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Model Answer

B Sc Forestry (III semester)

AS-2930 MM: 60

SECTION-A

Note: Q.No.1 is compulsory which carry20 marks.

Q.1.(a). Multiple choice questions (10)

i. G.O.B can be converted into G.U.B by ……. formula (g = G.O.B, g' = G.U.B)

a) $g = g'-2\pi t$ b) $g' = g - 2\pi t$ c) $g = g' + 2\pi t$ d) $g' = g + 2\pi t$

Ans. a) $g = g'-2\pi t$

ii. Which one of the following forest tree species have high specific gravity in wood

a) Shorea robusta b) *Acacia catechu*

c) *Dalbergia latifolia* d) *Dalbergia sissoo*

Ans. b) *Acacia catechu*

iii. The mean volume of a tree or forest crop at the desired age is called

a) C.A.I b) M.A.I c) P.A.I d) None of the above

Ans. b) M.A.I

iv. The difference between average set of repeated measurements or estimates to its true value is called

b) Accuracy b) Bias c) Precision d) None of the above

Ans. b) Bias

v. The number of peaks of a wave (Trough or Crest) passing through a fixed point in space per unit time is called

a) Wavelength b) Velocity c) Frequency d) None of the above

Ans. c) Frequency

(b) Fill in the blanks (10)

i**.** Small scale photography lies between **1:40000** to**1:70000** ratio.

ii. NRSA-**National Remote Sensing Agency, Hyderabad**

iii. Presslers's formula on the mean of two diameters is P= 200(D-d)/n(D+d).

iv. Standard stem small wood volume of stem wood round between **20 cm** and **5cm** volume being taken inclusive of bark.

v. 10 decimeter= **1 metre**

SECTION-B

Q.2. What are the different systems of measurements? Explain in detail the units of length, area & volume and their related measurements?

Ans. The following are the two systems of measurement which are commonly used

1. British system of F. P. S. system
2. French or metric system or C.G.S system ,

The standards of weights and measures Act, 1956 the British system or FPS system was used in forestry. Metric or CGS system which was introduced in October 1962, is now a legal.

Units of length: In the FPS or British system, foot is the unit of length and it is related to other measurements of this system as follows:

Units of length: FPS		Units of area: FPS	
12 inches	= 1 foot	144 square inches	= 1 square foot
3 feet	= 1 yard	9 square foot	= 1 square yard
66 feet or 22 yards	= 1 chain (100 links)	484 square yards	= 1 square chain
10 chains or 220 yards	= 1 furlong	10 square chains	= 1 acre
8 furlongs or 1760 yards	= 1 mile	640 acre	= 1 square mile
CGS		FPS	
10 millimeter (mm)	=1 centimeter	100 square millimeter	=1 square centimeter
10 centimeters	= 1 decimeter	100 square centimeters	= 1 square decimeter
10 decimeter	= 1 meter	100 square decimeter	= 1 square meter
10 meters	= 1 decameter	100 square meters	= 1square decameter
10 decameter	= 1 kilometer (km)	100 square decameters	= 1 hectare
10 hectometer	1 nautical mile	100 hectares	1 square kilometer

Units of Volume in British		Units of volume In Metric system	
1728 cubic inches	= 1 cubic foot	1000 cubic mm	= 1cubic centimeter
27 cubic feet	= 1 cubic yard	1000 cubic centimeters	= 1 cubic decimeter
		1000 cubic decimeters	= 1 cubic meter

Q.3. What is tree form? What are the different factors effecting tree form? Explain in detail the methods for studying tree form with suitable diagram?

Ans. Tree form: is defined as the rate of taper of a log or stem. Taper is the decrease in diameter of a log or stem of a log from base upwards.

Methods of studying form

1. By comparison of standard form ratios
2. By classification of form on the basis of form ratios
3. By compilation of taper table

1. By comparison of standard form ratios : we can study tree form in two way

a. Form factor b. Form quotient

a. Form factor: Form factor is defined as the ratio of the volume of a tree or its part to the volume of cylinder having the same length and cross section as the tree. These are as follows:

i. **Artificial form factor**: Also known as Breast height form factor. The basal area is measured at breast height and the volume refers to the whole tree both above and below the point of measurement

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

iii. **Normal form factor**: In this form factor basal area is measured at a constant proportion of the total height of the tree, e.g., 1/10 th, 1/20th.

b**. Form quotient**: FQ is the ratio between the mid-diameter and the dbh.

FQ= Mid-diameter/d.b.h.

2.By classification of form on the basis of form ratios : two way

a. Form class b. Form point ratio

a. **Form class:** is defined as one of the intervals in which the range of form quotients of trees is divided for classification and use.
b. **Form point ratio**: is the relationship, usually expressed as a percentage of the height of the form point above ground level to the total height of the tree.

3. By compilation of taper table:

i. Ordinary taper tables or diameter taper tables
ii. Form class table

 Paraboloid  Conoid  Neiloid

If we knew more about the factors determining stem form we might be in a better position to control it. Following are some of the important factors which affect the tree form;

a) Type of forest tree species
b) Genetics of the forest tree species
c) Age of the forest tree species
d) Competition among the forest tree species
e) Site conditions
f) Wind exposure
g) Silvicultural treatment given to the tree species
h) Size and structure of the crown

These factors the one which plays a decisive role in determining stem form is crown, particularly crown length. As such all factors that influence the crown also influences the tree form.

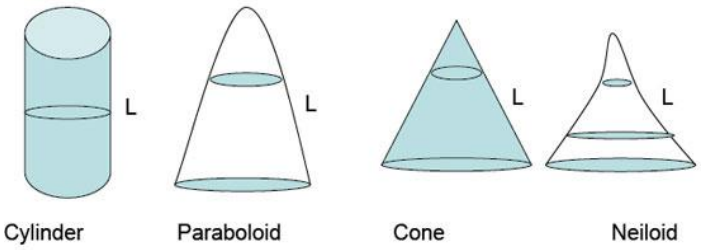
Q.4. (a) Write the different methods for calculating Volume of logs?

Ans. There may be different formula for different shape of the log, i.e. Cylinder, Paraboloid – Smalian's formula & Huber's formula Cone Neiloid – Newton's formula or Prismoidal formula

Form of Solid	Volume of full solid	Volume of frustum of solid	Remarks
Cylinder	sl	sl	
Paraboloid	$\frac{sl}{2}$	$\frac{s_1 + s_2}{2} * l$	Smalian's
	$\frac{sl}{3}$	$s_m * l$	Huber's
Cone		$\frac{(s_1 + s_2 + \sqrt{s_1 * s_2})}{3} * l$	
Neiloid	$\frac{sl}{4}$	$\frac{(s_1 + 4s_m + s_2)}{6} * l$	Prismoidol Newton's

where, s is the sectional area at the base in square units, s1 is the sectional area at the thick end in square units m is the sectional area at the middle in square units, s2 is the sectional area at the thin end in square units l is the length of the log or height of the solid in linear

units. **Measurement of Logs:** Different shapes of solid wood Log size:



Log size:

- 3m for research purpose
- < 4.5 m for transport

Section area

The area under each section Area = (π d2)/4 and Area = g2/(4π)

Newton's Formula: Most accurate formula**.** It **g**ives volume not only frustum of neiloid correctly, but also cylinder, paraboloid and cone**.** All other formulae can be derived from it Cumbersome to use as it necessitates the measurement of diameter and calculation of areas of three cross-sections. Difficult to apply when logs are stacked and mid-diameter can not be measured. Hence, Newton's formula is not used in practice. It is only used to calculate the error in volume calculated by other formulae

Quarter Girth Formula: The volume of the log will be calculated using quarter girth formula V = (g/4)2 * l π of value 3.14 is approximated to 4. Thus this formula underestimates the volume almost 21.5% as compare to full circular volume. It is known as Hoppus' Formula in Britain. Even if the log had no taper, the volume of the square timber would be 2r 2l.

Smalian's Formula: Requires the areas of end cross-sections. Overcomes the difficulty of measuring mid-diameter of logs when they stacked. Gives volumes of frustums of cylinders and paraboloid with absolute accuracy. Overestimates the volume and has positive error. Easier to apply than Huber's and Newton's formula. Easier to measure by wooden scale than tape or calliper as log may be lying on the ground.

Huber's Formula: Requires the areas of mid cross-sections. Impossible to use it when logs are stacked. Gives volumes of frustums of cylinders and paraboloid with absolute accuracy Underestimates the volume and negative error. Nearer true value than the Smalian's formula Better than the Smalian's formula because the effect of root swell does not vitiate the result in lower-most log.

(b) **Explain the xylometric method for calculating volume of firewood?**

Ans. Xylometer is used to calculate the volume of billets by the principle of water displacement consisting of graduated vessel and volume of wood. Water is poured in the vessel and reading of water level is taken. Then the piece of wood is submerged and the reading is again taken.The difference between two readings gives the volume of the piece of wood submerged. To obiviate the necessity of submerging large quantities of wood the whole stack is first weighted and only a portion is submerged.Let W be the weight of whole stack of wood and w be the weight of submerged pieces, V be the volume of the former and v be the volume of latter the ,

$$W:w:: V:v$$

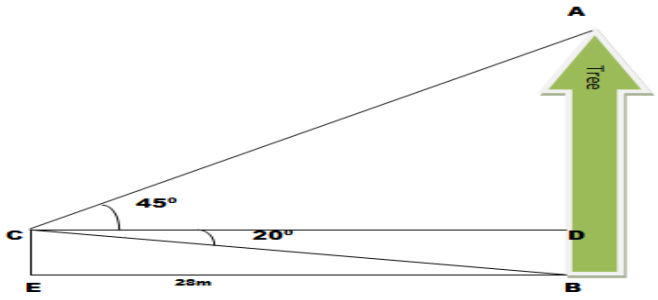
$$W/w=V/v$$

$$\text{Or } V/v = W/w$$

$$\text{Or } V= v \times W/w$$

Q.5. A tree is standing on a flat ground. If an observer standing at a distance of 28 m from the base of tree. Measures with the help of an Abney's level, angles' of 45^0 and 20^0 respectively to the top and base of the tree. Calculate the height of the tree with suitable diagram?

Solution:



Figure

Let AB be the Total height of tree

Where AB= AD+DB

EB= DC= 28m……(Given)

CE= Observer height

Angle ACD= 45^0…….. (Angle of elevation given)

Angle DCB= 20^0…….. (Angle of depression given)

In Δ ADC

AD/DC = $Tan45^0$

As we know that $Tan45^0$= 1

And DC= 28m……..given

Therefore AD/28m = 1
Or AD= 28m x 1
Or AD = 28 m…… (i)
Now in ΔBDC
BD/DC = $Tan20^0$
Since $Tan20^0$ = .36
DC = EB = 28m…….given
Therefore BD/28m = .36
Or BD = .36 x 28m
Or BD = 10.08m…….(ii)
From (i) & (ii) we get
AB = AD +DB
Or AB = 28m + 10.08m
Or AB = 38.08m
Therefore the total height of tree AB = **38.08m**…Ans

Q.6. Write Short notes of the following

Ans. (i) Growing stock of a forest

The growing stock of a forest is defined as the sum (by number or volume) of all trees growing in the forest or a specified part of it. In other words, it's the forest capital or capital in the form of growing trees even otherwise, the term is very suggestive. Stock is a commercial term which means a store or a godown containing articles. In this stock, the trees growing in the forest are the articles. Thus, growing stock refers to the inventory of trees growing in a particular forest. Therefore growing stock is very important aspect from the point of view of forest management. All calculations of yield are based on it and, therefore, at each revision of working plan, inventory of the growing stock is prepared before yield can be calculated.

(ii) Nutritional and Hormonal theories of tree form

Nutritional theory of tree form relates tree bole shape to the need of the tree to transport nutrients and water within the tree. These theories are based on the ideas that deal with the movement of liquids through pipes ie vascular bundles which decreases with the increase in the height of the tree, thus it explains that the diameter of a tree decreases from the base to the top of the tree.

The Hormonal theory of stem from envisages growth substances originating in the crown regulating the distribution of radial growth on the stem by controlling the activity of the cambium. It provides physiological explanation of how a tree grows and why trees differ in the way they do, but it does not specify the particular shapes trees may have under varying circumstances .the hormonal theory offers the most

promising approach to the stem form problem. It provides a physiological basis for the nutritional as well as the functional theories of stem form.

Q.7. Explain in detail the following

Ans. (i) Principles of remote sensing: Remote sensing is defined as the technique of obtaining information about objects through the analysis of data collected by special instruments that are not in physical contact with the objects of investigation. As such, remote sensing can be regarded as "reconnaissance from a distance," "teledetection," or a form of the common adage "look but don't touch."

All recording devives require energy to produce images. The most common and important source of energy used to produce image is the sun. the solar energy is received in the form of electromagnetic waves travelling at the speed of light (299000 km/second). The wave motion is described by wavelength, frequency and velocity. The wavelength (w) of the electromagnetic waves is the distance from one wave crest or peak to the next. The frequency (f) is the number of peak passing through a fixed point in space per unit of time. As the velocity (c) is constant at the speed of light, the three are related as follows:

$$C = fw$$

The usual unit of measurement of wave length is micrometer one thousand th part of a millimeter. Thus it is numerically equal to 10^{-6} m. The electromagnetic radiation occurs as a continuum of wave length and frequencies from short wave length and high frequency cosmic waves to long wave lengths and low frequency radio waves and is known as electromagnetic spectrum.

The science of remote sensing deals with the technique of detecting these changes in photographically or electronically.

(ii) Classification of remote sensing: Remote sensing classified into two broad categories:

(1) Aerial remote sensing (2) space remote sensing

(1) Aerial remote sensing: Arial remote sensing is that method of remote sensing in which cameras or other devices, fixed in an aircraft flying at fixed altitude are used to take photographs of any resource on earth. Films are processed after landing. The interpretation of the photographs gives information about

(iii) Advantages of remote sensing:

Remote sensing has enabled mapping, studying, monitoring and management of various resources like agriculture, forestry, geology, water, ocean etc. It has further enabled monitoring of environment and thereby helping in conservation. In the last four decades it has grown as a major tool for collecting information on almost every aspect on the earth. With

the availability of very high spatial resolution satellites in the recent years, the applications have multiplied. In India remote sensing has been used for various applications during the last four decades and has contributed significantly towards development. Since remote sensing has reduced the labour, cost and energy for the land resource assessments. Following are the main advantages of remote sensing;

a) Relatively *cheap* and *rapid* method of acquiring *up-to-date* information over a *large* geographical area.
b) It is the only practical way to obtain data from *inaccessible* regions
c) At small scales, regional phenomena which are invisible from the ground are clearly visible. Examples: faults and other geological structures. A classic example of seeing the forest instead of the trees.
d) Cheap and rapid method of constructing base maps in the absence of detailed land surveys.
e) Easy to manipulate with the computer, and combine with other geographic coverages in the GIS.