MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION
B. Sc. (Hons.)(Agri.)

Semester	: II (New)			**Academic Year**	: 2018-2019
Course No.	: FRST-111	**Title**	: Introduction to Forestry		
Credits	: 2 (1+1)				
Day & Date	:	**Time**	:	**Total Marks**	: 40

Note: 1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory
3. All questions carry equal marks
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 Define coppice and explain in detail natural regeneration of forest by coppice

A shoot arising from an adventitious bud at the base of a woody plant that has been cut near the ground or burnt back is called as a **coppice.** **(1 mark)**

Natural regeneration by coppice: **(3 marks)**

coppice generally arise from the adventitious buds formed between the wood and the bark of the stump and are comparatively short lived than those produced by dormant buds.

Some of the forest species hae difficulty to regenerate through the seeds. Therefore, their coppicing aility is utilized for the regeneration. e.g. teak (*Tectona grandis*) and sal (*Shorea robusta*).

The regeneration obtained by coppice is called as a **coppice crop** which when develops into a forest is called as a **coppice forest.**

Coppice regeneration is of two types:

a) **Seedling coppice:** is defined as the coppioce shoots arising from the base of the seedling that have been cut or burnt back.this method is used for the established reproduction when it is not making the good progress. In such cases seedlings are burnt and allowed to produce coppice shoots growing vigorously than the original seedlings. e.g. teak saplings grown needs to be cut back to get vigorous coppice shoots in black cotton soils. Seedling coppice also forms the main system of regeneration in sal forests of U.P., Bihar, Osissa and M.P.

b) **Stool coppice:** is defined as the coppice arising from a living stump or stool. When tree falls or is cut back above ground, few shoots arise from the adventitious buds near the top of the stumps. They are known as stools. Sometimes, shoots may arise from the collar region or the junction of the root and shoot and are called as collar shoots. As the shoots arising from the top of stumps are prone to the damage by blowing winds or rotting of the stumps; root collar shots give rise to better trees than stool shoots. E.g. Teak forests of Maharashtra, M. P., Bihar and Tamilnadu stool coppice is the source of regeneration. it is called as coppice with

standard or coppice with reserve system, where, low stumps are planted in slightly sloping position and are allowed to give out shoots at lower level which later on produce their own root system and are less affected by the rotting of stumps.

Factors affecting the coppice regeneration:

1. **Species:** coppicing ability of the species vary according to their genetic make upor inherent nature. On this basis species are classified as Strong coppice, Fair coppice, bad coppice and do not coppice.
2. **Age of the tree:** young trees and saplings produce good coppices due to smooth bark as compared to old trees.
3. **Season:** coppicing at the start of spring season is better as it provides the stored food anchors the regeneration activities in plant and thus sufficient growing period for the coppice produced
4. **Stump height:** Stump height varies with the species however, 15-25cm higher stumps are ideal as taller stumps are liable to be damaged by the wild animals whereas too low stumps are susceptible to stump splitting, termite attack and rotting.
5. **Method of cutting:** smooth sloping clean top cut without bark splitting drains helps draining rain water and prevents stump rotting. It helps in retaining coppicing ability.
6. **Rotation:** coppicing vigour decreases with increase in number of rotations.
7. **Other factors:** Climatc, Soil, Fire, Grazing, Browsing.

Q.2 Enlist different objectives and methods of thinning:

Objectives and methods of thinning: (Any four) **(2 marks)**

1. To improve the crop hygiene and protection
2. Salvage of anticipated losses of the merchantable volume
3. To assure the best physical conditions of growth
4. To obtain desired crop
5. Improvement of stand composition and regeneration
6. Improvement in Wood Quality
7. To Increase Net Yield and Financial out turn from a Stand
8. To Help Decomposition of Raw Humus

Methods of Thinning: **(2 marks)**

Following are the important and mostly adopted methods of thinning:

1. Mechanical Thinning
2. Ordinary Thinning
3. Crown Thinning
4. Free Thinning
5. Crab's Advance Thinning
6. Maximum or Numerical Thinning

Q.3 Explain use diameter tape with advantages and disadvantages in tree diameter measurement.

Diameter tape **(1 mark)**

- The diameter of a tree cross section may be obtained with a flexible tape by measuring the circumference of the tree and dividing by π (D=C/ π).
- The diameter tapes used by foresters, however are graduated at intervals of π units (in or cm), thus permitting a direct reading of diameter.
- A diameter tape is a measuring tape that has scales on both sides: one side is specially marked to show the diameter of a tree, and the other is a normal scale.

Advantages of tape: **(2 marks)**

- Tape is convenient to carry.
- It does not require constant adjustment.
- Only one measurement is needed even with irregular trees.
- Diameter measurement by tape is the easiest in the case of logs lying on ground.
- The errors in case of tape are always positive and systematic.
- Tape negotiates the whole circumference of the tree.
- Tape readings are more consistent.

Disadvantages of tape: **(1 marks)**

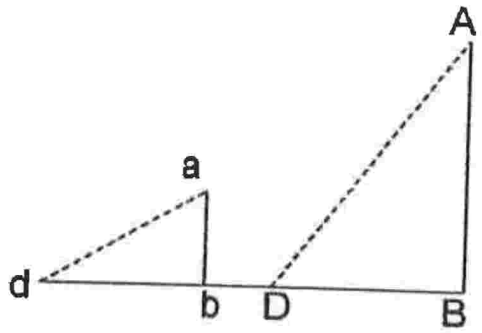
- The tape exaggerates the diameter if the tree has rough bark.
- It is somewhat slower to particularly in areas with dense shrub growth.
- Difference in tension of the tape due to elasticity affects true diameter.

Q. 4 (a) Describe the non-instrumental methods of tree height measurement in short.

1. **Shadow method**: a pole of convenient length is fixed upright in the ground and its height above the ground is measured. The shadows of the pole and the tree are also measured.

AB/ab = BD/bd, AB = BD x ab/bd

Where, AB is the tree, ab is the portion of the pole above the ground level, BD is the length of shadow of the tree and bd is the shadow of ab.



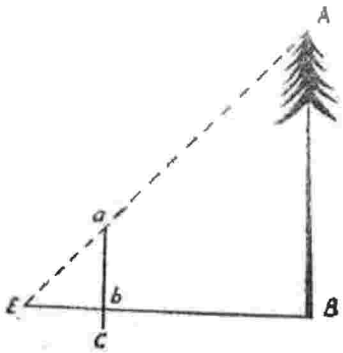
2. **Single pole method**

Pole of about 1.5 m length vertically at arm's length in one hand in such a way that portion of the pole above the hand is equal in length to the distance of the pole from eye.

AB/ab = EB/Eb i.e. AB = EB x ab/Eb

Where,

AB = tree, ac=pole about 1.5 m long, Eb=ab



b. Describe the differrent crown forms of trees (Any 4) **(2 marks)**

1. Conical: the crown width is maximum at base and it tapers towards apex forming a conical structure. e.g. pine, deodar
2. Cylindrical: uniform size horizontal branches on all sides form a cylindrical crown. e.g. fir, spruce, eucalyptus, casuarinas.
3. Spherical: all branches develop irregularly giving a spherical crown shape. e.g. mango, tamarind, citrus
4. Broad and flat topped: crown is globular but here the top of the crown is not round but, it is somewhat flattened. e.g. Acacia planiformis
5. Broom shaped : number of branches develop with little leaves and as there is no girth it forms a broom like structure. e.g. babul tree
6. Frondose crown: as in Prosopis juliflora
7. In trees like coconut, arecanut i.e. palms there is no branching on stem and crown is formed only with the broad and compound leaves at the top of unbranched stems.

Q.5 Write in detail artificial regeneration of forests by vegetative methods (4 marks)

Planting material besides seeds for e.g. Bare root seedlings, containerized seedlings, cuttings, layering, rhizomes, suckers, offsets, bulbs, corms are also used for vegetative propagation material.

Propagation by Cuttings: Cuttings are of two types, 1. Stem cutting 2. Root cutting

1. Stem Cutting: The species, which easy to root are suitable for this method of planting. Particularly species of di-cotyledons group having active cambium layer e.g. Shisam, Nimbara Drumstick, Mulberry Inga dulsis, Dhaman, Pangara, Pimpal, and Banyan Tree etc. Depending upon the maturity of stem cutting are grouped into:

i) Hard Wood Cutting: Mature woody branches are used.

ii) Soft Wood Cutting: Recently mature branches are used e.g. mulberry-Inga dulsis.

iii) Root-cutting: Roots are used for preparation of cutting e.g. Sandalwood, Pangara.

2. Stumps: In few species, stumps are used for planting e.g. Teak, Shivan, Shisam, Cassia spp. Stums are easy to transport, require less space and can be transported to long distance. These are prepared at the time of planting operation or just before planting operation. Fresh uprooted seedlings are used to transplant easily. 20% stem portion and 80% taproot is kept while preparing the stump. Fine edge knife or implement is to be used so as to avoid the damage, stem portion is cut 5 to 6 cm above the collar region is kept intact and remaining portion or roots are cut to prepare stump. The stumps are then packed in bundles, keeping stem portion on one side and roots on another side, the stumps should be transported immediately. For transportation stumps are covered with moist gunny bag cloth to avoid desiccation. They can be transported within 2-3 days without much loss.

These stumps are planted on start of monsoon after 3-4 rain showers when soil becomes sufficiently moist and soil temperatures are warm. Stumps are planted by preparing

small holes in slating portion with the help of crowbar so that new shoot will rise straight. Then the stumps are inserted inside and soil is pressed firmly so as to avid water stagnation in the hole. The cooler region is kept just near to the soil surface.

3. Root Suckers: Root suckers can also be used for planting purpose e.g. Pomegranate, Kokum, Salaim Anjan, Shisam, Nimbara, Pangara, Erythrona etc.

The layers, grafted plants, budded plants can be used to prepare planting material. These all are only used in forestry for conservation of superior genotype. It is used for commercial plantation as they are short lived, spreading and not develop long straight (trunk), particularly suitable for timber purpose.

Planting by root cuttings in sandal wood, pangara. Planting by root suckers e.g. Pala, Anjan, Pomegranate, Kokum, Salai, Shisam, Nimbara, Erythrina Supersa.

Q.6 Write in detail the benefits of Agro-forestry system **(4 marks)**

I. Environmental benefits: Combining trees with food crops on cropped farms yield certain environmental benefits such as,

1. It reduction of pressure on Forrest and helps in protection of ecological system.
2. It enhances the efficient recycling of nutrients by deep rooted trees on the site.
3. It augments biological diversity by favouring the environmental conditions.
4. It reduces the surface run-off, nutrient leaching and soil erosion.
5. It improves the microclimate, such as lowering of soils surface temperature and reduction of evaporation and maintenance of soil moisture due to mulching and shading.
6. It increases soil structure and soil fertility through addition and decomposition of litter fall.

II. Economical Benefits: Agro-forestry brings significant economic benefits to the farmers, the community, the region and the nation such as:

1. It increases outputs of food, fodder, fuel wood, timber and organic matter.
2. Ir reduces the risk of total crop failure as multiple crops are grown.
3. It increases the levels of farm income due to improved and sustained productivity.

III. Social Benefits:

1. It improves rural living standards from sustained employment and higher income due to sustainable yields.
2. Agro forestry system improves the nutrition and health of people due to increased quality and diversity of farm produce as a food.
3. Multiple outputs without the risk of total crop failure provides stability to rural peoples.
4. It maintains the ecological balance.
5. It reduces the sound and air Pollution.

Q.7 Write short notes (Any Two)

(a) Classification of Forest On the Basis of Ownership: **(2 marks)**

Forests can be classified as

A. Government Forests: These forests are owned by the state or central/national government bodies. On the basis of Legal status, Government forests are further classified into:

1. Reserved Forests: A Reserved forest is an area with complete protection, constituted according to chapter II of the Indian Forests Act. 1927.

2. Protected Forests: A Protected forest is an area subject to limited degree of protection constituted under the provisions of chapter IV of the Indian Forest Act., 1927.

3. Village Forests: A Village forest is a state forest assigned to a village community under the provisions of chapter III of Indian Forest Act.

B. Private Forests

C. Forests owned by Corporations, Panchayats, Societies and other Agencies.

(b) Quarter Girth formula (Hoppus's rule) **(2 marks)**

- This is the system of measurement used in Great Britain and also in Nepal for sale purpose when round timber is sold by volume
- This formula gives only 78.5% of the cubic volume of cylinders, thus allowing a loss of 21.5%
- In India and Britain, volumes of logs are calculated by the quarter girth formula:

$$\text{Volume of log (V)} = [g/4]^2 \times l$$

Where,

g = girth of the log at middle

l = length of the log

It is also known as Hoppus rule in Britain, after the name of Hoppus, who first prepared tables for use with it.

(c) Protein Bank: **(2 marks)**

Protein rich multipurpose fodder trees are raised on and around farm lands to augment the qulity and quantity of fodder in the farmlands. Trees species suitable for protein banks are Subabhul, Anjan, *Delbergia sissoo, Zizyphus species, Acacia species, Prosopis juliflora, Bomabx mulbericum, Sesbenia spp.* etc. are planted.

Q.8 What are the benefits of panting (planting) wind breaks and shelter belts? **(4 marks)**

The Benefits accruing as a Result of Planting of Shelter Belts / Wind Breaks are:

1. They reduce the wind velocity blowing over the crops and this reduces the evaporation losses, which reduces number of irrigations. They also prevent damage to evergreen foliage, uprooting of shallow-rooted plants, broken fences, shattered greenhouse glass and scattering of containerised plants
2. The reduction of wind velocity helps in large exposure of the stomata apertures, thus extending the period of photosynthesis on the leaf surface.

3. It is recorded that the dew formation in sheltered areas increases by 200 per cent. This is an important factor for the crops which thrive well in winter such as Sorghum, Horse gram etc.
4. The shelter belts provide a place for the snakes to live and multiply, which in turn prey on the rats, the major cause of damage to grain.
5. The birds nesting on the shelter belts are agencies to prey on the insect-pests, which damage the crops. They feed on the seeds of weeds, thus reducing the weed population in the fields and add good manure through their droppings.
6. The shelter belts by reducing the wind velocity prevent wind erosion.
7. The species planted as shelter belts yield, fruit, fodder, fuel, small timber for the farmer and thus add to the agricultural income.
8. The belts regulate the weather by reducing high summer temperatures and increase the low temperatures of winter.
9. The continuous and vast stretches of shelter belts add to the increased precipitation from cumulus clouds.
10. Provide shelter for pollinating insects, enabling fruit set in orchards
11. Reduce moisture loss from soil and plant foliage
12. Reduce damage from salt-laden winds in coastal areas.
13. Provide protection from driving snow and reduce heating costs to greenhouses and dwellings in temperate areas
14. Screen unsightly views and increase privacy
15. Provide a habitat for wild life, especially if made of mixed species
16. They improve the fertility of the land and create congenial environment for crop growth.

Q.9 Furnish the details in the table: **(1/2 mark each)**

S. N.	Particulars	Teak	Neem
1	Botanical name	*Tectona grandis*	*Azadirachta indica*
2	Family	Lamiaceae	Meliaceae
3	Propagation	Stump, seed	Seed
4	Uses	Furniture, poles, wind breaks	Furniture, insecticide, medicinal, wind breaks

Q.10 A.Form factor:ratio of volume of the tree to the volume ogf the cylenderhaving the same length and cross section as the tree

Artificial form factor:is also known as breast height form factor,in this the basal area is measured at breast height anf volume refers to the whole tree both above and below the point of measurement.

Absolute form factor:the basal area is measuresd at convenient height and the volume of the tree refers only to that part above the point of measurement.

B.Salient features of Indian forest policy 1988

Importance of conservation of forest as wealth
1/3 plains and 2/3 hills should be covered with forests
Do afforestation,social and farm foresty on large scale
Recognize rights of people living in forests
Prevent problem of encroachment
Prevention of political intervention
No pro industriasl stand
Peoples participation
Wild life protection

SECTION "B"

Q.11 Fill in the blanks.

1) A. A secondary shoot arising from the roots of a tree or shrub that can grow into a new mature individual is called as a **root sucker.**

2) B. The second National Forest Policy was enunciated (decided) in **1952**

3) C. **Nursery** is defined as an area where plants are raised for eventual planting out

4) D. **Taungya system** was first evolved in Burma in 1850 as a mode of replanting vast teak areas.

Q. 12 Match the pairs

(A)	Answer(B)
1. Hypsometer	c. Tree height
2. Biltmore stick	d. DBH
3. Assam	a. Shifting cultivation
4. Girdling	b. Tending

Course Instructor

Dr. S. N. Ambad
Professor of Horticulture
RCSM College of Agriculture, Kolhapur
Mob.:

Head of the Section

Dr. S. N. Ambad
Professor of Horticulture
RCSM College of Agriculture, Kolhapur
Mob.:

Head of the Department

Dr. S. A. Ranpise
Head Department of Horticulture,
MPKV, Rahuri