nitrogen ratio. [P1/8(c) | 15 M]. • What is the different soil type found in India? Identify five tree species growing each in Alluvial soils, red soils, Black cotton soils and Arid and desert soils. [P1/7(b) | 15 M]. • Define afforestation. Discuss in brief the afforestation techniques, including the choice of species, for ravine lands [P1/3(a) | 10 M].
2019	• Soil is an interface of air, minerals, water and life. Comment [P1/5(c) | 8 M]. • What are the ***Paedogenic Process***? Explain the important process of soil formation [P1/8(c) | 15 M]. • What are the characteristics of ***Saline*** and ***Alkaline Soils***. Explain the reclamation of saline and alkaline soils with suitable tree species [P1/7(a) | 15 M].
2018	• Write in detail about the influence of ***Parent Rock*** in the distribution of tree species [*Linked Q* | P1/5(c) | 8 M]. • Write the ***Soil-Water Relationship*** of any forest area. Describe the influence of water table in the growth and development of tree species. [P1/7(a) | 10 M].
2017	• What are the various methods adopted to conserve the soil on sloping areas? Explain in brief. [P1/7(b) | 10 M]. • Where are ***Cold Deserts*** found in India? Explain site characteristics encountered in a cold desert and steps suggested to overcome problems in their afforestation [*Linked Q* | P1/3(a) | 10 M]. • Describe the technique of ***Sand Dune Fixation*** in the thar desert. Also mention the choice of species for plantation [P1/3(b) | 15 M].
2016	• Write distinguish features of ***Saline Alkaline Soil*** [P1/5(b) | 8 M]. • Explain ***Types of Rocks*** based on formation and minerals based on chemical compositions [P1/5(d) | 8 M]. • Write the characteristics of ***Cold Desert***. Discuss soil working and planting techniques for cold desert [*Linked Q* | P1/1(d) | 8 M].
2015	• Why is a lot of emphasis laid on research relating to soil conservation? Discuss [P1/5(b) | 8 M].

	• Describe different textural classes of soil and the way they affect plant growth. [P1/6(b) | 10 M]. • Why is ***Saline-Alkaline Soil*** considered problematic? can you suggest any procedure to make it suitable for plant growth? [P1/7(b) | 10 M].
2014	• Specific problem of ***Coastal Land*** and ***Hot Deserts*** [*Linked Q* | P1/2(b) *iv* | 5 M].
2013	• What are the specific problem of the following wasteland? suggest at least 3 species for planting in each of them (20 m) – (a) Hot desert, (b) Saline alkaline soil, (c) Wetland, (d) Cold desert. [P1/2(a) | 5 × 4 = 20 M].
2012	• Explain different process of soil erosion. Briefly describe them giving examples as to how the vegetation including trees can help in conserving soil and water [P1/7(b) | 10 M]. • Describe briefly the afforestation techniques adopted for ***Ravenous Lands of Yamuna*** giving suitable species [P1/5(f) | 5 M]. • Give suitable forestry techniques for the reclamation of ***Salt Affected Soils*** [P1/6(b) | 8 M]. • How shelterbelt and wind breaks are helpful in ***Sand Dune Stabilization*** and desert control? [P1/5(a) | 5 M]. • Discuss afforestation of inland sand dunes by giving their distribution, site conditions, planting techniques and species suitable in such areas [P1/5(e) | 5 M]. • List the Pioneers flora of sand dunes under – [*Linked Q* | P2/5(b) | 8 M]. (a) On dunes, (b) Spread out sand, and (c) Stabilized dunes.
2011	• Discuss the factors that inhibit tree growth in ***Alkali*** and ***Saline Soils***. How is alkali soil managed for tree species plantation? Write scientific names of four tree species suitable for plantation in Alkali soils [P**2**/6(a) | 20 M].
2010	• "Among the causes of soil erosion some are manageable" comment [P1/7(b) *i* | 5 M]. • Difference between erodibility and erosivity [P1/7(c) *ii* | 5 M]. • What are ***Saline*** *and* ***Sodic Soils*** ? [P1/7(d) *i* | 5 M]. • Mention ten species (Scientific name) of trees tolerant to salinity [P1/7(d) *ii* | 5 M].

WATERSHED MANAGEMENT

2024	• What is the role of ***Watershed Development*** plan in India? Describe its guidelines framed for better implementation. Briefly write on the watershed mission project [P1/6(b) | 10 M].
2023	• Explain the benefits of ***Watershed Management*** [P1/7(b) | 10 M].
2022	• How does ***Watershed Influence*** the ecology and socio-economic development of a region? [P1/5(c) | 8 M].
2021	• How can ***Watershed Management*** enhance and promote sustainable integrated water resource management? [P1/5(c) | 8 M].

	• How do you differentiate a springshed from a ***Watershed***? Explain how a healthy springshed can ensure a better hydrological cycle of an area [P1/7(b) | 15 M].
2020	• What are the roles of forest in ***Watershed Management***? [P1/5(c) | 8 M].
2019	• Write the characteristics of ***Watershed***. Explain the factors affecting watershed management [P1/6(c) | 10 M].
2018	• What are the measures to be taken into consideration during preparation of earthen ***Check Dam*** in the forest areas? [P1/5(b) | 8 M]. • What is ***Hydrology***? Describe the role of hydrology in planning and management of watershed development. Does tree species improve the infiltration rate, soil temperature, water level and hydrological cycle? Justify with few examples [P1/8(a) | 10 M].
2017	• What is ***Water Harvesting***? List the different methods of water harvesting and suggest various practices for efficient use of conserved water [P1/8(a) | 20 M].
2016	• Define ***Watershed***. Describe tree-based models for reclamation of degraded hills [P1/8(c) | 10 M].
2015	• Good ***Watershed Management*** must consider the social, economic and environmental sustainability, and institutional factors. Comment [P1/8(a) | 10 M].
2013	• What is ***Watershed Management***? Explain its objectives and role in rural development [P1/8(d) | 10 M].
2012	• Describe the afforestation in an undulating community land situated in the catchment, of a small water reservoir [P1/6(d) | 5 M].
2011	• Explain the various applications of geo-textiles for soil conservation [P1/5(c) | 10 M]. • Write short notes on – (ii) ***Riparian Buffer*** [P1/7(c)ii | 2½ M]. • Discuss the factors to be considered for efficient ***Recycling of Harvested Water*** [P1/8(d) | 10 M]. • Discuss strategies and plans adopted for the treatment of catchment areas [*Linked Q* | P**2**/3(b) | 10 M].

AFFORESTATION OF DIFFICULT SITES

2024	• Describe in brief the types of forest soils existing under diverse ecological zones. Suggest suitable techniques for the conservation measures followed under ravines, water logged, hot deserts and coastal areas [P1/8(b) | 10 M]. • Explain the concept of soil biological fertility. Suggest a suitable plan for the restoration of soil biological fertility through the use of eco-friendly sources [P1/8(c) | 15 M]. • Briefly describe the current scenario of the ***Saline*** and ***Alkaline Soils*** in India. Draw a management plan using suitable plant species [P1/5(b) | 8 M].
2023	• How does moisture influence the soil formation and growth of vegetation? [P1/5(c) | 8 M].

	• Explain the theory of humus formation predominant in forested vegetation [P1/6(b) | 10 M].
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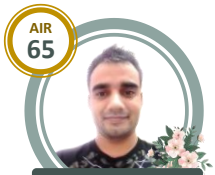

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