



**FOREST
SURVEYING &
ENGINEERING**

**ECOLOGY
DENDROLOGY
ETHNOBOTANY**

MODULE 5

**INDIAN FOREST SERVICE (MAIN)
EXAMINATION 2024**

Congratulations

To all our successful candidates in

INDIAN FOREST SERVICE (IFOS) 2023



1
AIR

Ritvika Pandey

Forestry Comprehensive
Course



3
AIR

Swastik Yaduvanshi

Forestry Comprehensive
Course



5
AIR

Vidyanshu Shekhar Jha

Forestry Comprehensive
Course + Test Series



6
AIR

Rohan Tiwari

Forestry Comprehensive
Course



10
AIR

Shashank Bhardwaj

Forestry Comprehensive
Course + Test Series



14
AIR

Ankan Bohra

Forestry Comprehensive
Course



16
AIR

Prachi Gupta

Forestry Comprehensive
Course



17
AIR

Raj Patoliya

Forestry Comprehensive
Course + Test Series



23
AIR

Vineet Kumar

Forestry Comprehensive
Course



27
AIR

Jatin Babu S

Forestry Comprehensive
Course



28
AIR

Gaurav Saharan

Test Series



37
AIR

Yash Singhal

Forestry Comprehensive
Course



41
AIR

Nitish Pratik

Forestry Comprehensive
Course



50
AIR

VAASANTHI P.

Test Series



54
AIR

Sourabh Kumar Jat

Forestry
Comprehensive Course



56
AIR

Ekam Singh

Forestry Comprehensive
Course + Test Series



57
AIR

Kunal Mishra

Forestry Comprehensive
Course



58
AIR

Atul Tiwari

Forestry Comprehensive
Course



60
AIR

Aman Gupta

Forestry Comprehensive
Course + Test Series



61
AIR

Sanket Adhao

Forestry Comprehensive
Course



63
AIR

Preeti Yadav

Forestry Comprehensive
Course



65
AIR

Nihal Chand

Forestry Comprehensive
Course + Test Series



66
AIR

Shashikumar S. L.

Forestry Comprehensive
Course



67
AIR

Dhino Purushothaman

Forestry Comprehensive
Course

**FOREST SURVEYING &
ENGINEERING +
FOREST ECOLOGY, DENDROLOGY
& ETHNOBOTANY**

PAPER – 2



EDITION : 2024

☎ +917223970423 🌐 Hornbillclasses.com

Gole ka mandir, Morar, Gwalior (MP) 474005

Module - 5

SYLLABUS



- ▷ **SURVEYING AND FOREST ENGINEERING** : (1) Forest surveying - different methods of surveying, maps and map reading. (2) Basic principles of forest engineering - Building materials and construction. (3) Roads and Bridges - General principles, objects, types, simple design and construction of timber bridges.
- ▷ **FOREST ECOLOGY** : Biotic and abiotic components, forest ecosystems; forest community concepts; vegetation concepts, ecological succession and climax, primary productivity, nutrient cycling and water relations. Physiology In Stress Environments (drought, water logging salinity and alkalinity). Forest Types in India, identification of species, composition and associations. Conservation of forest ecosystems. Clonal parks.
- ▷ **DENDROLOGY** : Taxonomic classification, principles and establishment of herbaria and arboreta
- ▷ **ETHNOBOTANY** : Role of Ethnobotany in Indian Systems of Medicine; Ayurveda and Unani. Introduction, nomenclature, habitat, distribution and botanical features of medicinal and aromatic plants. Factors affecting action and toxicity of drug plants and their chemical constituents.

Module - 5

CONTENT



| SURVEYING & FOREST ENGINEERING | | |
|---|-----------------------------|-----------|
| 1. | Forest Roads & Bridges | 1 – 9 |
| 2. | Surveying (Introduction) | 10 – 13 |
| 3. | Linear measurement | 14 – 16 |
| 4. | Chain Survey | 17 – 25 |
| 5. | Compass Survey | 26 – 32 |
| 6. | Plane Table Survey | 33 – 42 |
| 7. | Levelling | 43 – 48 |
| 8. | Building material | 49 – 59 |
| 9. | Building construction | 60 – 72 |
| FOREST ECOLOGY | | |
| 10. | Ecology & Environment | 73 – 94 |
| DENDROLOGY | | |
| 11. | Taxonomy | 95 – 103 |
| 12. | Herbarium | 104 – 108 |
| ETHNOBOTANY | | |
| 13. | Ethnobotany | 109 – 116 |
| 14. | Medicinal & aromatic Plants | 117 – 120 |

INDIAN FOREST SERVICE (IFoS) PYQs [2008 to 2023]

FOREST SURVEYING & ENGINEERING

| | |
|------|--|
| 2023 | <ul style="list-style-type: none"> • What do you understand by bridges and culverts? Write the types of any two bridges with sketches [10 M] • Give a list of materials used in construction of building and describe the characteristics of any two materials [15 M] |
| 2022 | <ul style="list-style-type: none"> • Write the general principles of surveying. Describe (i) direct methods of chaining on sloping ground, and (ii) chaining when vision is obstructed, but chaining is free (15) • Explain the <i>Single-Line</i> and <i>Double-Line</i> Field Books with neat sketches. Mention the steps followed in the field work of Chain Survey (15 m) |
| 2021 | <ul style="list-style-type: none"> • Explain the term (i) True meridian, (ii) Magnetic meridian, (iii) Reduced bearing, and (iv) Fore and back bearing (8 m). • What are the advantages and disadvantages of <i>Plane Table Surveying</i>? Describe Radiation, Intersection, Traversing and Resection methods of plane table surveying (15 m). • Describe structure of <i>Suspension Bridge</i> and Cantilever bridge (10 m). |
| 2020 | <ul style="list-style-type: none"> • Construction and maintenance of <i>forest roads</i> can be considered as an essential investment of forest growth. Comment (8 m). • What are the factors that cause foundation failure during construction of a <i>forest building</i>? (10 m). • What are the basic details of an engineering design of a <i>timber bridge</i>? What steps should be taken to ensure its durability? (15 m). • What are the objectives of forest surveying? How does topographic survey aid in forest planning and management? (15 m). |
| 2019 | <ul style="list-style-type: none"> • Define <i>bridge</i> and explain different types of bridge with sketches (8 m). • Give a list of <i>Survey methods</i> adopted in Forest. Describe the survey of forest when a river comes in the way of Survey line (15 m). • Explain concrete and write the characteristics of good <i>concrete mixture</i> (10 m). • What is brick ? Describe different types of bricks giving their characteristics (10 m). |
| 2018 | <ul style="list-style-type: none"> • What is the importance of surveying in forestry ? Discuss different methods of surveying to solve the forestry field problems (8m). • Give the <i>classification of forest roads</i>. What features are required for a reconnaissance for forest roads? (8m). |
| 2017 | <ul style="list-style-type: none"> • Describe the <i>dead</i> and <i>live loads</i> and how they are calculated on the roof trusses over |

| | |
|------|--|
| | buildings? (10 m). |
| 2016 | <ul style="list-style-type: none"> Enumerate the methods of direct linear measurements. Discuss in brief the application of prismatic compass in forest survey (10 m). Distinguish the <i>Irish bridge</i>, Simple <i>wooden bridge</i> and <i>suspension bridge</i> with details and neat sketches (15 m). |
| 2015 | <ul style="list-style-type: none"> <i>Topographic surveys</i> are found useful in forest management. Discuss (8 m). Which are the basic factors you have to look for before running out a survey lines in chain survey ? (8 m). How will you find the reduced levels of the given points by height of collimation methods and rise and fall method and then check arithmetically ? (15 m). In a forest survey, you are provided a prismatic compass. How will you accomplish the bearings of line AB ? (10 m). |
| 2014 | <ul style="list-style-type: none"> How is Compass survey done ? what are the advantages of compass surveying ? (15 m). |
| 2013 | <ul style="list-style-type: none"> Define the arches used in construction. What are the different characteristics required in an arch ? (10 m). Describe all the 5 kinds of chains used in survey and advantages and disadvantages of chain surveys (8 m). Write down the chemical constituents of earth (chemical formula and percentage range of contents) for manufacture of good quality of <i>bricks</i> (7 m). Find out the maximum and minimum pressures of a wall which is 60 ft long and 4.5 ft wide at the base of its footing, carrying loads at the following distances from the left hand side : 20 tons at 10 ft, 30 tons at 25 ft, 40 tons at 28 ft, 48 tons at 50 ft and 12 tons at 55 ft (15 m). |
| 2012 | <ul style="list-style-type: none"> Describe the structure of Dumpy level through a well labelled diagram (10 m). Discuss the "Two-Point Problem" - the special case of resection in Plain Table Survey (12 m). Describe the limitations and advantages of Plane Table Survey (8 m). |
| 2011 | <ul style="list-style-type: none"> Describe how you would continue the line with the chain only, When (20 m) <ol style="list-style-type: none"> A large river interrupts the chain line, and A forest area comes across the chain line Explain the term (10 m) <ol style="list-style-type: none"> Whole circle bearing, and Quadrantal bearing Describe, with sketches of <i>Suspension Bridge</i> (10 m). |
| 2010 | <ul style="list-style-type: none"> Describe methods of using <i>prismatic compass</i> in forest surveys (5m). Distinguish between <i>Irish bridge</i>, <i>Suspension bridge</i> and <i>Cantilever bridge</i> (8m). |

| | |
|------|---|
| 2009 | <ul style="list-style-type: none"> • Write the simple design and construction of timber bridge across river in the forest (10 m). • What are the major principles of designing roads in remote forest areas ? Provide diagrams wherever necessary (20 m). |
| 2008 | <ul style="list-style-type: none"> • Write the Practical uses of chain and compass survey in forestry (10 m). • Describe the proper orientation for ideal forest buildings (20 m). |

FOREST ECOLOGY

| | |
|------|--|
| 2023 | <ul style="list-style-type: none"> • Describe the major attributes of forest ecosystem [8 M]. • Explain different types of Biodiversity and describe various methods for its management [15] • What is deforestation? Discuss the impact of deforestation on the environment [15 M] |
| 2022 | <ul style="list-style-type: none"> • Discuss the components of a desert ecosystem. Write steps to control shifting of sand dunes (15) [<i>Linked Q: Wasteland management</i>] |
| 2021 | <ul style="list-style-type: none"> • What are holotype, neotype, lectotype and syntype of plant science ? Describe the role of arboreta and <u>clonal parks in conservation</u> of biodiversity (15) |
| 2020 | <ul style="list-style-type: none"> • Why is carbon cycle important? How do human activities affect carbon cycle ? (10 m). • What are the structural and functional changes that occur in a <i>forest ecosystem</i> during succession? (15m) |
| 2019 | <ul style="list-style-type: none"> • What are <i>ecological pyramids</i>? Explain different types. Mention the implications of concepts of ecological pyramids in understanding forest ecosystems (10 m). • Describe various physiological mechanisms underlying <i>drought resistance, drought tolerance</i> and <i>drought avoidance</i> in forest species [15 m <i>Linked Q</i>]. • Describe the features and importance of <i>clonal parks</i> in forest conservation (8 m). |
| 2018 | <ul style="list-style-type: none"> • What is <i>carbon sink</i> ? How do forest soils act as important carbon sinks? (8 m). • Forest ecology is the study of complex interactions between organic and inorganic components of the forest ecosystem. Explain <i>organic</i> and <i>inorganic components</i> providing two examples of each as they relate to the forest ecosystem (8 m). |
| 2016 | <ul style="list-style-type: none"> • Garg (1988) described the <i>ecological pyramid</i> as a graphical representation of relationship between the trophic levels of an ecosystem. Explain with the help of neat diagrams (10 m). • Define <i>ecological amplitude</i>. Describe the <i>classification and characters of plant communities</i> (10 m). |
| 2015 | <ul style="list-style-type: none"> • Why is <i>carbon recycling</i> important ? What are its influences on climate ? Discuss your points for or against (10 m). • Growth and productivity of forest plants are affected by <i>different types of air pollutants</i>. What are those ? Suggest suitable remedies (10 m). |

| | |
|------|--|
| | <ul style="list-style-type: none"> Narrate how sustainable forestry accounts for the <i>ecological, economic, social and cultural values of forests</i>. Give your opinion (15). |
| 2014 | <ul style="list-style-type: none"> Which are the six major <i>attributes of an ecosystem</i>-explain in detail (8 m). Why is a balance between production, social and environmental objectives necessary in <i>sustainable forest management plans</i>? (20 m). |
| 2013 | <ul style="list-style-type: none"> Describe the <i>qualitative characteristics of plant community</i>. |
| 2012 | <ul style="list-style-type: none"> Describe Raunkier's life forms (8 m) Discuss "ecological amplitude" and the law of tolerance" in the context in which they are generally used (6m). Discuss the phytosociological analysis describing formulae for calculation of – (15 m) <ol style="list-style-type: none"> Frequency and relative frequency, Density and relative density Abundance Relative dominance, and Importance value index (IVI) Explain with the help of suitable examples the various kinds of population interaction during their growth period and give difference between commensalism and amensalism of plant relationship (10 m). Write short notes on – <ol style="list-style-type: none"> Source-sink relationship with respect to carbon cycle (5 m). Energy flow model in ecosystem (5 m). Ex-situ and in-situ conservation (5 m). |
| 2011 | <ul style="list-style-type: none"> What are the effects of particulate air pollutants on the regeneration of a forest ecosystem ? Discuss (10 m) |

DENDROLOGY

| | |
|------|--|
| 2023 | <ul style="list-style-type: none"> What are the different types of plant classification systems? Name the one which is mostly followed in Indian herbaria [10 M] |
| 2022 | <ul style="list-style-type: none"> NO |
| 2021 | <ul style="list-style-type: none"> What are holotype, neotype, lectotype and syntype of plant science ? Describe the role of arboreta and <u>clonal parks in conservation</u> of biodiversity (15) |
| 2017 | <ul style="list-style-type: none"> Define herbarium and write its significance. What are the steps in establishing herbarium and which method of plant classification is followed in herbarium arrangement ? (8 m). |
| 2010 | <ul style="list-style-type: none"> List merits of Bentham and hooker system of plant classification used in dendrology (5 m) |

ETHNOBOTANY

| | |
|------|---|
| 2023 | <ul style="list-style-type: none"> • NO |
| 2022 | <ul style="list-style-type: none"> • NO |
| 2021 | <ul style="list-style-type: none"> • Discuss the role of tree domestication in biodiversity conservation (10 m) • Write the scientific name of 10 medicinal plants and their uses (15 m) |
| 2020 | <ul style="list-style-type: none"> • NO |
| 2019 | <ul style="list-style-type: none"> • NO |
| 2018 | <ul style="list-style-type: none"> • Define ethnobotany. Write in detail about the role of ethnobotany in modern medicine and its approaches to the drug industry (15 m). • Enlist the common and scientific names of trees and shrubs (seven each) having medicinal importance in ethnobotany (10 m). |
| 2017 | <ul style="list-style-type: none"> • What is ethnobotany and describe the role of ethnobotany in the Indian systems of medicine (8 m). |
| 2016 | <ul style="list-style-type: none"> • The knowledge of ethnobotany helps to identify viable medicinal plants for pharmaceutical industries. Explain (10m). |
| 2015 | <ul style="list-style-type: none"> • Give the scientific names of at least five drug yielding plants with their use in pharmaceutical industry (8 m). |
| 2014 | <ul style="list-style-type: none"> • No |
| 2013 | <ul style="list-style-type: none"> • Write short notes on the following medicinal plants : (4 × 2.5) <ol style="list-style-type: none"> Aconitum heterophyllum Orchis latifolia Podophyllum emodii Morchella esculanta • Write critical notes on - Siddha system of medicines (2.5 m). |
| 2012 | <ul style="list-style-type: none"> • NO |
| 2011 | <ul style="list-style-type: none"> • NO |
| 2010 | <ul style="list-style-type: none"> • NO |
| 2009 | <ul style="list-style-type: none"> • Classify medicinal plants on the basis of plant parts used and explain general rules of sustainable collection of medicinal plants, with suitable examples (20 Marks). |

CHAPTER 1

Chapter outline

1.1 Forest Road

- ✿ Types of roads
- ✿ Road Construction
- ✿ Road Prism
- ✿ Drainage in Hill Roads
- ✿ Importance
- ✿ Basic principles of road design
- ✿ Challenges
- ✿ Maintenance of roads
- ✿ Exercise - 1

1.2 Bridges

- ✿ Ford or Drift
- ✿ Causeways
- ✿ Irish bridge
- ✿ Suspension bridge
- ✿ Cantilever bridge
- ✿ Simple wooden bridge
- ✿ Culverts
- ✿ Exercise - 2



FOREST ROADS & BRIDGES

1.1 FOREST ROADS

Road is an open and wide way connecting one place to another and makes it easy to move vehicles and people. If these roads are constructed in or around the forest areas, they are called **Forest roads**.

TYPES OF ROADS

- Based on the time period, it will be used.

| TEMPORARY | PERMANENT |
|---|--|
|  |  |
| Usable only for dry & winter Months | All weathered and motorable road |

- Based on **LOCATION** : (a) inside the forest, and (b) peripheral road
- Based on **USE**
 - (i) **Main motorable road** : main road connected HQ to the forest block, important rest houses and forest depots. They are the metalled road with well-drained and are being used throughout the year.
 - (ii) **Branch (Feeder) Jeepable road** : these are the feeder road connecting interior forest areas with the main road. These are the usual earth roads, though in some cases, the surface may be improvised by spreading sand, gravel, or laterite stones.
 - (iii) **Bridle paths** : Prepared for a quick and direct route from place to place to transport the timber by animals.
 - (iv) **Inspection paths** : the narrow path of 06 to 1-meter width, usually constructed in and around each sub-compartment, make them assessable

| Types of roads | Main motorable road | Feeder jeepable road | Bridlepath | Inspection path |
|----------------|---------------------|----------------------|------------|-----------------|
| Width (m) | 3.5 | 3 | 2 to 2.5 | 0.6 to 1 |
| Road chamber | ½ to 1/25 | 1/5 to 1/20 | – | – |

- **Based on terrain :** (a) Plain roads - are constructed on plains; construction and maintenance are easy and economic, (b) Hill roads - constructed on hilly terrain

ROAD CONSTRUCTION

Before the construction of a forest road, we have to take a *reconnaissance survey* to produce a preliminary report with

- a rough map of an area where all reasonable points through which the road must pass are highlighted.
- Produce contour map
- To estimate its alignment, suitable design, construction cost, importance, and its effect on the forest, wildlife, natural ecosystem, and local watershed.

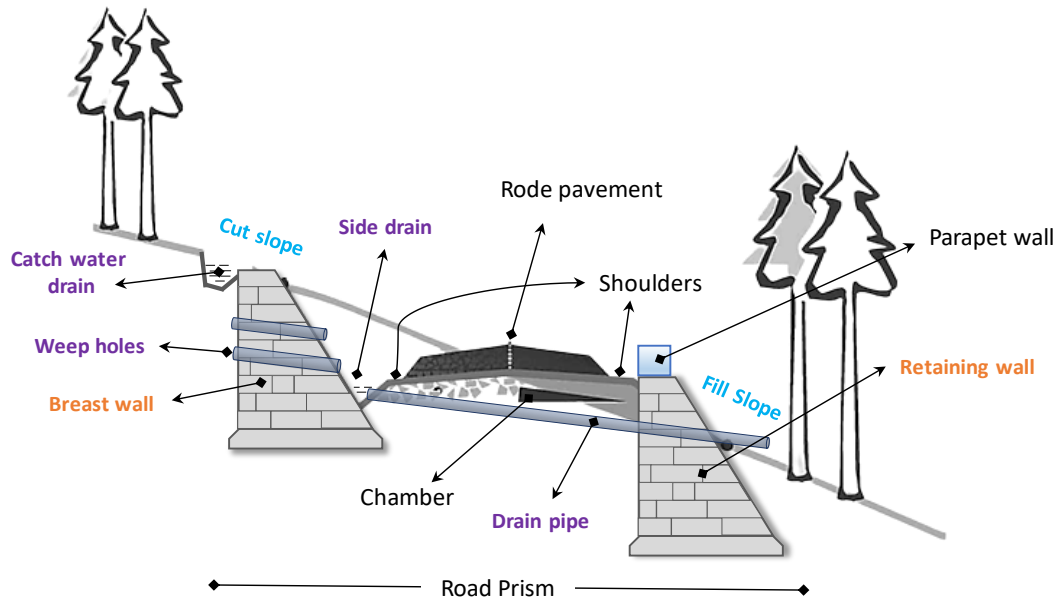
MAIN FEATURES (POINTS) THAT SHOULD BE CONSIDERED DURING A RECONNAISSANCE SURVEY OF AN FOREST AREA FOR PLANNING TO CONSTRUCT A FOREST ROAD

means factors that are required to be considered and solved before designing and constructing of a forest road.

- Obstacles from which road will pass away, *i.e.*, ridge, steep, river valley, etc.
 - Rough elevation of the hills, saddles, passes, valleys, and the other important geographical positions and locations like water holes, wells, and rivers.
 - Among the number of routes that have been selected
 - Climate and precipitation regime
 - Environment & Social impact on the proposed location
- } Locality issues
- Gradients of the road.
 - Horizontal and vertical alignment of road, drainage system, and supporting walls
 - Road widths
 - Cut and fill slope angles
 - Soil types
 - Availability of materials for construction and labour cost
- } Road-related issues
- Intended use of the road, requirements of local, traffics & market places.
 - Intended season of use
 - Permanent or temporary use
 - How can it help in controlling Soil erosion & forest fire
- } Use related issue

ROAD DESIGN or 'ROAD PRISM'

Forest roads should be designed to *meet management objectives* and *optimize harvest systems* and *transportation efficiency* while *minimizing environmental impacts*. The forest road engineer can use specific design techniques to achieve all these goals by horizontal and vertical alignments of a road to provide the appropriate geometry for the vehicle sizes and traffic as well as timber transportation.



PARTS OF HILL ROADS

- **Road crown** or Running surface or carriageway : The main function of pavement is to carry the vehicular load and distribute
- **Shoulders** or **berm** : It is the part of the road between the edge of the actual road and the side drainage.
Main function : (a) Provide structural support to the pavement, (b) Provide extra width for crossing, and can divert traffic during repairs.
- **Chamber** : it is the transverse raising of the road in the center above its edges. It is done to allow the rainwater falling on the road surface to drain away quickly. This is usually expressed in terms of the transverse slope of the road. Thus, a chamber of $\frac{1}{20}$ means that the center of the road is raised above its edges by an amount equal to one-twentieth of the half the width of the road.
- **Gradient** : It is the rate of rising or falling along the length of the road with respect to the horizontal.
- **Breast wall** : Constructed at the upslope side of the road to prevent Lateral pressure of the earth.
- **Retaining wall** : Constructed at the downslope side to resist pressure from earth filling of the pavement due to traffic load and other loads.
- **Parapet wall** : to provide protection to the traffic against falling down in the valley. It is constructed as a continuous wall but with small gaps.
- **Catch water drain** : to collect or intercept the rainwater and divert them to nearby cross drainage work.
- **Side Drainage** : at the foot of hill slope to collect rainwater carriageway from hill slope and divert it to the nearby cross drainage work.

CHAPTER 2

Chapter outline

2.1 Introduction

- ✿ Need, Objectives & Scope
- ✿ Classification

2.2 Topographic Survey

- ✿ Objectives
- ✿ Uses in Forestry

2.3 Cadastral Survey

- ✿ Objectives
- ✿ Significance in Forestry

SURVEYING

[INTRODUCTION]

2.1 INTRODUCTION

Surveying is the art of determining the relative positions of different objects on the earth's surface by measuring the *horizontal distances* between them and preparing a map to any suitable scale [In this branch, the measurements are taken only in the horizontal plane].

- **Leveling** is the art of determining the relative *vertical distances* of different points on the earth's surface. Therefore, the measurements are taken only in the vertical plane in leveling.

NEED, OBJECTIVES & SCOPE OF SURVEYING IN FORESTRY

Surveying and Map readings are important tools for protecting, managing, and administering a forest estate. A forester is often required to map out fire-burnt areas; demarcate and/or check forest boundaries; layout felling Coupes; prepare plantation maps and stock maps; detect and rectify encroachments and illicit possessions; prepare plans of areas to be cleared, or fenced or planted; align extraction roads and paths and for a variety of other purposes connected with his duties.

- To prepare a *topographic map* of a forest area that shows the hills, valleys, rivers, and forest villages of a forest area.
- To prepare a *cadastral map* showing the boundaries of the compartment, blocks, etc.
- To prepare plantation, stock, and management maps
- Determining the direction and distance Between different offices, plantation sites, and available water sources like rivers, streams, etc.
- Construction of forest roads and bridges
- To map out fire burnt areas
- To detect encroachments on the forest land, forest resources allocation, etc.

CHAPTER 3

Chapter outline

- 3.1 Methods of Linear measurement
- 3.2 Distance measuring tools
 - ✿ Ranging rod
 - ✿ Tape
 - ✿ Arrow
 - ✿ Chains & their types
- 3.3 Ranging
 - ✿ Direct ranging
 - ✿ Indirect ranging
- 3.4 Exercise

LINEAR MEASUREMENTS

3.1 METHODS OF LINEAR MEASUREMENT

- By pacing or stepping – a walking step is considered ≈ 80 cm or 2.5 feet
- Chaining
- Ocular estimation
- Odometer – A simple device attached to the wheel of any vehicle.
- Modern tools : RADAR, SONAR, LIDAR, etc.



pacing or stepping



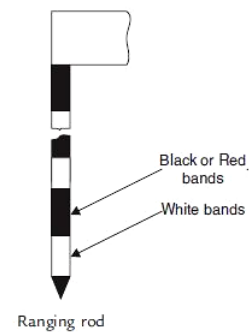
Speedometer



Passometer

3.2 INSTRUMENTS REQUIRED FOR MEASURING DISTANCES

- **Ranging Rod** : a rod of bamboo or metal used to make a ranging line straight and mark boundaries.
- **Tape** : Cloth or Lenin tape, metallic tape, steel tape, etc.
- **Arrow** : a steel wire is used to count the number of chains while measuring a chain line by marking the spot.
- **Chain** : A chain is a galvanized ring of steel wire pieces linked together with 100 to 150 pieces.



Types of chains

- **Metric chain** : 20 to 30 m long chain divided into 100 links.
- **Steel band** : a steel ribbon of 20 or 30 m in length
- **Gunter's chain** is 66 ft long and divided into 100 links. So, each link is 0.66 ft. It was previously used for measuring distances in miles and furlongs.

CHAPTER 5

COMPASS SURVEY

Chapter outline

- 5.1 Definition
- 5.2 Principle of Compass Survey
- 5.3 Related important terminology
- 5.4 Types of Compasses
- 5.5 Methods of Traversing
- 5.6 Steps for compass survey
 - ✦ Advantages of compass Survey
 - ✦ Source of errors in compass survey
- 5.7 Scope & Application of Compass Survey
 - ✦ Practical Utility of Compass Survey in the Forest
- 5.8 Exercise

In chain surveying, the area to be surveyed is divided into a number of triangles. Hence, this method is suitable for small areas of fairly level ground. When the area is large, undulated, and crowded with many details or follows a river or coastline, *triangulation* (which is the basic principle of chain surveys) is not feasible. In such an area, the method of *traversing* is adopted.

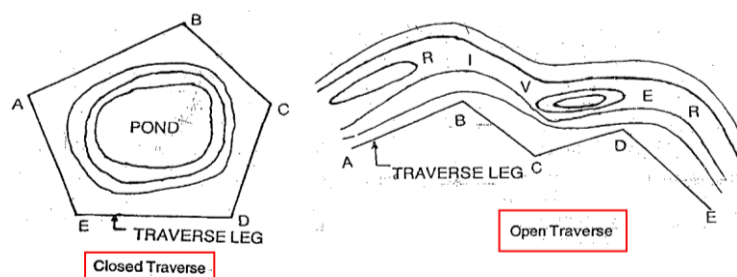
In traversing, the framework consists of a set of connected lines. Lengths are measured by chain or tape, and directions are identified by angle measuring instruments, such as a compass. Therefore, the process is called *compass traversing*.

5.1 DEFINITION

Compass surveying is a type of surveying in which the directions of surveying lines are determined with a magnetic compass, and the length of the surveying lines is measured with a tape or chain, or laser range finder.

5.2 PRINCIPLE OF COMPASS SURVEY

Traversing involves a series of connected lines. The distance of lines is measured by the chain, and the angle between lines are calculated by compass.



5.3 RELATED IMPORTANT TERMINOLOGY

- **True meridian** : The line or plane passing through the geographical north pole and geographical south pole is known as the 'true meridian' or 'geographical meridian'.

CHAPTER 6

PLANE TABLE SURVEY

Chapter outline

- 6.1 Introduction
- 6.2 Principle
- 6.3 Accessories of a plane table
- 6.4 Orientation
 - ✦ By Magnetic needle
 - ✦ By Back sighting
- 6.5 Methods of plane tabling
 - ✦ Radiation
 - ✦ Intersection
 - ✦ Traversing
 - ✦ ResectionSpecial methods
 - ✦ Two-Point Problem
 - ✦ Three-point problem
- 6.6 Source of errors in PT Survey
- 6.7 Procedure of PT Survey
- 6.8 Remarks
 - ✦ Scope of PT Survey
 - ✦ Advantages PT Survey
 - ✦ Disadvantages of PT Survey
 - ✦ Practical application of PT Survey in Forestry
- 6.9 Exercise

6.1 INTRODUCTION

Plane table surveying is a graphical method of survey in which the field observations and plotting are done simultaneously. A plane table survey does not involve the use of a field book. It is mainly suitable for filling interior details when traversing is done by theodolite.

6.2 PRINCIPLE

parallelism, meaning that the rays drawn stations to objects on the paper are parallel to the lines from the stations' objects on the ground. The relative positions of the objects on the ground are represented by their plotted positions on the paper.

6.3 ACCESSORIES OF A PLANE TABLE

- **Plane table** : a well-seasoned drawing table of wood 75 cm by 60 cm in size. The top surface of the table is well-leveled
- **Alidade** : a metallic ruler with a sight vane
 - **Plane Alidade** : consists of a metal or wooden ruler of length of about 50 cm
 - **Telescopic Alidade**: consists of a telescope meant for inclined sight or sighting distant objects clearly.
- A **spirit level** : a small metal tube containing a small bubble of spirit. The bubble is visible on the top along a graduated glass tube. Uses - to levelled plane table every time
- **Trough compass** : to fix the direction of a table
- **Circular Box Compass** : It carries a pivoted magnetic needle at the center. The circular box is fitted on a square base plate.
- **U Fork with plumb bob** : for centering plane table at a targeted point. Uses - to centering the table over a station.

CHAPTER 8

BUILDING MATERIAL

Chapter outline

8.1 Stone

- ✿ Types of rocks
- ✿ Properties of good structural rock

8.2 Bricks

- ✿ Constituents
- ✿ Characteristics of good bricks
- ✿ Classification of Bricks
- ✿ Size of bricks

8.3 Lime

- ✿ Properties
- ✿ Classification
- ✿ Function, Uses & Manufacturing

8.4 Sand

- ✿ Source
- ✿ Characteristics
- ✿ Function
- ✿ Bulking of sand

8.5 Cement

- ✿ Properties
- ✿ Cement v/s Lime

8.6 Mortar

- ✿ Ingredients of mortar
- ✿ Types
- ✿ Function

8.7 Concrete

- ✿ Ingredients
- ✿ Properties
- ✿ Types

8.8 Other building material

- ✿ Asbestos
- ✿ Fly Ash

8.9 Exercise

Building materials have an important role to play in this modern age of technology. Although their most important use is in construction activities

8.1 STONE

Stones used in construction are derived from the rocks forming the crust of the earth's surface.

TYPES OF ROCKS

- According to geological formation : (a) igneous rock, (b) Sedimentary rock and (c) Metamorphic rock.
- According to chemical composition : (a) Siliceous Rocks, *i.e.*, Granite. (b) Calcareous Rocks, *i.e.*, Limestone. (c) Argillaceous Rocks, *i.e.*, Slate.

PROPERTIES OF GOOD STRUCTURAL STONE

- Strong against crushing forces
- Durability
- Hardness and toughness
- Appearance : Stones with lighter shades are preferable.
- Availability: Large size blocks of stones should easily be available, and it should be cheap.
- Stones should have the ability to receive polish and paint when used for facework.
- Stones should be resistant to fire
- Fineness of grain

TYPES OF BUILDING STONES

- Granite
- Basalt
- Limestone & Chalk
- Sandstone
- Laterite

CHAPTER 9

Chapter outline

9.1 Introduction

- Types of buildings
- Components of buildings
- Site selection
- Site preparation

9.2 Building foundation

- Objectives
- Safe bearing capacity
- Loads on foundation
- Footing & Its types
- Causes of foundation failure

9.3 Walls

- Types of walls
- Related terminology
- General principles

9.4 Arches & Lintels

- Terminology
- Types of arches
- Types of lintels

9.5 Roofs & Roof Coverings

9.6 Exercise

BUILDING CONSTRUCTION

9.1 INTRODUCTION

Forest managers are required to construct different types of building like office buildings, staff quarters, Nursery stores, rest houses, etc. in various localities. Hence the design, construction and maintenance of such buildings are very important aspects of their jobs which should be carried out properly and in a systematic manner

TYPES OF BUILDINGS

- Administration buildings
- Residential buildings, *i.e.*, Staff quarters, Hostels,
- Storage buildings, *i.e.*, Nursery storage
- Educational buildings, *i.e.*, Training center
- Forest chaukies

COMPONENTS OF BUILDING

- Sub-structure or foundation** : It is the lower portion of a building, usually located below the ground level, which transmits the load of the super-structure to the supporting soil.
- Super structure** : It is a part of structure which is above ground level, and which serves the purpose of its intended use.

A building has the following components : Foundations, Masonry (Walls & columns), Floor, Roof, Doors & Windows, Stairs, etc.

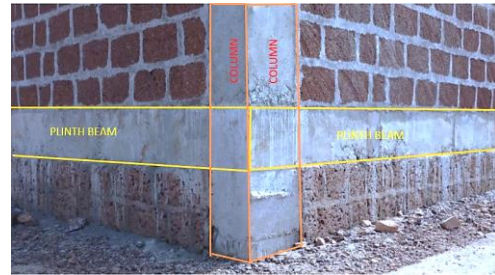
SITE SELECTION

The chief considerations that govern the choice of site for a forest building are

- Situation and Accessibility : Select a place near a forest village or strategic locations, *i.e.*, waterhole, Road-railway connectivity, entry gate of National parks or Wildlife sanctuaries, etc.
- Good water supply: For construction, Nursery and domestic use.

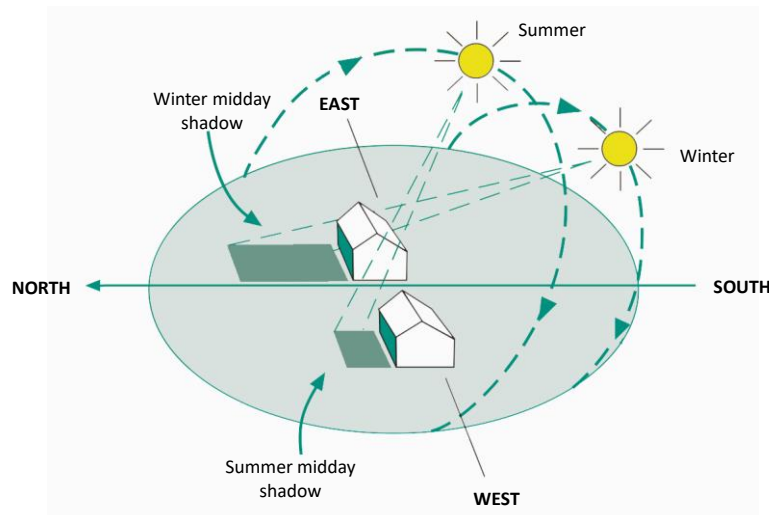
- For small structures, ordinary earth or moorum would be suitable for soil for the foundation. The rocky foundation would be unnecessarily expensive for small buildings since the loads would be negligible.
- Elevation and drainage : A slightly raised site and the presence of natural drainage would be helpful to keep the place dry, healthy and prevent the reach of wildlife.
- Orientation : In hot climates, the building should face north or slightly northeast to avoid the hot afternoons of summer. In cold climates, face it south or slightly south-west to get as much sun as possible in the winters.

- **Setting Out Building / Ground Tracing** : Ground tracing is the process of laying down the centre lines and excavation lines on the ground before the excavation is started. It is based on the following
- **Plinth** : The part of superstructure in between ground level and floor level



IFoS 2008 : Describe the **proper orientation** for ideal forest buildings (20 m) [*Repeat, Arunachal PSC Civil (Main) 2015-16*]

Hints : Orientation is the positioning of a building in relation to seasonal variations in the sun's path as well as prevailing wind patterns. Good orientation can increase the energy efficiency of our forest building, making it more comfortable to work, cheaper to maintain by reducing the need of auxiliary heating and cooling system.



Ideal orientation (in most climate) : 20° west of north and 30° east of north.

PREPARATION OF SITE

- Clear the undergrowth and stumps on the site of the building. Any termite mold should be completely dug out until the queen is located and relocated to the new area [Avoid unnecessary cutting of trees or damaging wildlife habitat].
- If the soil is soft, it may be necessary to dig trenches criss-cross and deep below the foundation level and filled with boulders, broken stone, sand and gravel.

CHAPTER 10

Chapter outline

- 10.1 Ecology
- 10.2 Forest Ecology
- 10.3 Environment
- 10.4 Ecological pyramids
- 10.5 Bioaccumulation
- 10.6 Forest community
- 10.7 Ecotone
- 10.8 Productivity of ecosystem
- 10.9 Material cycling
- 10.10 Conservation of forest
Ecosystems

ECOLOGY & ENVIRONMENT

10.1 ECOLOGY

Ecology refers to the examination of the interactions between living organisms and their abiotic or physical surroundings.

BRANCHES OF ECOLOGY

It is based on the organism level.

Ecology is a **Greek***** term :
Oikos = House/Dwelling +
Logos - Study

- (1) **Autecology or species ecology** : The study of the reciprocal relationship of a species or population with its environment is known as autecology.
- (2) **Synecology or Biocoenology or Community ecology** : Study of the reciprocal relationship of the group of different species with their environment.
- (3) **Applied ecology** : it is a specialised field of ecology concerned with the conservation and economic exploitation of organisms, *i.e.*, conservation ecology, Pollution ecology, Forest ecology, etc.
- (4) **Paleoecology** : Study of the relationship between organisms and the environment in the past.
- (5) **Geneecology** : Study of genetic composition and changes in relation to the origin of ecads, ecotypes, etc.

LEVEL OF ORGANIZATION

The organisation is the arrangement and coordination of small components into larger components in a hierarchy where each level is formed of components of the lower level, and itself becomes part of a higher level.

- (1) **Organism** : An individual plant or animal, a distinct living entity made up of one or more cells, performs all life processes independently. However, it does not live in isolation and shows interaction with other organisms (Interdependence). *The organism is the basic unit of ecological hierarchy****.
- (2) **Population** is the grouping of similar organisms (individuals) in a particular geographical area or space. The different populations of the same organism present in a particular geographical area are

CHAPTER 11

TAXONOMY

Chapter outline

11.1 Taxonomy

- ✿ Dendrology
- ✿ Systematics

11.2 Types of taxonomy

- ✿ New systematics
- ✿ Taxonomic categories

11.3 Importance of taxonomy

11.4 Identification of species

11.5 Nomenclature

- ✿ ICBN Rule

11.6 System of Classification

- ✿ Artificial system classification
- ✿ Natural system of classification
- ✿ Phylogenetic system of classification

11.7 Exercise

11.1 TAXONOMY

Taxis (Arrangement) + nomos (Law)

Taxonomy is the study of principles and procedures of plant identification, nomenclature, and classification.

So, Key elements of Taxonomy –

- ▶ **Identification** : A process by which an organism is recognized from the others by an already known organism and is assigned to a particular taxonomic group is called identification.
- ▶ **Nomenclature** : Naming an organism according to international scientific rules is called nomenclature.
- ▶ **Classification** : A process by which an organism is grouped into convenient categories on the basis of some easily observable characters.

Note : **Dendrology** : A branch of forestry that deals with the taxonomy of trees and other woody, plants including nomenclature, classification, identification, and distribution. (*Virtually dendrology works as a branch of taxonomy that deals with trees*).

Systematics : A branch of taxonomy deals with the study of diversity of an organism as well as establishing comparative and evolutionary relationships among them based on its anatomy, ecology, physiology and biochemistry comparison.

11.2 TYPES OF TAXONOMY

Alpha taxonomy : The identification and classification of organisms based on only morphological characters is called alpha taxonomy.

Beta taxonomy : it involved not only gross morphological features but also genetic, anatomical, cytological, palynological (pollen and pores study), physiological and other characteristics. It is also called **biosystematics**.

Omega taxonomy : Analysis and synthesis of all information and types of data to develop a classification system based on phylogenetic relationships.



68
AIR

Diwakar Swaroop

Forestry Comprehensive Course



72
AIR

Rajesh Kumar

Forestry Comprehensive Course



74
AIR

Krishna Chaitanya

Forestry Comprehensive Course



75
AIR

Harveer Singh Jagarwar


Forestry Comprehensive Course



76
AIR

Akash Dhanaji Kadam

Forestry Comprehensive Course



78
AIR

Himanshu Dwivedi

Forestry Comprehensive Course



80
AIR

Sumit Dhayal

Forestry Comprehensive Course



82
AIR

Priyadarshini

Forestry Comprehensive Course + Test Series



91
AIR

Suheet Balkal

Forestry Comprehensive Course



93
AIR

Harshad Hinge

Test Series



96
AIR

Maharshi Kumar

Forestry Comprehensive Course



97
AIR

Akash Kumar

Forestry Comprehensive Course



104
AIR

P R Sarbajit

Forestry Comprehensive Course



105
AIR

Pawan K. Meena

Forestry Comprehensive Course



110
AIR

Keshav Prasoon

Forestry Comprehensive Course + Test Series



111
AIR

Nagabhushana S

Forestry Comprehensive Course



113
AIR

Shewale Vyankatesh G.

Forestry Comprehensive Course



123
AIR

Chandra Bhushan

Forestry Comprehensive Course



127
AIR

Shubham Kanoujia

Forestry Comprehensive Course + Test Series



128
AIR

Harsh Verma

Forestry Comprehensive Course + Test Series



134
AIR

Gaugin Gyanendra Singh

Forestry Comprehensive Course

64 Out of **147** Total Selections in

Indian Forest Service (IFoS) 2023



Single source solution for **Forestry optional**

The study material provides comprehensive coverage of the syllabus and previous year's questions, presenting them in a structured and topic-specific format. Additionally, it includes exploration of emerging areas that are not explicitly stated in the IFoS syllabus but frequently appear in exam questions.