

(g) Find the sum of the series

$$x(x+y) + x^2(x^2+y^2) + x^3(x^3+y^3) + \dots \text{ upto } n \text{ terms.}$$

(h) Find out the limit $\lim_{x \rightarrow 0} \frac{\sin^2 ax}{\sin^2 bx}$

(i) If $(1+i)(1+2i)(1+3i)\dots(1+ni) = (x+iy)$, show that $2.5.10$
 $\dots(1+n^2) = x^2+y^2$

(j) Construct a 2×2 matrix $A = (a_{ij})$ whose elements are

$$\text{given by } a_{ij} = \frac{i}{j}$$

(k) Using binomial theorem, compute $(98)^5$.

(l) suppose two boats leave a place at the same time. One travels 56 km in the direction $N50^\circ E$,

(m) If x, y, z are in arithmetic progression, then find the

$$\text{value of the determinant } \begin{vmatrix} a+2 & a+3 & a+2x \\ a+3 & a+4 & a+2y \\ a+4 & a+5 & a+2z \end{vmatrix}$$

B.Sc. 1st Semester (Honours) Examination, 2022-23

FORESTRY

COURSE ID: 13508 COURSE CODE: SH/FST/BS 1104

COURSE TITLE: Forest Botany

Time : 2 Hours

Full Marks : 50

The figures in the right hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

I. Write a definition or *one* sentence answer any *Ten* of the followings : 1×10=10

1. What is vascular criptogams.
2. Meristematic tissue
3. What is amphibious plant
4. Mention two gymnosperm plant
5. Mention living cell of xylem tissue
6. Root cap

7. Draw valvate aestivation
8. Albuminous cell
9. Mention a modified leaf
10. Spongy parenchyma
11. What is stele
12. Reticulate venation
13. Conjoint vascular bundle
14. Annual Ring.
15. Prop root

II. Write short note/define any *Ten* of the followings :

2×10=20

1. Actinomorphic and zygomorphic flower
2. Heterophylly
3. Floral formula
4. Floral diagram
5. Secondary meristematic tissue

(y) Evaluate $\int_0^{\frac{\pi}{4}} \tan^3 x \, dx$

2. Answer any *ten* questions : 2×10 =20

(a) Prove that $\sin \alpha + \sin \left(\alpha + \frac{2\pi}{3} \right) + \sin \left(\alpha + \frac{4\pi}{3} \right) = 0$.

(b) Show that the following system of equations is inconsistent : $2x+y = 3$, $4x+2y = 5$.

(c) Find $\frac{dy}{dx}$, When $y = \frac{e^x + \log x}{\sin 3x}$.

(d) Show that the function $f(x) = 4x^3 - 18x^2 + 27x - 7$ has neither maxima nor minima.

(e) Show that the square roots of $-15-8i$.

(f) If the sum of n terms of an arithmetic progression is of the form $pn + qn^2$, where p and q are constants, then find the first term and common difference of the progression.

- (o) Prove that $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$
- (p) Find the sign of the expression $\sin 100^\circ + \cos 100^\circ$
- (q) Find the cofactor of the element 1 in $\begin{pmatrix} 2 & 3 & 3 \\ 1 & -2 & 2 \\ 3 & -1 & -2 \end{pmatrix}$
- (r) Define homogeneous system of linear equations.
- (s) Find the value of $x^3 + 7x^2 - x + 16$, When $x = 1 + 2i$.
- (t) Find the value of the $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1}$.
- (u) Find $\frac{d}{dx} \left(e^{\sqrt{ax+b}} \right)$.
- (v) Find the value of $\tan 75^\circ$.
- (w) Evaluate $\int \frac{dx}{1 + \sin x}$
- (x) Prove that $\cos 100^\circ + \cos 20^\circ = \cos 40^\circ$

6. Raceme
7. Bark
8. Lenticel
9. Function of xylem parenchyma
10. Petiole
11. Soft wood
12. Seed coat
13. Cork-cambium
14. Basal placentation
15. Function of vessel element

III. Write down in brief any *four* of the followings: $5 \times 4 = 20$

1. Types of vascular bundle
2. Economic importance of gymnosperm
3. Write the difference between monocot. stem & dicot stem.
4. Seed dispersal mechanism of angiosperm _____,
5. Draw and describe a mature ovule
6. Difference between Cymose & racemose Inflorescence.

COURSE TITLE: Basic Mathematics

Full Marks : 70

Time : 3 Hours

1. Answer any *twenty* questions : $1 \times 20 = 20$

- (a) Find out the $\lim_{x \rightarrow 0} \frac{x}{|x|}$ (if exists).
- (b) Find the 12th term of the arithmetic progression $\{-5, -3, -1, \dots\}$.
- (c) Find the total number of ways of answering 10 objective type questions each question having four choices.
- (d) Find the n^{th} term of the Geometric Progression $\sqrt{3}, \frac{1}{\sqrt{3}}, \frac{1}{3\sqrt{3}}, \dots$
- (e) Which term of the sequence $\{2, 1, 2^{-1}, 4^{-1}, \dots\}$ is 128^{-1} ?
- (f) Find the value of $\frac{z_1}{z_2}$ Where $z_1 = 2 + 3i$ and $z_2 = 1 + 2i$.

(g) Find the fourth term from the end in the expansion

of $\left(\frac{x^3}{2} - \frac{2}{x^3}\right)^9$

- (h) How many triangles can be formed by joining the vertices of a hexagon?
- (i) Consider a matrix of order 3×3 such that $|A| = 3$. Find the value of $|3A|$, where $|A|$ denotes the determinant of the matrix A.
- (j) Show that ${}^n C_r + {}^n C_{r-1} = {}^{n+1} C_r$.
- (k) In ΔABC , prove that $a(b \cos C - c \cos B) = b^2 - c^2$.
- (l) State whether the matrix $\begin{pmatrix} 2 & 3 & 6 & 4 \end{pmatrix}$ is singular or non-singular.
- (m) A is a skew symmetric of order 3, write the value of $\det A$.
- (n) Find the argument of the complex number $\frac{1}{1+i}$.

(d) If $x\sqrt{1+y} + y\sqrt{1+x} = 0$ for $-1 < x < 1$, then prove that

$$\frac{dy}{dx} = -\frac{1}{(1+x)^2}$$

(e) Evaluate $\int \frac{\cos x - \cos 2x}{1 - \cos x} dx$

(f) If $f'(x) = x + \frac{1}{x^2}$ and $f(3) = 4$, then find $f(x)$.

(g) Find the minimum value of $4e^{2x} + 9e^{-2x}$.

(h) Expand $(1-3x)^7$ by binomial theorem.

and

The product of three numbers in arithmetic progressions is 224, and the largest number is 7 times the smallest. Find the numbers. 2.5+2.5

(n) Evaluate $\int_0^a \frac{dx}{(x^2 + a^2)^2}$

(o) If the fourth term in the expansion of $\left(ax + \frac{1}{x}\right)^n$ is $\frac{5}{2}$,

then find the value of a and n .

3. Answer any six questions :

5×6=30

(a) Prove that
$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

(b) Using Cramer's rule, solve the following system of linear equations

$$2x - y - z = 7, \quad 3x + y - z = 7, \quad x + y - z = 3$$

(c) Prove that

$$\tan \left\{ \frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b} \right\} + \tan \left\{ \frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b} \right\} = \frac{2b}{a}$$