4. Botany I Paper (Bot.311), 2066
(Plant Diversity)

Time : 3 hrs. Full Marks : 100

Attempt ALL the questions.

Group "A" [10×4=40]

1. Classify Algae according to Fristch with suitable examples.

OR

Give an illustrative account of the life cycle of *Chara*.

2. Describe the life cycle of *Anthoceros* with necessary diagrams.

OR

Explain the sterilization of sporogenous tissue in Bryophytes with suitable examples.

3. Explain the alternation of generation in Pteriodophytes with suitable diagrams.
4. Give salient features of Poaceae with floral diagram and floral formula; and mention its economic importance.

Group "B" [5×6=30]

5. Write a brief account of (any SIX):
   a. Range of Hyphae in Fungi.
   b. Vesicular Arbuscular Mycorrhizae (VAM)
   c. Importance of Azolla in agriculture
   d. Heterospory in Pteridophytes
   e. Gymnosperms of Nepal

f. Evolution of Gymnosperms
g. Botanical Nomenclature
h. Merits of Engler and Prantl's system of classification of Angiosperms.

6. Give well labeled diagrams (any TWO: No descriptions required) [5×2=10]
   a. L.S. ovule of Cycas
   b. Floral diagram of *Ranunculus*.
   c. Life cycle of *Alternaria*

7. Distinguish between the following : (any TWO): [5×2=10]
   a. Isogamous and hetetrogamous reproduction in Algae.
   b. Lycopsida and Pteropsida.
   c. Cymose and Racemose Inflorescence in Angiosperms

8. Write short notes on any FIVE: [5×2=10]
   a. Mention the names of two kingdoms from Whittaker's system of classification of living organisms.
   b. Name two types of fossils.
   c. Give the names of two living organisms from the Coenozoic era.
   d. Mention two uses of *Spirulina* for mankind.
   e. Name two examples of Fruticose Lichens.
   f. Provide the names of two photosynthetic protests.
   g. Name two anatomical structures present in foliose lichens.

Botany I Paper (Bot.311-Plant Diversity), 2067

Bachelor Level /Science & Tech / I Year — Full Marks: 100
Time: 3 hrs.

Attempt ALL the questions.

GROUP "A" (4x 10=40)

1. Classify Fungi according to Ainsworth with suitable examples.

OR

Give an account of the life cycle of *Albugo* with suitable diagrams.

2. Describe the reproductive of structures of *Ephedra* with necessary diagrams.

OR

Write an account on distribution of Gymnosperms in Nepal.

3. Explain the stellar system in Pteridophytes with suitable examples.
4. Give salient features of Gentianaceae with floral diagram and floral formula and mention its economic importance.

GROUP "B" (6x5=30)

5. Write a brief account of (any SIX):
   a. Lichens as bio-indicators of environmental pollution.
   b. Sexual reproductive structures of *Chara*.
   c. Role of Algae in an aquatic food chain.
   d. Sterilization of sporogenous issue in Bryophytes.
   e. Heterospory in Pteridophytes.

f. Economic importance of conifers
g. Importance of Herbarium.
h. Angiosperm Phylogeny Group (APG).

GROUP "C" (2x5=10)

6. Give well labelled diagrams
(any TWO: No descriptions required)
a. Vegetative structure of *Navicula.*
b. L.S. of sporophyte of *Porella.*
c. Life cycle of *Pteirs.*

GROUP "D" (2x5=10)

7. Distinguish between the following: (any TWO)
a. Phaeophyceae and Rhodophyceae.
b. Paleozoic and Mesozoic Eras.
c. Hypogynous and Epigynous flowers in Angiosperms.

GROUP "E" (5x2=10)

8. Write short notes on any FIVE:
a. Mention two features of Five Kingdom System of classification of living organisms.
b. Biological significance of *Anabaena.*
c. Give Latin names of two Foliose Lichens.
d. Mention uses of bacteria for mankind.
e. Two principal features of Croncraist's System of Classification of Angiosperms.
f. Two salient features of orchids.
g. Give the Latin name and family of "Strawberry".

OLD COURSE - BOT.311

(Cryptogarnic Botany, Gymnosperms and Angiosperms)

Each question of Section "A" carries 10 marks and questions of Section "B" and "C" carry 5 marks.

Attempt ALL the questions.

Section "A"

1. Explain the life cycle of *Volvox* with necessary diagrams.
OR
Give an account of life cycle of *Puecinia* with suitable diagrams.
2. Give a concise account on the distributiorfof Gymnosperms in Nepal.
3. Give salient features of Polygonaceae with suitable examples, floral diagram and floral formula.

Section "B"

Give well labelled diagrams of the following: (No description is required)

4. Life cycle of *Albugo.*
5. L.S. of capsule of *Polytrichum.*
6. T.S. of strobilus of *Equisetum.*

7. *Inflorescence* of Euphorbiaceae.

Section "C"

Write short notes on the following:

8. Multiplication of viruses.
9. Lichens as bioindicators of environmental pollution.
10. Late blight of Potato.
11. Geologic time scale.
12. Biological significance of Heterospery.
13. Sperophyte of Marchwitia,
14. Economic importance of *Pinus*.
15. Merits of Engler and Prates system of classification of Angiosperms.
16. Fruit type in Rutaceae.
17. Plantation and economic importance of Rice.

Botany I Paper (Bot.311-Plant Diversity), 2068

Bachelor Level /Science & Tech / I Year — Full Marks: 100

Time: 3 hrs.

Attempt ALL the questions.

GROUP "A" (4x 10=40)

1. Describe range of vegetative structure in Algae with suitable examples.

OR

Give an illustrative account of the life cycle of *Batrachospermum*.

2. Describe the life cycle of *Polytrichum* with necessary diagrams.

OR

Explain sporophytic evolution in Bryophytes with suitable examples and diagrams.

3. Explain Heterospory in Pteridophytes with suitable diagrams and point out, its biological significance.
4. Give salient features of Mangnoliaceae with floral diagram and floral formula; and mention its economic importance.

GROUP "B" (6x5=30)

5. Write a brief account of (any SIX):
   a. Sexual Reproduction in Fungi
   b. VAM (Vesicular Arbuscular Mycorrhizae)
   c. Importance of Lichens for mankind
   d. Steles in Pteridophytes
   e. Conifers of Nepal
   f. Evolutionary significance of Gymnosperms
   g. Principles of Botanical Nomenclature
   h. Merits of Cronquist's System of Classification of Angiosperms

GROUP "C" (2x5=10)

6. Give well labelled diagrams
   (any TWO: No descriptions required)

a. Magnified filament of *Anabaena*
b. L.S. Ovule of cycas
c. Life cycle of *Albugo*.

GROUP "D" (2x5=10)

7. Distinguish between the following: (any TWO)
   a. Chlorophyceae and Rhodophyceae
   b. Psilopsida and Pteropsida
   c. Marginal and parietal placentation

GROUP "E" (5x2=10)

8. Write short notes on any FIVE:
   a. Mention two features of Six Kingdom System of classification of living organisms.
   b. Name two types of formation of fossils.
   c. Give the names of two living organisms from the Palaeozoic era.
   d. Reproductive structure in Fruticose lichens.
   e. Provide the names of two photosynthetic protists.
   f. Floral parts in orchids.
   g. Give the Latin name and family of "Ainselu".

Botany I Paper (Bot.311-Plant Diversity), 2069

Bachelor Level/Science & Tech./I Year — Full Marks : 100
(For: Regular Examinee only) — Time :3hrs.
Attempt ALL the questions.

GROUP 'A' (4×10=40)

1. Give an account of the life cycle of *Agaricus* with suitable diagrams.

   Or

   Describe the life cycle of *Ficus* with necessary diagrams.
2. Give an illustrated account of sterilization of sporogenous tissue in Bryophytes.

   Or

   Describe the life cycle of *Lycopodium* with necessary illustrations.
3. Describe the reproductive structures of Pinus with suitable diagrams.
4. Discuss Bentham and Hooker's system of classification of flowering plants. Mention its merits and demerits.

GROUP 'B' (6×5=30)

5. Write a brief account of (any SIX):
   (a) Reproduction in *Anabaena*.
   (b) Role of Lichens in biomonitoring of environmental pollution.
   (c) Heterothallism in Fungi.
   (d) Algae as food.
   (e) Vegetative reproductive structures in Bryophytes.
   (f) Alternation of generation in Pteridophytes.

(g) Types of fossils.
(h) APG system

GROUP 'C' (2×5=10)

6. Give well labelled diagrams (any TWO: No descriptions required)
   (a) Diagrammatic life cycte of *Riccia*
   (b) T.S. of stem of *Equisetum*.
   (c) T. S. *cycas* leaf

GROUP 'D' (2×5=10)

7. Distinguish between the following: (any TWO)
   (a) Ectomycorrhiza and endomycorrhiza
   (b) Euredospore and basidiospore
   (c) Hypogeal and epigeal seed germination

GROUP 'D' (2×5=10)

8. Write short notes on any FIVE:
   (a) Two demerits of Two Kingdom System of classification of living organisms
   (b) Role of bacteria in agriculture
   (c) Fruticose lichens
   (d) Redalgae
   (e) Hornwort
   (f) Use of Gymnosperms in medicine
   (g) Botanical nomenclature

Botany I Paper (Bot.311-Plant Diversity), 2070

Bachelor Level /Science & Tech /I Year — Full Marks: 100
New Course: Botany - 311 (Plant Diversity) — Time: 3 hrs.
Attempt ALL the questions.

GROUP "A" (4×10=40)

1. Describe the life cycle of Alternaria with necessary illustrations.

OR

Give a descriptive account of life cycle of Chara with suitable diagrams.

2. What do you mean by sterilization of sporogenous tissues ? Discuss it with reference to the structure of sporophyte of Polytrichum.

OR

What is alternation of generation? Discuss it with reference to the life cycle of Pteris.

3. Give an account of the general characteristics and economic importance of Gymnosperms.
4. Give distinguishing features of the family Orchidaceae with floral diagram and floral formula. Mention its economic importance. (6×5=30)

GROUP "B"

5. Write a brief account of (any SIX):
   Five Kingdoms system of classification of living organisms

b. Reproduction in Spirulina
c. Economic importance of Lichen
d. Role of Algae in soil reclamation
e. Seed habit in Pteriodophytes
f. Evolution of Gymnosperms
g. Herbarium techniques
h. Mode of fossil formation

GROUP "C" (2×5=10)

6. Give well labelled diagrams
(any TWO: No descriptions required)
a. Diagrammatic life cycle of Riccia
b. T.S. of stem of Lycopodion
c. T.S. of needle of Pinus

GROUP "D" (2×5=10)

7. Distinguish between the following: (any TWO)
a. Conidia and Pycnidia
b. Normal and coralloid roots of Cycas
c. Phyllotaxy and aestivation

GROUP "E" (5×2=10)

8. Write short notes on any FIVE:
a. Edible mushrooms of Nepal
b. Lichens in medicine
c. Clamp connection in Basidiomycetes
d. Elaters
e. Cycas as living fossil
f. Binomial nomenclature
g. Geological periods

OLD COURSE - BOT 311

(Cryptogamic Botany, Gymnosperms and Angiosperms)

Each question of Section "A" carries 10 marks and questions of Section "B" and "C" carry 5 marks.

Attempt ALL the questions.

Section "A"

1. Describe the vegetative structure and reproduction of Albugo with suitable diagrams.

OR

Describe the life cycle of Batrachospermura with proper sketches.

2. Describe the development of microspores (pollen grains) of Pinus from time of its formation till the end of fertilisation.

3. Describe the floral structure of family Rosaceae with its floral formula and floral diagrams. Give the scientific name of any two plants of this family with their economical importance.

Section "B"

Draw well labelled diagrams of the following:
(No description is required)

4. T.S. of aerial stem of Equisetum.
5. V.S. of thallus of Anthoceros.
6. Teleutosporous of Puccinia in T.S.
7. Vegetative structure of Vaucheria.

Section "C"

Write short notes on the following:

8. Ring rot of potato.
9. Economic importance of Bacteria.
10. Sporophyte of Marchantia.
11. Heterosporous sporocarp of Mavsilea.
12. Lichen as pioneer community in plant succession.
13. Ovuliferous scale of Pinus.
14. Medicinal importance of Serpentina.
15. Demerits of Bentham and Hooker's system of classification of Angiosperms.
16. Mode of Fossil formation.
17. Stelar system in pteridopytes.

Botany – I Paper (Bot.101-Plant Diversity), 2070 (New course)

Four Year Bachelor Level/Science & Tech./I Year — Full Marks: 100
Time: 3 hrs.

Attempt ALL questions.

GROUP "A" (4×10=40)

1. Give illustrative account of the life cycle of Chara.

OR

Describe the range of vegetable thallus in Algae.

2. Give an account of life cycle of Alternaria with necessary diagrams.
3. Describe the structure of sporangiophore of Equisetum.
4. Give salient features of Rosaceae along with floral diagram, floral formula and economic importance.

OR

Write down the classification of Engler and Prantle. Mention the merits and demerits of this classification system.

GROUP "B"

Write a brief account of (any EIGHT): (8×5=40)

5. Economic importance of bacteria.
6. Sexual reproduction in Albugo.
7. Internal structure of heteromerous lichen.

8. Capsule of Polytrichum.
9. Sporophyte of fern.
10. Economic importance of Gymnosperms.
11. Coralloid root.
12. Distinguish between Impression and Petrification fossil.
13. Give the contributions of John Hutchinson.
14. Write down the floral diagram and floral formula of Malvaceae.

GROUP "C"

Write short notes on (any EIGHT): (8×2.5=20)

15. The concept of six kingdom systems.
16. Phylogenetic system of classification.
17. Ascus.
18. Describe Monera.
19. Cellular structure of Navicula
20. Sporophyte of Riccia
21. Megasoprangium of Pinus
22. Economic importance of Gymnosperms.
23. Inflorescence of Cyperaceae.
24. Economic importance of Orchids.

Botany – I Paper (Bot.101-Plant Diversity), 2071

Bachelor Level (4 Yrs:)/ I Year/Science & Tech. Full Marks: 100
Time: 3 hrs.

Attempt ALL questions.

GROUP "A" (4×10=40)

1. Give illustrative account of the life cycle of Vaucheria.

OR

Describe different types of reproduction found in Algae.

2. Give an account of the life cycle of Agaricus with necessary diagrams.
3. Explain the stem anatomy of different species of Lycopodium with illustration of stellar type.
4. Give salient features of Caryophyllaceae along with floral diagram, floral formula and economic importance.

OR

Give a concise account of the classification system proposed by Bentham and Hooker.

GROUP "B"

Write a brief account of (any EIGHT): (8×5=40)

5. Reproduction in Oscillatoria.
6. Explain Teleutospores.
7. Justify lichens as indicators of air pollution.
8. Alteration of generations in bryophytes.

9. Describe the range of habitat in pteridophytes
10. Give the salient features of Coniferopsida.
11. Internal structure of stem of Ephedra.
12. Significance of fossil.
13. Give the contributions of Arthur Cronquist
14. Write down the floral diagram and formula of Lamiaceae.

GROUP "C"

Write short notes on (any EIGHT): (8×2.5=20)

15. The limitations of four kingdom system of classification.
16. Natural and artificial system of classification.
17. Cleistothecium.
18. Receptacles of Fucus.
19. The scales found in bryophytes.
20. Urostachya.
21. Megasporophyll of Cycas.
22. Pattern of gymriosperms distribution in Nepal.
23. Inflorescence of Moraceae.
24. Economic importance of Magnolia.

Botany – I Paper (Bot.101-Plant Diversity), 2072

Bachelor Level (4 Yrs. prog.) I year/Science & Tech. Full Marks: 100
Time: 3 hrs.

Attempt ALL the questions.

Group "A" [4×10 = 40]

1. Give an illustrated account of the life cycle or *Vaucheria*.

OR

Describe the thallus structure and reproduction in *Chlamydomonas*

2. Describe the life cycle of *Riccia* with necessary diagrams.
3. Explain the alternation of generation in pteridophytes with suitable diagrams.
4. Give salient features of Ranunculaceae with floral diagram and floral formula. Mention its economic importance.

OR

Briefly describe the natural system of classification proposed by Benthar and Hooker

Group "B" [8× 5 = 40]

Write a brief account of (any Eight):

5. Give the economic importance of algae.
6. Briefly describe the sporophyte of *Anthocerus* with the help of suitable diagrams.
7. Write important characteristic features of Basidiomycetes with example.
8. Give an account of gymnosperms found in Nepal and their distribution.
9. Draw diagramma... life cycle of Albugo.

10. Give the contribution of Carolus Linnaeus in modern taxonomy.
11. With the help of well labeled diagram, describe the anatomy of leaf of *pinus.*
12. Distinguish between isogamous and heterogamous reproduction in Algae.
13. How are sterile jackets developed around archegonia in bryophytes?
14. Distinguish between Lycopsida and pteropsida.

Group "C"

Write short notes on (any Eight): **[8×2.5 = 20]**

15. Distinguish between crustose and Foliose lichen with examples.
16. Give biological significance of *Spirulina.*
17. Give floral diagram and floral formula of *Rosa alba.*
18. Write significance of plant taxonomy.
19. Give salient feature of *Fucus.*
20. Differentiate between recemose and cymose type of inflorescence.
21. Name two fungi of medicinal value. Also give the names of medicines obtained from them.
22. Draw well labelled diagram showing internal structure of stem of *Lycopodium.*
23. Give the name of two living organisms from the Cenozoic era.
24. Describe the structure of sporophyte of *polytrichum.*

5. Mathematics I Paper (Math. 311), 2066
(Calculus)

Time : 3 hrs. Full Marks: 75

Attempt ALL the questions.

Group "A" 5×7=35

1. Define and deduce the expressions for the polar subtangent and polar subnormal at any point P(r, θ) of a curve $r = f(\theta)$. Find the angle between the curves $r^2 = a^2 \cos 2\theta$ and $r^2 = b^2 \sin 2\theta$. [1+2+4]

2. State Taylor's series extended to infinity. Let Rn denote the remainder after n terms of the series. Prove that $\lim_{n\to\infty} Rn = 0$ is both necessary and sufficient condition that the function $f(x+h), |h| < \delta$ can be expanded in an infinite series. Hence show that

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots\ldots\ldots \text{ to } \infty \text{ for all x.}$$ [1+2+4]

OR

State Leibnitz theorem.

If $y = \tan^{-1} x$, prove $(1+x^2)y_1 = 1$

and hence show that

$$(1+x^2)y_{n+1} + 2nxy_n + n(n-1)y_{n-1} = 0$$ [1+2+4]

3. Define Beta and Gamma functions.

Prove that : $\int_0^{\pi/2} \sin^m x \cos^n x dx = \frac{\tau\left(\frac{m+1}{2}\right)\tau\left(\frac{n+2}{2}\right)}{2\tau\left(\frac{m+n+2}{2}\right)}$ and hence show that

$\int_0^{\infty} e^{-x^2} dx = \frac{1}{2}\sqrt{x}$. [2+3+2]

4. How do you define the maximum and minimum values of a function of two variables ?

Find the minimum values of $x^2 + y^2 + z^2$ when $x + y + z = 3a^2$. [2+5]

OR

State and establish Eulers theorem for a homogeneous function of degree n. Use this theorem to show that

$x\frac{2u}{2x} + y\frac{2u}{2y} = \tan u$ if $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$. [1+2+4]

5. State the condition of exactness of a first order differential equation. Verify that the equation $(2xy + y^2)dx + (x^2 2xy - y)dy = 0$ is exact and hence find its general solution.

Group "B" **10×4=40**

6. What is the angle between the curve $r = \psi_1(\theta_2), r = \phi(\theta)$? Show that the curves $ax\, ax^2 + by^2 = 1$ and $a^1x^2 + b^1y^2 = 1$ cut orthogonally if $\frac{1}{a} - \frac{1}{a^{-1}} = \frac{1}{b} - \frac{1}{b^1}$. [1+3]

OR

Show that the tangent drawn at the extremities of any chord of the cardiode $r = (1 + \cos\theta)$ which passes through the pole are perpendicular to each other. [4]

7. What do you mean by indeterminate form ?

Evaluate : $\lim_{x \to \pi/2} (\sin x)^{\tan x}$. [1+3]

8. Evaluate : $\int_0^{\pi/2} \int_{\pi/2}^{\pi} e^x \cos(y - x) dy dx$

OR [4]

Show that $\int_0^1 dx \int_0^1 \frac{x-y}{(x+y)^3} dy \neq \int_0^1 dy \int_0^1 \frac{(x-y)}{(x+y)^3} dx$ [4]

9. Show that $\int_0^1 \log\sin x dx = \int_0^{\pi/2} \log\cos x dx = \pi/2 \log\left(1/2\right)$. [4]