Hornbill Classes

HORNBILL CLASSES

Forestry Optional

IFoS | 2023 | Main Test Series | Test Paper 1

Name of candidate	PATOLIYA RAJ BHIKHUBHAI
Date	07/10/2023
Examination	IFoS (Main) 2023

Index Table

QN	Maximum Marks	Obtain marks
1 (a)	8	4
1 (b)	8	4.5
1 (c)	8	4
1 (d)	8	5
1 (e)	8	5
2 (a)	15	8
2 (b)	15	7
2 (c)	10	4
3 (a)	20	
3 (b)	10	
3 (c)	10	
4 (a)	15	8
4 (b)	10	8
4 (c)	10	5
5 (a)	8	4
5 (b)	8	4.5
5 (c)	8	5
5 (d)	8	5.5
5 (e)	8	2
6 (a)	15	
6 (b)	15	
6 (c)	10	
7 (a)	15	
7 (b)	15	
7 (c)	10	
8 (a)	15	8
8 (b)	15	7.5
8 (c)	10	4

$$\frac{103}{200}$$

* Draw Diagram Properly
* Pls read Question Properly. Sometime. whot
unnecessary Content
* Overall — good.

1. Answer the following [8 × 5 = 40]

   (a) Define mycorrhiza and its role in the success of forest plantation (8 Marks)

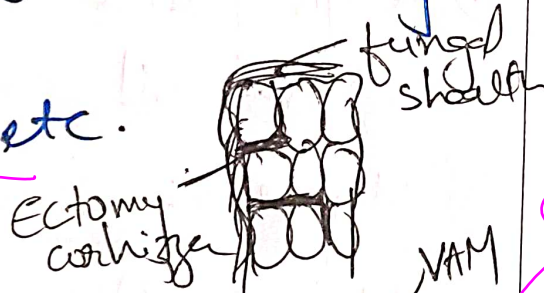Mycorrhiza is defined as a symbiotic relation between fungi and plants.

Two types {
  Endomycorrhiza
  Ectomycorrhiza.
}

4

Ectomycorrhiza

fungi : Ascomycetes and Basidiomycetes

Plants : Casuarina etc.

underline

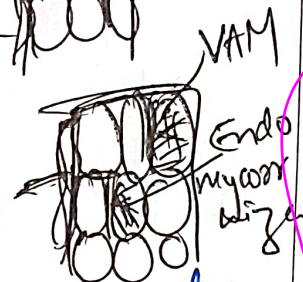fungal sheath

Ectomy corrhiza

Endomycorrhiza →

VAM

Endo mycorrhiza

fungi : ~~Basidiomycetes~~ phycomycetes

plants : Angiosperm

VAM (Vasicular Arbiscular mycorrhiza)

good †
try to use
color Pen.
for more
clear
figures/diagram

1

Success in forest plantation

① Reservior of phosphate (70-80%)

② provide resistance against drought, frost etc (extreme weather).

③ Helps in producing growth hormone called |Auxin| ang |gibberelin|.

④ Helps plant to uptake nutrient from soil and moisture.

⑤ "Mycorrhiza induced resistance" against the disease.

⑥ Help to tap the essential micro and macro nutrient.
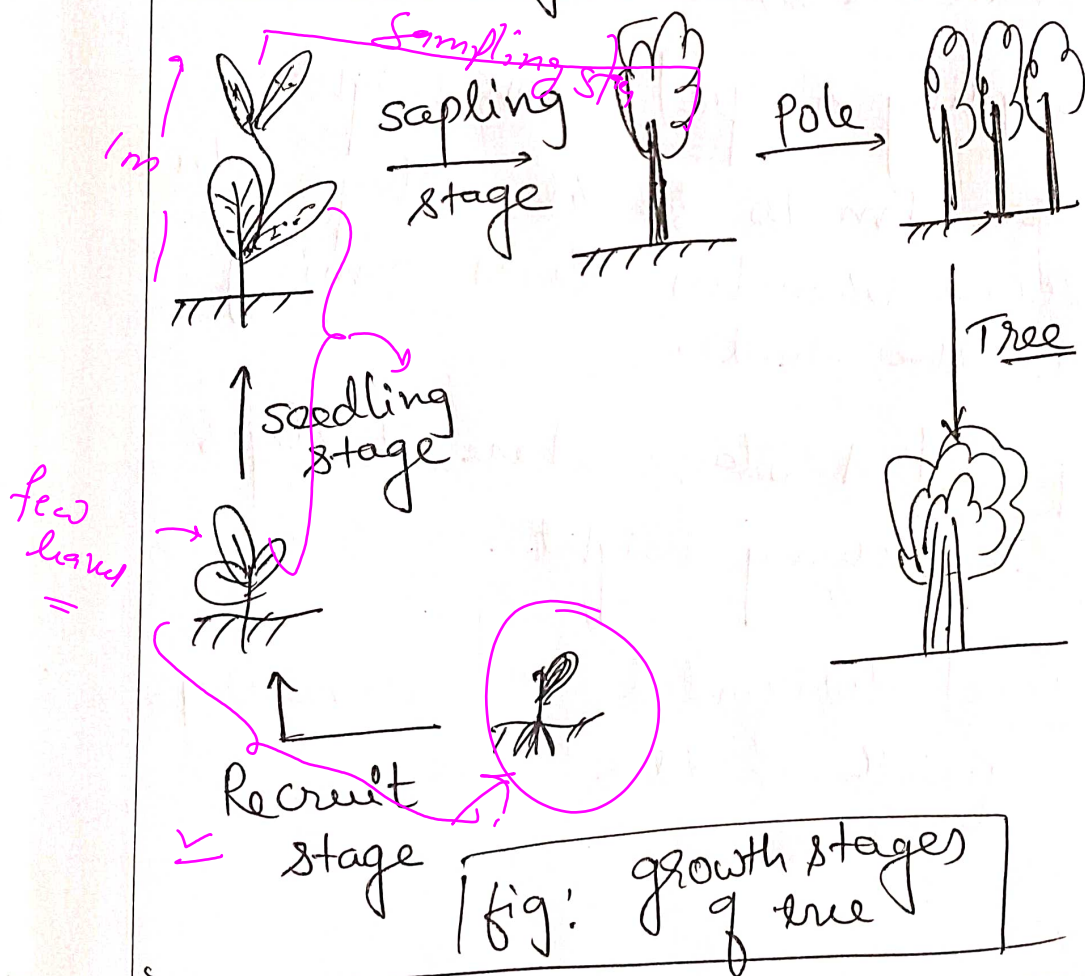
eg: (Frankia) and Casuarina equisetifolia

श्रृ. Bacteria

(b) Explain the different growth stages of trees

(8 Marks)

Proper growth of the tree depends upon various factor such as climatic, edaphic, topographic, biotic and participation of human and economic factor.

| Different growth stages of trees |

sapling stage

Pole

Sampling stage

seedling stage

few leaves

Recruit stage

Tree

fig: growth stages of tree

Recruit stage Growth of plant from germination of seed to the stage where few leaves are grown.

Seedling stage few leaves to the height of plant is less than (<1) meter.

sapling stage From height of tree 1m to the stage where lower branches starts coming in the plant.

pole A stage where it stops in growing height of

Tree Horizontal or secondary growth in the tree demark.

(c) Differentiate between Even-aged and Un-even aged stand

(8 Marks)
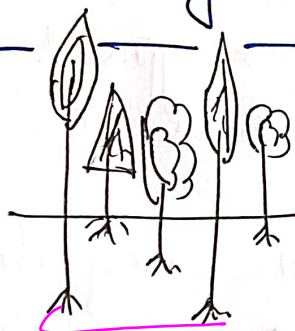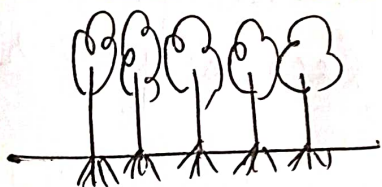
Even aged	Un-even aged stand
Most of the tree stand is of even age (same age) class	Mixed type of forest. (Not same age class)
even aged	Uneven aged
Site quality is not properly utilize	Site quality can be effectively utilized.
Economically important because less tapering rate, straight bole, natural pruning, uniform crown.	Economically less important because high tapering rate, unuiform crown size.

revised once again and try to rewrite this Question again

5

HORNBILL CLASSES

Even aged	Uneven aged
Examples Nilambur teak Plantation	Satpura forest
Ecologically less important	Ecologically more important *desirable*
phenotypical superior	phenotypical less superior.
More susceptible to fire, insect, pest attack.	less susceptible to fire, insect, pest attack
Easy to supervise and Mangge.	Difficult to supervise and manage
eg Clear felling System	eg shelterwood or Selection system.
Artificial regeneration	Natural regeneration

6

(d) Explain the role of fire in forest regeneration

(8 Marks)

Fire plays an important role in regeneration of forest.

| Role of fire in forest regeneration |

① Fire helps in removing the [exogenous dormancy] of the seeds.

(eg) Tectona grandis seed. (orthodox seeds).

② Fire helps in removal of unwanted trees or weeds present in the area.

③ The ash of the burnt plants helps in regeneration of new crops. (source of nutrient)

7

④ Due to fire certain micro-organism which may be harmful becomes <u>dead</u>.
(Helps in controlling <u>Biotic</u>) factors

⑤ slow [fire] at night helps crop to protect from frost attack.
(i.e) Frost tender species like Terminalia <u>arjuna</u>, Tectona <u>grandis</u>

⑥ Faster regeneration process therefore reduces rotation period.
(Help in pre-preparation of field before sowing with low time period).
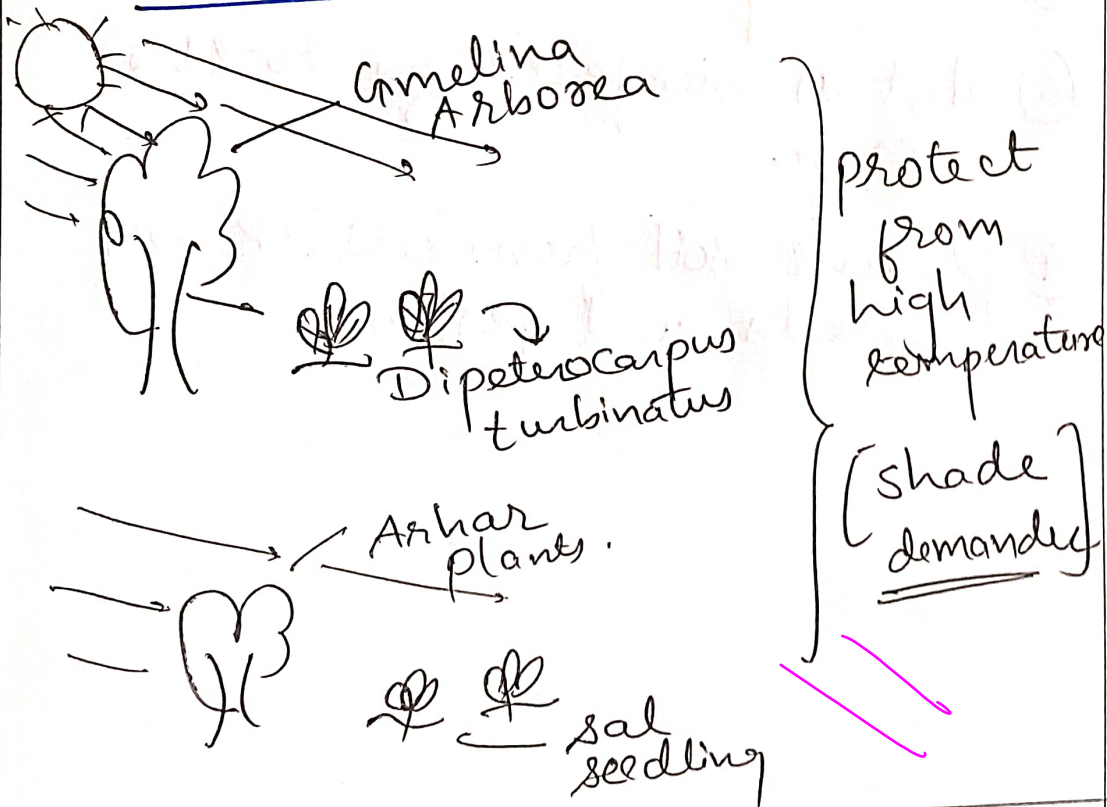
(e) Cover crop and Nurse crop

(8 Marks)

Nurse crop is grown with primary objective to protect a crop from frost, temperature and strong winds etc.

[eg] If the required crop species frost tender, then we should [not] select such nurse crop which shed their leaves in winter

Gmelina Arborea

Dipterocarpus turbinatus

Arhar plants.

sal seedling

protect from high temperature

[shade demander]

Cover crop

Cover crop may be shrubs or herb or small tree with main objective is to prevent soil erosion and protect soil from degradation.

Significance

1. protect against soil erosion.
2. Mulching
3. act as bio-fertilizer to the crop.
4. prevent soil from attack by weeds and pest.

2 (a) : What do you understand by the term locality factors? How do these factors affect the decision of plantation undertaking by the forester? (15 Marks)

locality factor is defined as the sum total of all climatic, edaphic, topographic and biotic factor of an area in which the crop is growing.

| Locality factors |

① Climatic ⊂
- Wind
- Temperature
- Insolation
- Moisture

② Edaphic ⊂
- Mycorrhiza
- Nutrient
- soil organic nutrient

③ Topographic ⊂
- Aspect
- Altitude
- slope
- latitude

④ Biotic ⊂
- Animal attack
- parasite.

⑤ Economical ⊂
- Availability of funds
- support of government.
- Silvicultural system

⑥ Human ⊂
- people participatoy
- Joint forest Management

How these factor affect in plantation.?

① Selection of the species is done based on the climatic factor consideration.

Ⓔ🇬 Drought resistance : prosopis juliflora

Good coppicer : Acacia nilotica

frost tender : Tectona grandis

② Edaphic factor helps in choosing right species under government programe.

Ⓔ🇬 Mangrove forest ⎰ Anaerobic soil, waterlogging soil.⎱

hence ⟹ Avicennia marina. Rhizophora mucronata ⎱

Under MISHTI Scheme ✶

3] Topographic factor plays important role. if plantation in himalaya than <u>northern slope</u> should be prefer instead of southern slope.

4) It also depends on the type of area and silvicultural system.

[eg] Hilly terrain ⟹ <u>Shelter</u> wood system
⟱
Deodar + Kail

plain terrain ⟹ Clear felling ⟱
<u>Tectona</u>
<u>grandis</u>

5) purpose of plantation plays important role. production purpose than <u>Salix alba</u>, cricket bat industries, Urban forestry than <u>Azadirachta indica</u>, Acacia <u>nilotica</u>, Mangifera <u>indica</u>, Ficus <u>benghensis</u> etc.

2 (b) Climate change is affecting the composition, distribution, and phenology (15 Marks) of plants. How?

climate change means long term increse in the temperature. This increse in temperature have affected composition distribution and phenology of plants.

climate change and composition

① Composition of plants which can tolerate high temperature.

② Reduction in the growth of new plants.
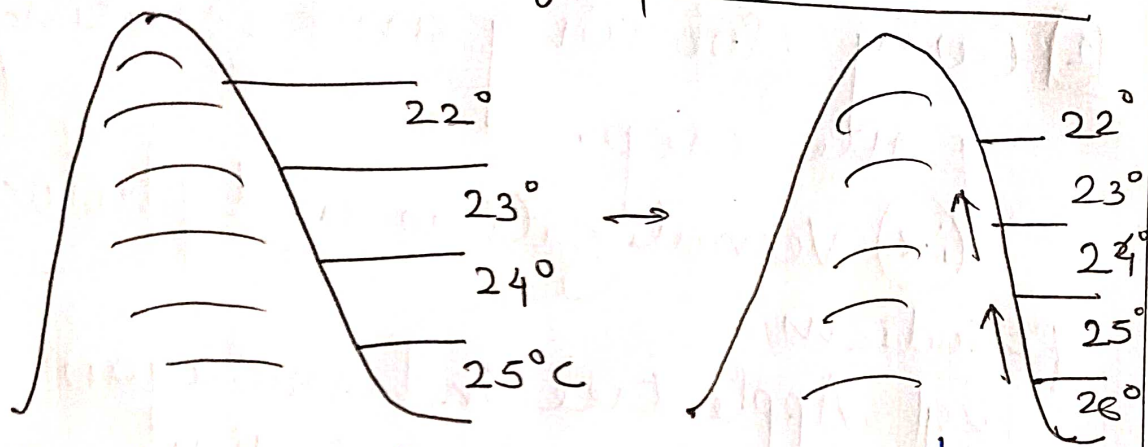
(i.e) Sunburn and sunscaled of young seedling.

③ Dominance of light demander species, reduction in shade demander.

④ Dominance of drought resistance, frost resistance etc.

Rewrite this Question if time permit for more clear structuring

14

Climate change and distribution of plants

① Upward shifting of the plant species.

② Extinction of plant species found in higher altitude.

③ Incease in invasive alien species.

④ More productivity by exotic species, due to temperature change.

⑤ 'obnoxious plant' when they get distributed in other area, due to temperature change

Climate change and phenology

① Early flowering and fruiting of the crop.

ⓘ Vernalization and photo-periodism

[eg] Apple tree in himalayan region.

② Climate change can induced new type of disease ⇒ leaf fall in different season *Early leaves shedding is shorea robusta*

③ Melting of snow, therefore affect the phenology of pinus geriardiana (Kail).

④ More gregarious flowering in bamboo ⇒ loss of biodiversity of forest.

⑤ Reduction in producing viable seeds for reproduction.

Shorea robusta (Sal) is an evergreen in silk but now start exhibiting deciduous nature in dry localities. (Imp. eg)

2 (c) Narrate the association of types of soils with various types of forest (10 Marks)

According to champion and seth Classification forest is classified into 16 types. (1968).

Types of forest	Types of soil
tropical Evergreen forest (Species) Dipetrocarpus spp Artocarpus spp. Mesua ferred.	⇒ More torrential rainfall ⇒ poor nutrient of soil ⇒ lateritic soil ⇓ dominated by Xylia Xylocarpus
Littoral and swamp forest	⇒ waterlogged soil, Anaerobic and nutrient poor soil. ⇒ gleying soil!
Tropical moist and dry decidous	⇒ Red soil in the south india and black cotton soil. (eg) Acacia nilotica
Tropical thorn forest	⇒ Desert soil or saline soil is associated.

17

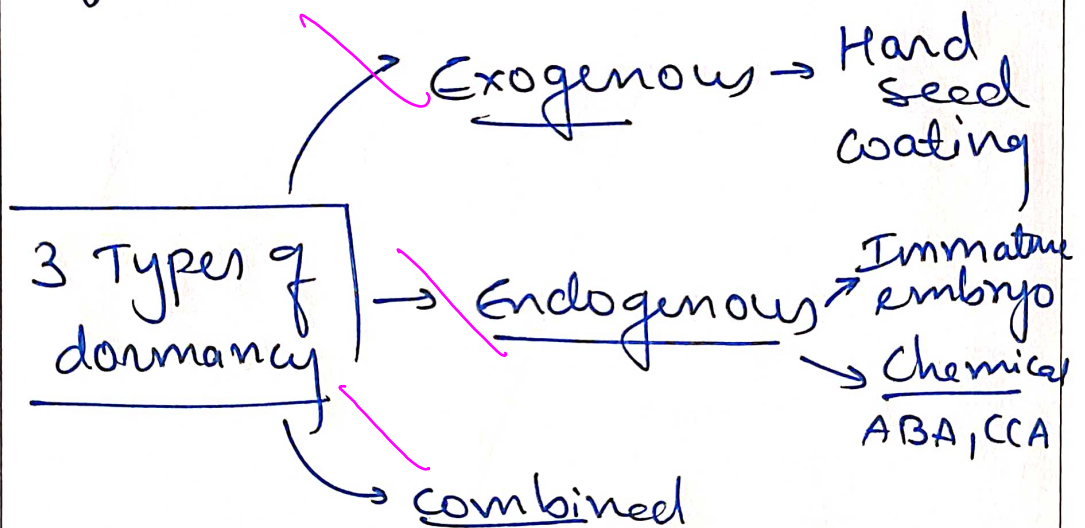|	
Subtropical dry evergreen forest	⇒ foothill of himalaya, alluvial soil (eg) ⇒ Shorea robusta
Temperate forest	⇒ Mountaneous soil with huge litter (eg) Cedrus deodara. Juniperus.
Sub-alpine and alpine forest	⇒ Brown soil with low nutrient. ⇓ cold desert condition in himalayan region of lahaul - spiti and Kinnaur region.

draw in properly in the original exam

18

4 (a) What is dormancy? How pre-sowing seed treatment helps in overcoming dormancy in tree seeds (15)   15 Marks

Dormancy is physiological phase of seed in which it fails to germinate despite availability of favourable environment.

3 Types of dormancy →

- Exogenous → Hard seed coating
- Endogenous → Immature embryo → Chemical ABA, CCA
- Combined

Therefore, to remove above dormancy, pre sowing treatment is required for proper germination of tree seeds.

Pre sowing seed treatment in overcoming dormancy

① Soak in water for 24 hour to 48 hour in case of hard seeds (eg) Tectona grandis

② weathering of the seeds.

③ Scarification of seeds.
→ H_2SO_4 acid can be used.
→ rubbing on sand paper.

④ Extraction of immature seeds from the tree.

⑤ slight fire to the seeds, so that outer layer become weak.

⑥ Animal eat the seeds and they removed it via poop (excreta).

7 ~~the~~ Cold stratification

↳ Certain seeds germinates under cold enviroment, therefore providing such environment helps in germination of such seeds.

eg Cedrus deodara

8 α rays, γ rays

↳ These rays are passed to remove chemical dormancy of the seeds in the laboratory.

→ Helps in removing the endogenous dormancy.

28

4 (b) Calculate the number of plants required for 10 hectares of plantation in which the plants are planted at 2.5 m× 2.5 m in square

15 Marks

plantation area is $\boxed{10 \text{ hectares}}$

Now, 1 hectare is $\boxed{10^4 m^2 \text{ area}}$

$10000 \ m^2$

100 m

2.5 m
2.5 m

40 plants

100 m

← 40 plants →

Therefore, if the spacing between the plantation is 2.5m × 2.5m than, In 1 hectare total 40 plants will be planted in Row and 40 plants in the column.

Let us assume that one seed is required for one plant.

Hence, Total plant in 1 hectare of plantation is given by,

$$= 40 \text{ plants} \times 40 \text{ plants}$$

$$= 1600 \text{ plants in 1 hectare.}$$

But, Total 10 hectares is given for plantation.

Hence, 1600×10

$$= \boxed{16,000 \text{ plants}}$$

4 (c) : Explain objective and different kinds of thinning operations   10 Marks

Thinning operations are carried out under tending operation by removing unwanted or bad quality timber to obtain required timber.
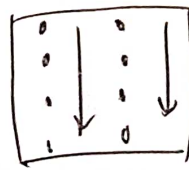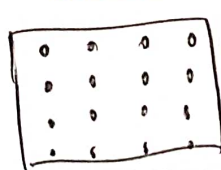
[Types]

Even aged — Un-even aged

Even aged:
- Mechanical thinning
- Ordinary thinning
- Crown thinning
- Elite thinning
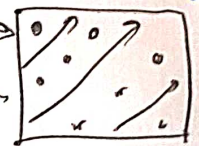- Crab thinning
- Numerical thinning.

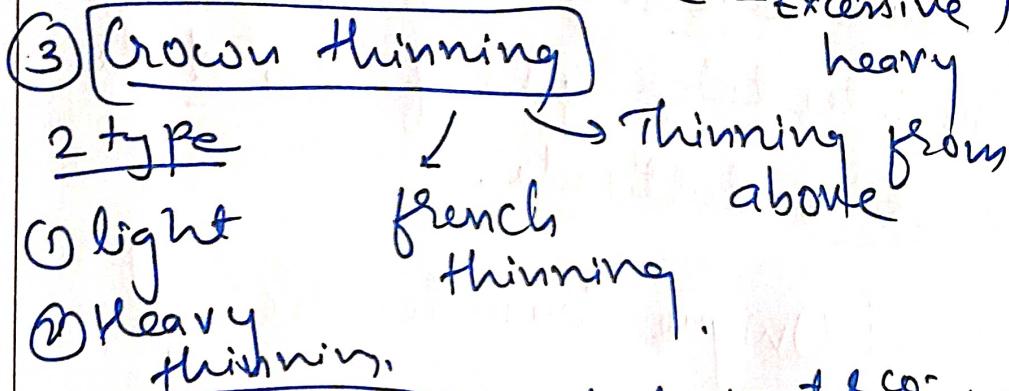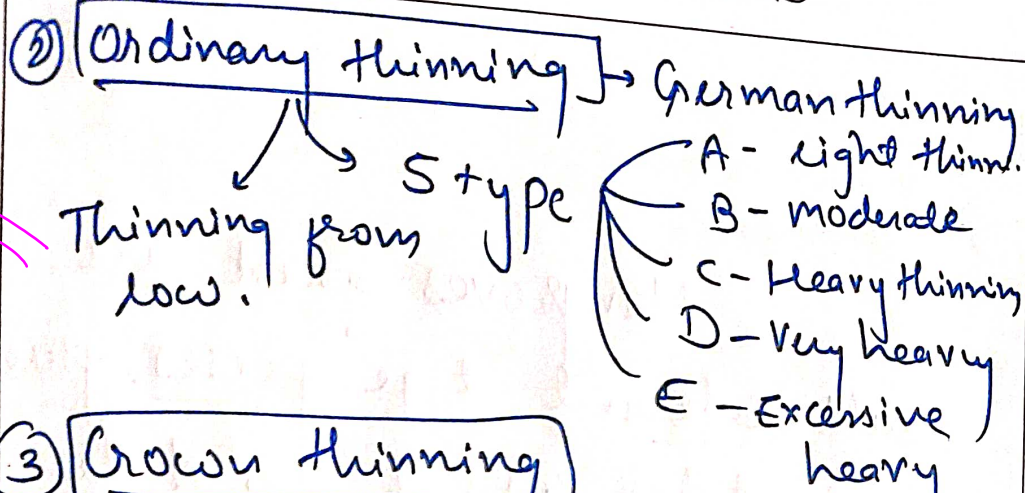Un-even aged:
- Selection type.

① Mechanical thinning

Row thinning
Space thinning

Row thinning →

Row thinning

Side notes (handwritten):
Go write summary of these in short. 2/3 line each. instead of figure

32

② **Ordinary thinning** → German thinning

↙ 5 type
- A - light thinn.
- B - moderate
- C - Heavy thinning
- D - Very heavy
- E - Excessive heavy

|| Thinning from low.

③ **Crown thinning** → Thinning from above

2 type

① light — french thinning

② Heavy thinning.

④ **Elite thinning** → only dominant & co-dominant

⑤ **Crown thinning** → Before competion begin

⑥ **Numerical thinning** < Basal area, $\frac{L}{H}$ ratio. etc

Objective

① High quality timber can be obtained.

② Reduction of pest or insect attack.

③ Regular source of income by selling timber.

④ Effective silvicultural operation

2/3 more objective

5. Answer the following [8 × 5 = 40]

(a) Describe the unique characteristic features of mangrove forests with suitable examples

8 Marks

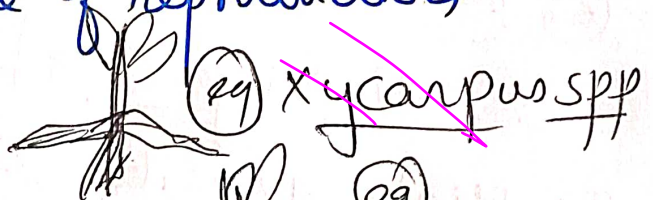Mangroves forest are salt tolerant tree species, growing in inter tidal zone of 24°N to 38°S lattitude.

Unique characteristics of Mangrove forest

① plant adaptation
Vegitational & or characteristic

① Vivipary mode of reproduction
② Buttressing
③ Knee roots
④ pneumataphores
   eg Avicennia spp.
⑤ prop & stilt root

   eg Xycarpus spp
   eg Sonneratia spp.

② Oceanic factor
① Inter tidal zone

growing in .

34

② Salt spray.
③ Tsunami and wave.

③ [Edaphic factor] characteristic

① low nutrient availability.
      eg) less N, P, K, availability.
② Waterlogging condition
③ Anaerobic soil.

④ [Biodiversity support]

① fisher   ③ Bengal tiger
② Oyster

[Ecotone zone].

⑤ [Benefits]

Tangible	Intangible
→ Bonphool honey (sunderban)	→ protection from Tsunami. (2004 india)
→ Wood, timber	→ CO_2 sequester
→ Minor forest produces.	

5 (b) : Discuss the afforestation techniques of cold desert · 8 Marks

Cold desert have unique characteristic with low temperature (<0°C), less rainfall poor nutrient soil etc

Draw it properly
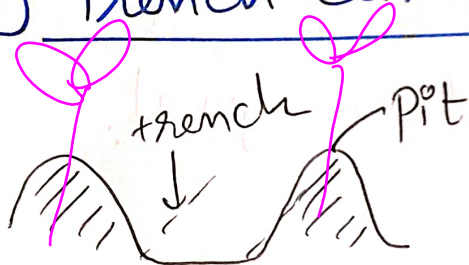
Ladakh
Lahaul & spiti
Kinnaur

Afforestation techniques

① Trench·cum-pit Method

trench   pit

In this technique 120 cm long trench with 60 cm wide and 45 cm depth trench is done.

[Species] Hipphopae rhamnoides
(sea buck thorn)

36
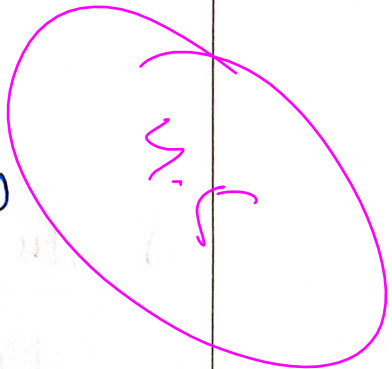
(ii) Irrigation cum drainage

Due to unavailability of the water in cold desert, such afforestation technique can be used.

Species → pinus wallichiana
(Kail)

(iii) Stump plantation with pollarding

Hardy stump prepared in the nursery is planted and then pollarding is carried out.

Species
- Salix alba
- populus deltoides

5 (c) : Describe the method of artificial regeneration of *Tectona grandis*　8 Marks

Tectona grandis

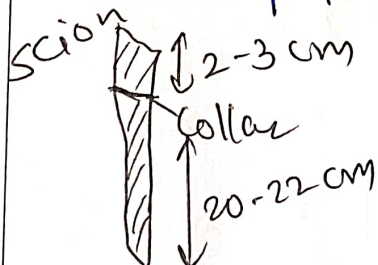Common name; TeaR

Family : Verbenaceae

Tectona grandis is light demander tree with uniform Crown grown in india below 24° N.

Method of Artificial regeneration

(1) Seeds →
- orthodox seeds
- Remove exogenous dormancy.
- Good seed year seeds.

(2) Stump plantation

Scion ⎰ 2-3 cm
Collar
20-22 cm

stump of teaR is prepared in the nursery.

③ Cutting

Stem cutting can be used for artificial regeneration of the teak.

④ Coppice

As teak is good coppicer, coppicing can be used for artificial regeneration of teak.
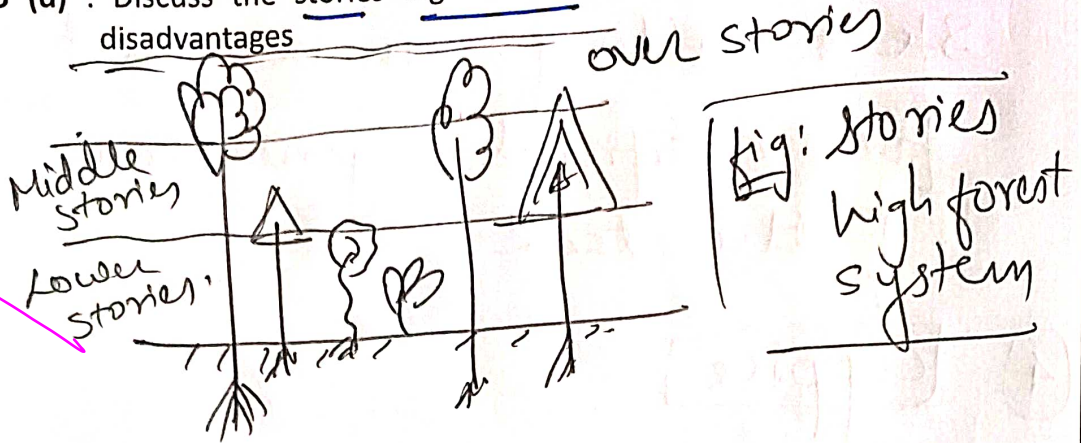
⑤ Tissue culture

→ This can also be used to provide desired characteristic.

⇒ In-vitro method for artificial regeneration.

5 (d) : Discuss the ^two stories high forest system with its advantages and disadvantages   8 Marks

Middle stories
over story
Lower stories

fig: stories high forest system

Forest regenerated by the seeds is called high forest.

Dominant (D): Tallest of the plant in the forest is called Dominant true

Pre-Dominant : D_1

Co-dominant : $\frac{5}{6}^{th}$ of $D_1 = D_2$

Dominated , $d \Rightarrow \left(\frac{3}{4}^{th} \text{ of } D_1 \right)$ then it is called dominated

Suppressed $S = \left(\frac{1}{2} - \frac{5}{8}^{th} \right) D_1$ is called suppressed.

diseased tree (K), Moribund tree etc,

[Advantage]

① proper utilization of site quality.

② Growth of light demander with shade demander together.

③ protect soil from frost or soil erosion.

④ forest stratification, hence more ecological supriority.

[Disadvantage]

① Competition among species for light.

② May become source of pest or disease attack.

③ lower storey cannot grow much fastly.
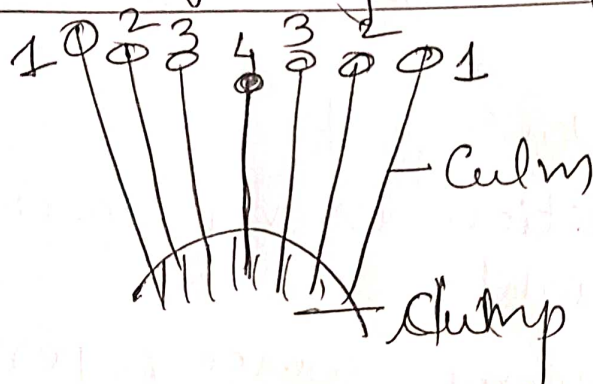
④ Economically not viable for lumbering industries.

5 (e) : Discuss general felling rules of Bamboo

Bamboo are perenial grasses. It comes under Graminaceae family.

Example of bamboo → Dendrocalamus strictus.
→ Arundinaria falcata.

General felling rules of bamboo

— Culm

— Clump

Standing bamboo wood is called culm, whole plant of bamboo grass is supported together called clump.

2

good?

During felling, outermost Culm should be fell first. (i.e from figure no. 1), during Secondary felling no. 2 culm would become the outer and mature, hence no. 2 will be cut. In this way Culm should be felled from outer to inner part.

⟹ As new culm of bamboo will come in inner side of the clump.

Revised it once and Rewrite.

8 (a) : Explain in brief the Distribution, phenology, and Silvicultural characteristics of the following tree species (15)   15 Marks

(i) Casuarina equisetifolia
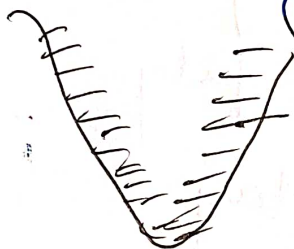
(ii) Acacia nilotica

(iii) Shorea robusta

(i) Casuarina equisetifolia

Family : Casuarinacea

Distribution : Exotic tree species from indonesia : grown in the coastal region of india.

Casuarina equisetifolia.

Temperature : 10-40°C

Rainfall : 200-300 cm

Soil : May survive in saline or waterlogged condition.

phenology

leaf fall : Twice in the year once in Nov-Dec and once in june .

61

leaf renewal : After the fall of the leaf.

fruiting : Twice in the year in jan-feb and once before monsoon.

Silviculture Character (i) light demander species

(ii) drough tolerate species

(iii) Highly wind firm

(iv) presence of Frankia, Mycorrhiza hence good growth.

good

(ii) Acacia nilotica

Common name: Sissoo → babool

Family : leguminoseae

Distribution

In state like, gujarat, rajasthan, U.P, bihar, odisha and even in south india (pan india presence).

(ii) Acacia nilotica

Common name : Sisoo

Family : leguminosaea

Temperature : $10^b - 40°C$

Rainfall : 70 cm — 160 cm

Soil type : loamy, well aerated soil avoid waterlogging and saline condition

Phenology leaf fall : March - April

leaf renewal : May - june

flowering : June july

fruiting : April - May

Silviculture characterishc

① light demander species

② Frost resistant species

③ Wind firm tree ⇒ good root development

④ Moderate fire resistant.

⑤ Orthodox seeds

(iii) **shorea robusta**

Common name : **Sal**

Family : **Dipterocarpus**

Distribution

Found in North india, Assam, meghalya etc

Temperature : $10°C - 40°C$

Rainfall : $200 cm - 300 cm$

soil : alluvium soil, loamy soil.

phonology leaf fall : Feb - March

leaf renewable : April - May

flowering : April - May,

fruiting : May - june

Silvicultural characteustic
① light demander species.
② Frost resistant species
③ Wind firm with good root system
④ Moderate fine resistance.

8 (b) : Define clear felling. Write down the types, advantages and disadvantages of this system with a suitable diagram   15 Marks

Clear felling is silviculture operation under which the trees are felled in single operation. [Divided into equi-extensive and equi productive]

Coupe ⟵

Felling : felling of crop in single operation. plantation as well in single operation.

Character of Crop → Even aged crop.

Regeneration → Mainly artificial regeneration but some -time natural regeneration.

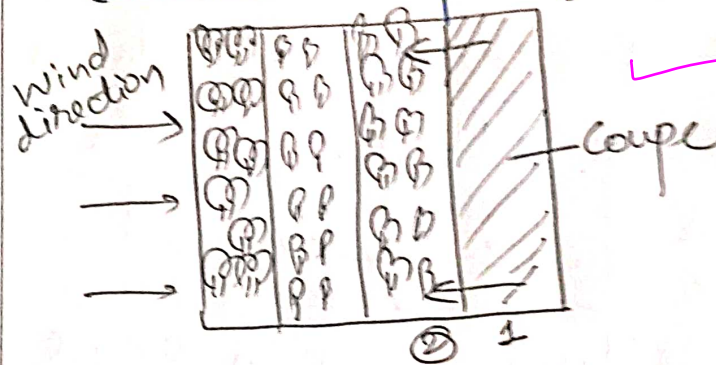Tending operation → pruning, climber cutting, weeding etc.

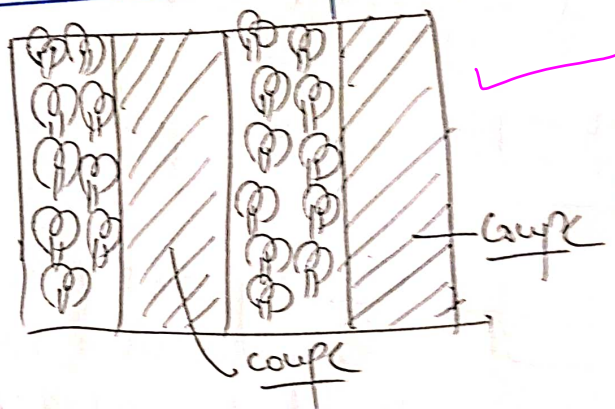Example pinus Resia , Casuarina equisetifolia , Shorea Robusta

Two types

① Clear strip system

Wind direction →

→

→

coupe

② 1

② Alternate strip system

coupe

coupe

Advantage of clear felling

① Simplest silvicultural operation.

② Easy to supervise and manage.

③ High quality timber with less tapering, natural pruning and straight bole.

④ Mechanization can be used and high productivity.

⑤ More Economically viable ⇒ more return.

⑥ Does not require skill set, easily managed.

| Disadvantage of clear felling |

① Site quality is not properly utilise.

② danger of soil erosion as the area is open for long time.

③ Frost may affect the seedling and sapling.

④ insect or pest attack may be susceptible.

ⓔ Sal heartwood borer in Sal.

⑤ Only light demander species can be grown.

⑥ Shortage of labour during the season.

⑦ If excessive production ⇒ less price in market. —
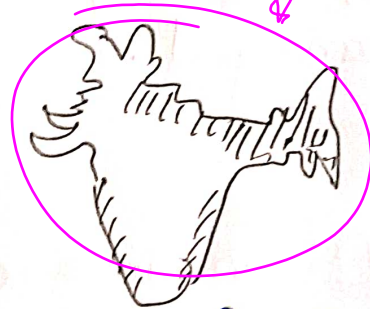
So not suitable where small market.

Dendrocalamus strictus

Family: Graminaceae

Distribution

growing area?
Draw it Properly.

Temperature: 10° – 45° C

Rainfall : 150 cm – 200 cm of rainfall

Soil : → lower canopy in tropical and subtropical region. }?

Forest type :. Tropical forest
  • Mountain subtropical forest
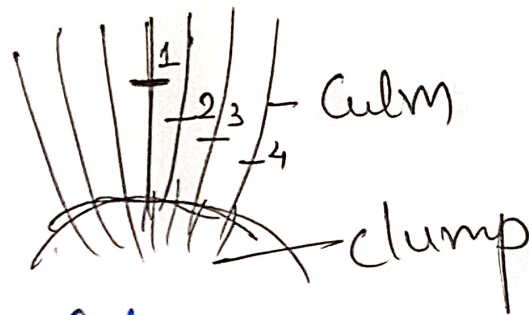   ↳ Moist broad leaves
  • Mountain temperate forest

→ gregariously distributed in north east of india.

Regeneration method ┤ ① Rhizome cutting,
② Seed.
③ Rooted Culm.

68

Outer Culm is culted first, then inner side culm under silvicultural operation.

[Commercial uses]

(i) It is used in Construction sector for formwork,

(ii) Used as irrigation tool under 'Zabo' of Nagaland.

(iii) In nursery cutting is used for selling purpose (Rhizome)

(iv) It is used in shipping industry and furniture industry.