

Shivaji University, Kolhapur



“A” Re-accredited By NAAC
(2014) with CGPA-3.16

New Syllabus For Bachelor of Science BOTANY

SEMESTER -V: Paper -IX, X, XI, XII

SEMESTER -VI: Paper - XIII XIV, XV, XVI

Syllabus to be implemented from June 2015

A] Ordinance and Regulations:-
(As applicable to Degree Course)

B] Shivaji University, Kolhapur
Revised Syllabus for Bachelor of Science

1. TITLE: Subject-Botany
Optional under the Faculty of Science

2. YEAR OF IMPLEMENTATION:-

Revised Syllabus will be implemented from **June 2015 onwards.**

3. PREAMBLE:-

[**Note :-**The Board of Studies should briefly mention foundation, core and applied components of the course/paper. The student should get in to the prime objectives and expected level of study with required out come in terms of basic and advance knowledge at examination level.]

4. GENERAL OBJECTIVES OF THE COURSE:
(as applicable to the Degree concerned)

Objectives:-

- 1) To impart knowledge of Science is the basic objective of education.
- 2) To develop scientific attitude is the major objective to make the students open minded, critical, curious.
- 3) To develop skill in practical work, experiments and laboratory materials and equipment's along with the collection and interpretation of scientific data to contribute the science.
- 4) To understand scientific terms, concepts, facts, phenomenon and the relationships.
- 5) To make the students aware of natural resources and environment.
- 6) To provide practical experience to the students as a part of the course to develop scientific ability to working the field of research and other fields to the his own interest and to make them it for society.
- 7) To the students are expected to acquire knowledge of plant and related subjects so as to understand natural phenomenon,

manipulation of nature and environment in the benefit of human beings.

- 8) To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self reliant and sufficient.
- 9) To create the interest of the society in the subject and scientific hobbies, exhibitions and other similar activities.

5. DURATION

The course shall be a full time course for **THREE** years

6. PATTERN:-

Pattern of Examination will be Semester for Theory and Annual for practical.

7. FEE STRUCTURE:-

As per Government / University rules.

1. Refer brochure and prospectus of concern affiliated college/institute to Shivaji University, Kolhapur.
2. Other fee will be applicable as per rules and norms of Shivaji University, Kolhapur.

8. ELIGIBILITY FOR ADMISSION:

As per guidelines obtained from Shivaji University, Kolhapur by following rules and regarding reservations by Govt. of Maharashtra.

9. MEDIUM OF INSTRUCTION:

The medium of instruction shall be in English.

**10. STRUCTURE OF COURSE- B.Sc.III Botany (Optional)
THIRD YEAR (SEMESTER V/VI) (NO.OF PAPERS-8)**

Sr. No.	Subjects/Papers	Theory	Internal	Total Marks
1.	Semester V- Paper-IX	40	10	50
2.	Paper-X	40	10	50
3.	Paper-XI	40	10	50
4.	Paper-XII	40	10	50
5.	Semester VI Paper-XIII	40	10	50
6.	Paper-XIV	40	10	50
7.	Paper-XV	40	10	50
8.	Paper-XVI	40	10	50
	Practical-I			50
	Practical-II			50
	Practical-III			50
	Practical-IV			50
	Total			600

11. SCHEME OF TEACHING:

[The scheme of teaching and examination should be given as applicable to the course/paper concerned.]

THIRD YEAR-SEMESTER- V and VI: Botany(Optional)

Scheme of Teaching and Examination

Sr.No.	Subject/Paper	Teaching Scheme (Hrs/Week)				Examination Scheme (Marks)		
		L	T	P	Total	Theory	Term Work	Total
	Semester- V							
1	Paper-IX	3	-			40	10	50
2	Paper-X	3	-			40	10	50
3	Paper-XI	3	-			40	10	50
4	Paper-XII	3	-			40	10	50
	Semester- VI							
5	Paper-XIII	3	-			40	10	50
6	Paper-XIV	3	-			40	10	50
7	Paper-XV	3	-			40	10	50
8	Paper-XVI	3	-			40	10	50
	Practical-I(annual)			5				200
	Practical-II(annual)			5				
	Practical-III(annual)			5				
	Practical-IV(annual)			5				
	Total	12	-	20	32			600

12. SCHEME OF EXAMINATION:-

- The examination shall be conducted at the end of each term for semester pattern.
- The Theory paper shall carry 40 marks.
- The evaluation of the performance of the students in theory papers shall be on the basis of Semester Examination of 40+**10** marks.
- Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each unit of syllabi.

13. STANDARD OF PASSING:-

As prescribed under rules and regulation for each degree.

15. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS-(FOR REVISED SYLLABUS)

(Introduced from June 2015 onwards)

Nature of Question papers (Theory)

COMMON NATURE OF QUESTION FOR THEORY PAPER MENTIONED SPERATELY:

Old Syllabus (Semester pattern)			New Syllabus (Semester pattern)		
Semester No.	Paper No.	Title of Old Paper	Semester No.	Paper No.	Title of New Paper
V	IX	Biology of Cryptogams.	V	IX	Biology of Non Vascular Plants and Palaeobotany
	X	Microbiology and Plant Pathology		X	Genetics and Analytical Techniques in Plant Science
	XI	Gymnosperms & Palaeobotany		XI	Fundamentals of Plant Physiology and Ecology
	XII	Angiosperms and Environmental Biology		XII	Plant Biochemistry
VI	XIII	Genetics	VI	XIII	Biology of Vascular Plants
	XIV	Microbial Genetics, Plant Breeding and Biostatistics		XIV	Microbiology and Plant Pathology
	XV	Plant Biochemistry		XV	Plant breeding, Biostatistics, Ethnobotany and Horticulture
	XVI	Molecular biology and Biotechnology		XVI	Molecular Biology and Biotechnology

16.

SPECIAL INSTRUCTIONS,IF ANY.

B. Sc. Part III / Semester V
Botany Paper – IX
Biology of Non Vascular Plants and Paleobotany

(40 periods)

- Unit 1. Algae :** 10
- Sub-unit 1.1** Occurrence and distribution of algae.
- Sub-unit 1.2** Origin and evolution of sex in algae.
- Sub-unit 1.3** Types of life cycles in algae – Haplontic, Diplontic, Haplodiplontic, Isomorphic, Heteromorphic, Haplobiontic, Diplobiontic. Triphasic.
- Sub-unit 1.4** Study of life cycles with emphasis on classification, occurrence, morphology, reproduction and economic importance of
- a) *Chara* b) *Ectocarpus***
- (Excluding development of sex organs and sporophyte).
- Unit 2. Fungi** 10
- Sub-unit 2.1** Occurrence and distribution of Fungi.
- Sub-unit 2.2** Types of reproduction in Fungi.
- Sub-unit 2.3** Study of following types with emphasis on classification, structure of mycelium, nutrition, Reproduction and Economic importance of
- a) *Albugo* b) *Uncinula***
- (Excluding developmental stages).
- Unit 3. Bryophytes** 10
- Sub-unit 3.1** Comparative account of Bryophytes with respect to morphology, gametophyte and sporophyte.
- Sub-unit 3.2** Alternation of generations in Bryophytes.
- Sub-unit 3.3** Study of life cycle of *Funaria* (Excluding developmental stages).
- Unit- 4. Paleobotany** 10
- Sub-unit 4.1** General account, Process of fossilization, Types of fossils.
- Sub-unit 4.2** Geological time scale.
- Sub-unit 4.3** Study of following form genera with reference to systematic position, external morphology, anatomy and affinities -
- a) *Lyginopteris* b) *Enigmocarpon***
- Sub-unit 4.4** Applications of Paleobotany - Role of microfossils in oil and coal exploration.

B. Sc. Part III / Semester V
Botany Paper – XI

Fundamentals of Plant Physiology and Ecology

Unit-1: Mineral nutrition and Nitrogen Metabolism	10
Sub Unit 1.1 Mineral nutrient uptake	
A) Passive uptake – Diffusion.	
B) Active uptake – Carrier Concept.	
Sub Unit 1.2 Role of minerals - Criteria of essentiality of elements. Role, Deficiency Symptoms and disorders of macro nutrients (P, K, Ca, Mg) and micro nutrients (Fe, Mn) in plants and its recovery.	
Sub Unit 1.3 Nitrogen metabolism	
a) Introduction b) Biological nitrogen fixation c) Reduction of N ₂ to NH ₃	
d) Nitrate reduction e) Ammonia assimilation f) <i>nif</i> genes.	
Unit 2. Photosynthesis and Respiration	12
Sub Unit 2.1 Photosynthesis –	
a) Introduction, Photosynthetic pigments and their role.	
b) Light dependent reactions: Photosystems – reaction center complexes, Photolysis of water, Electron transport and photophosphorylation.	
c) Light independent reactions [Dark reactions]: Calvin cycle, C ₄ cycle and CAM pathways.	
d) Significance of photosynthesis. e) Photorespiration and its significance.	
Sub Unit 2.2 Respiration- a) Introduction. b) Types of respiration b) Glycolysis.	
d) Decarboxylation – conversion of pyruvate to acetyl CoA.	
e) TCA cycle. f) ETS in mitochondria.	
Unit 3. Population ecology	08
Sub Unit 3.1 Concept of Population.	
Sub Unit 3.2 Density. Natality and Mortality.	
Sub Unit 3.3 Limiting (regulatory) factors of population -Abiotic factors: Nutrients, and moisture .Biotic factors – Competition and density.	
Unit 4. Ecosystem	10
Sub Unit 4.1 Introduction.	
Sub Unit 4.2 Types and components of ecosystems.	
Sub Unit 4.3 Dynamics of ecosystem-Food chain, Trophic levels, foodweb, ecological Pyramids, energy flow [Box and Pipe Model].	
Sub Unit 4.4 Phases and types of Biogeochemical cycle. Hydrobiological (water) cycle, Nitrogen cycle, Phosphorus cycle.	

**B. Sc. Part III / Semester VI
Botany Paper – XIII**

Biology of Vascular Plants (40 periods)

Unit- 1 Pteridophytes:	08
Sub-unit 1 .1 General account of Pteridophytes with reference to	
a) Structure of gametophytes b) Alternation of generations.	
c) Stelar evolution	
Sub-unit 1.2 Study of life cycle of <i>Marsilea</i> (Excluding developmental stages).	
Unit-2 Gymnosperms:	06
Sub-unit 2.1 Study of life cycle of <i>Gnetum</i> (Excluding developmental stages).	
Sub-unit 2.2 Evolutionary significance.	
Unit -3 Angiosperms:	16
Subunit 3.1 Phylogeny of angiosperms: A general account of the origin of Angiosperms (With special reference to Gnetalean theory).	
Subunit 3.2 System of Classification –Takhtajan. Outline of to APG III classification 2009.	
Subunit 3.3 Modern Taxonomy in relation to palynology, anatomy and cytology (Cytotaxonomy) in plants.	
Subunit 3.4 Flower: a) Concept of flower as a modified shoot.	
b) Structure of anther – Microsporogenesis and development of male gametophyte.	
c) Structure of Pistil – Megasporogenesis. Structure of a typical ovule. Types of ovules. Development and Types of female Gametophyte i.e. monosporic, bisporic and tetrasporic.	
Subunit 3.5 Pollination and Fertilization:	
a) Types and significance of pollination,	
b) Development of embryo in Monocotyledons and Dicotyledons.	
c) Double fertilization and Triple fusion, Endosperm formation.	
d) Mechanism of pollination in <i>Vallisneria</i> , <i>Calotropis</i> and Maize .	
Unit 4. Anatomy:	10
Subunit 4.1 Meristem: Theories of structural development –	
a) The Apical cell theory b) Histogen Theory c) Tunica corpus theory	
Subunit 4.2 Tissue System and their function:	
a) Epidermal tissue system b) Secretory tissue system c) Mechanical tissue system.	

B. Sc. Part III / Semester VI
Botany Paper – XIV
Microbiology and Plant Pathology

(40 periods)

Unit 1 :Microbiology	14
Sub-unit 1.1 Methods in Microbiology – Staining, Sterilization methods, Culture media, Pure culture methods.	
Sub-unit 1.2 Micro-organisms in biological world and characteristic features of different groups – Bacteria, Viruses, Phytoplasma, Actinomycetes.	
Sub-unit 1.3 Industrial applications of micro-organisms with reference to organic acids, alcohol, antibiotics and bio-pesticides.	
Unit 2. Microbial Genetics	08
Sub-unit 2.1 Introduction	
Sub-unit 2.2 Bacterial genome	
Sub-unit 2.3 DNA viruses	
Sub-unit 2.4 RNA viruses	
Sub-unit 2.5 Recombination in Bacteria - Transformation, Transduction and Conjugation	
Unit 3. Plant Pathology	10
Sub-unit 3.1 Classification of plant diseases based on Pathogens, Crops and Symptoms.	
Sub-unit 3.2 Transmission of pathogen-Seed borne, Soil borne and Air borne.	
Sub-unit 3.3 Prevention and control of plant diseases. Role of quarantine.	
Unit 4. Study of Plant diseases	08
Sub-unit 4.1 Phytoplasma – Grassy shoot disease of Sugarcane.	
Sub-unit 4.2 Viral – Yellow vein mosaic of Bhendi.	
Sub-unit 4.3 Bacterial – Citrus canker.	
Sub-unit 4.4 Fungal – a) Downy mildew of Bajara.	
b) Leaf spot of Turmeric	
c) Grain Smut of Jowar.	
d) Anthracnose of Bean.	

**B. Sc. Part III / Semester VI
Botany Paper – XV**

Plant breeding, Biostatistics, Ethnobotany and Horticulture

(40 periods)

Unit 1. Plant Improvement:	10
<p style="margin-left: 20px;">Sub-unit 1.1 Introduction.</p> <p style="margin-left: 20px;">Sub-unit 1.2 Aims and objectives of plant breeding.</p> <p style="margin-left: 20px;">Sub-unit 1.3 Methods of plant breeding.</p> <p style="margin-left: 40px;">a) Introduction and Acclimatization.</p> <p style="margin-left: 40px;">b) Selection- i) Mass Selection ii) Pure line Selection iii) Clonal Selection</p> <p style="margin-left: 40px;">c) Hybridization techniques in self-pollinated crops and cross-pollinated crops.</p> <p style="margin-left: 40px;">d) Male sterility and significance in plant breeding.</p> <p style="margin-left: 40px;">e) Hybrid vigour</p>	
Unit 2. Ethnobotany:	06
<p style="margin-left: 20px;">Sub-unit-2.1 Introduction, scope and objectives</p> <p style="margin-left: 20px;">Sub-unit-2.2 Methodology of Ethnobotany: a) Field work b) Herbarium c) Temples</p> <p style="margin-left: 40px;">d) Sacred grooves.</p> <p style="margin-left: 20px;">Sub-unit-2.3 Role of Ethnobotany in modern medicine with reference to</p> <p style="margin-left: 40px;">a) <i>Vitexnegundo</i>. b) <i>Tribulus terrestris</i>. c) <i>Morinda spe</i>. d) <i>Agel spe</i>.</p>	
Unit 3. Biostatistics:	08
<p style="margin-left: 20px;">Sub-unit 3.1 Collection and presentation of data.</p> <p style="margin-left: 20px;">Sub-unit 3.2 Measures of central tendency - Mean, Mode and Median.</p> <p style="margin-left: 20px;">Sub-unit 3.3 Variance and standard deviation. Coefficient of variation.</p> <p style="margin-left: 20px;">Sub-unit 3.4 Test of Significance (T-text), Chi-square test (X2 test).</p>	
Unit 4. Horticulture:	12
<p style="margin-left: 20px;">Sub-unit 4.1 Gardening- Definition, objectives and scope. Types of gardening. Planning and layout of gardening. Plant materials and design .</p> <p style="margin-left: 20px;">Sub-unit 4.2 Ornamental plants: Types and classification. Flowering trees, Flowering shrubs, Indoor plants, Hedges, Edges and Lawn.</p> <p style="margin-left: 20px;">Sub-unit 4.3 Plant Nursery Management- Introduction, types of nursery, infrastructure and requirements, manure, fertilizers, pesticides, methods of irrigation and commercial importance.</p>	

**B. Sc. Part III / Semester VI
Botany Paper – XVI**

Molecular Biology and Biotechnology (40periods)

- Unit 1. Nucleic acid: Carriers of genetic information:** 10
- Sub-unit 1.1** Historic perspective. DNA as a carrier of genetic information
[Different experiments.]
- Sub-unit 1.2** Replication of DNA, Enzymes involved in replication. Denaturation and
Renaturation of DNA.
- Sub-unit 1.3** Differential Gene action: Operon Model [lac operon].
- Unit 2. Recombinant DNA Technology:** 12
- Sub-unit 2.1** Introduction and Principle.
- Sub-unit 2.2** General method and Enzymes involved in recombinant DNA technology.
- Sub-unit 2.3** Cloning Vectors – a) Prokaryotic- Plasmid, Lambda phage and Cosmid.
[Brief idea] b) Eukaryotic-YAC [Yeast Artificial Chromosomes].
- Sub-unit 2.4** Blotting techniques-Southern and Northern.
DNA fingerprinting – RFLP, RAPD.
- Sub-unit 2.5** Gene amplification –PCR technique
- Sub-unit 2.6** Construction of Genomics and c-DNA libraries.
- Unit 3. Genetic Engineering:** 10
- Sub-unit 3.1** Introduction.
- Sub-unit 3.2** Method of Gene transfer - *Agro bacterium* mediated,
Direct gene transfer by Electroporation, Microinjection,
Microprojectil bombardment in crop biotechnology.
- Sub-unit 3.3** Reporter genes.
- Sub-unit 3.4** Transgenic plants.
- Sub-unit 3.5** Applications of Plant Biotechnology.
- Unit 4. Plant Tissue Culture:** 8
- Sub-unit 4.1** Historical perspective, Principles, Terminology.
- Sub-unit 4.2** Composition of medium, nutrient and hormone requirement.
- Sub-unit 4.3** Totipotency and Cellular differentiation.
Organogenesis and embryogenesis [Somatic and zygotic].
- Sub-unit 4.4** Applications of plant tissue culture.
a) Protoplast culture b) Somatic hybridization c) Micropropagation.

Shivaji University, Kolhapur
B. Sc. PART – III (BOTANY)/Practical - I
Revised Syllabus (Introduced from 2015-2016)

1. Identification of following algae: (Any four)

- a) *Oscillatoria* b) *Zygnema* c) *Caulerpa*
d) *Padina* e) *Batrachospermum*

2.-3. Life cycle of following types:

- a) *Chara* b) *Ectocarpus*

4. Identification of following Fungi: (any four)

- a) *Phyllchora* b) *Alternaria* c) *Clavaria*
d) *Melampsora* e) *Rhizopus* f) *Agaricus*

5-6. Life cycle of following types:

- a) *Albugo* b) *Uncinula*

7. Identification of following Bryophytes: (any four)

- a) *Marchantia* b) *Targionia* c) *Cyathodium*
d) *Plagiochasma* e) *Fossombronia* f) *Asterella*

8-9. Life cycle of *Funaria*.

10. Identification of following Pteridophytes: (Any four)

- a) *Adiantum* b) *Asplenium* c) *Osmunda*
d) *Blechnum* e) *Ophioglossum*

11-12. Life cycle of *Marsilea*.

13-14. Life cycle of *Gnetum*.

15. Study of types of fossils:

Impression, Compression, Petrification, Cast, Coal ball, Amber.

16. Study of Fossil genera- *Lyginopteris*

17. Study of Fossil genera- *Enigmocarpon*

18-19..Preparation of PDA (Slants and Plates) and sterilization.

20. Inoculation of Fungi on slants and plates.

21. Isolation and separation of Soil fungi by Dilution method.

22-24. Plant diseases as per theory

25. Study of fermentation by yeast.

Shivaji University, Kolhapur
B. Sc. PART – III (BOTANY)/Practical - II
Revised Syllabus (Introduced from 2015-2016)

1-9. Study of following plant families.

- i) Annonaceae ii) Meliaceae iii) Fabaceae iv) Rubiaceae**
v) Convolvulaceae vi) Acanthaceae vii) Euphorbiaceae
viii) Polygonaceae ix) Cannaceae x) Poaceae

10. Identification of Genus and Species with the help of Cooke's flora.

11. Diversity in the structure of stigma and style.

12. Types of ovules.

13. Study of apical meristems through permanent slides and photographs

14. Study of Epidermal tissue system: cell types, stomata types; trichomes: non-glandular and glandular.

15. Study of Mechanical tissue system

16. Study of Secretary tissue system.

17. Study of role and deficiency symptoms of P, K, Ca, Mg, Fe, and Mn

18. Separation of Photosynthetic pigments by ascending paper chromatography

19. Study of Kranz leaf anatomy in C₄ plants.

20. Estimation of TAN value in CAM plants .

21. Demonstration of working of Ganong's respirometer.

22. Study of vegetation by the Chart quadrat method.

23. Determination of DO (Dissolved O₂) and BOD (Biological O₂ Demand) in polluted and non-polluted water samples (any two)

24. Titrimetric estimation of free CO₂ and bicarbonates in polluted and non-polluted water samples. (any two)

25. Analysis of electrical conductivity, temperature and pH of different water samples.

26. Field visit to familiarise students with ecology of different sites.

It's to be written in Journal.

Shivaji University, Kolhapur
B. Sc. PART – III (BOTANY)/Practical - III
Revised Syllabus (Introduced from 2015-2016)

1. Genetic Examples: Polygene inheritance.
- 2-3. Study of meiosis in *Allium*. Preparation of permanent cytological slides.
4. Determination of chromosome count in PMCs in *Allium* / *Cynotis*.
5. Preparation of karyotypes – idiograms by using photographs.
6. Detection of meiotic anomalies in chromosomes in *Rhoeo*.
7. Micrometry technique
- 8-9. Microtomy technique
- 10-11. Microphotography technique
12. Separation and identification of amino acids by TLC
- 13-14. Separation of isozymes using gel electrophoresis.
15. Qualitative tests for sugar in plant material. (Any two tests)
16. Qualitative tests for starch and cellulose in plant material (Any two tests)
17. Qualitative tests for proteins in plant material. (Any two tests)
18. Determination of fatty acid value of oil sample.
19. Qualitative tests for lipid in plant material. (Any two tests)
20. Determination of isoelectric point of protein in plant material.
21. Estimation of proteins in plant sample by Biuret method.
22. Mounting of a properly dried and pressed specimens of **ten** weed plants with herbarium label.

Shivaji University, Kolhapur
B. Sc. PART – III (BOTANY)/Practical - IV
Revised Syllabus (Introduced from 2015-2016)

1. Methods of emasculation.
2. Breeding technique in a) Malvaceae b) Fabaceae c) Poaceae
3. Measure of central tendency of given data.
4. Analysis of the given data using computer / Study of frequency distribution and its graphic presentation.
5. Common Plants used for ethenobotanical purpose by tribal
[Botanical Name, common name, purpose and method]
6. Identification of common ornamental plants
7. Identification of common edge and hedge plants.
8. Identification of common foliage and flowering plants.
9. Isolation of plant genomic DNA and its spooling.
10. Calorimetric estimation of DNA using di-phenyl amine.
- 11-12. Isolation of total RNA from plant tissue and its calorimetric estimation.
- 13-14. Preparation of tissue culture medium (M.S.) and its sterilization.
- 15-16. Demonstration of techniques of *in vitro* sterilization and inoculation methods using suitable explants.
17. Isolation of protoplast
18. Nursery Techniques
19. Study of methods of Gene transfer through photographs.
20. Study of steps of genetic engineering for the production of Bt cotton, golden rice through photographs.
- 21-22. Submission of PPT [Power Point presentation] on any topic in Botany.

SHIVAJIUNIVERSITY, KOLHAPUR
B.Sc.Part-III: Practical Examination in Botany
February/March-2016
Practical-I

Time:11.00a.m. onwards

Total Marks:50

- N.B.** 1) *Draw neat labeled sketches wherever necessary.*
 2) *Show your preparations to the examiners.*
 3) *Do not write about points of theoretical information unless asked specifically*

Q.1. Identify and classify the specimens A, B, and C. Draw neat labeled sketches.

Leave at least one slide of each specimen for inspection. (12)

[A- Algae, B-Fungi, C-Bryophytes]

Q.2 Identify the specimens D and E. Draw neat labeled important sketches.

Leave at least one slide of each specimen for inspection. (10)

[D- Pteridophyte, E-Gymnosperm]

Q.3 Inoculate the given culture 'F' of the fungus, on the slants of PDA (3)

(No written answer)

OR

Q.3 Isolate and separate Soil fungi from given sample (3)

(No written answer)

Q.4 Set up the experiment showing fermentation (No written answer) (3)

Q.5 Identification-

- a) **Identify and describe the specimen G. [Algae/Fungi] (2)**
- b) **Identify and describe the specimen H.[Bryophyte/Pteridophyte] (2)**
- c) **Identify and describe the specimen I. [Fossil type] (2)**
- d) **Identify and describe the specimen J. [Fossil genera] (3)**
- e) **Identify the plant disease K Give their symptoms, causal organisms and control measures (3)**

Q.6 a) Submission of each five plant disease specimens. (5)

b) Journal (5)

SHIVAJI UNIVERSITY, KOLHAPUR
B.Sc.Part-III: Practical Examination in Botany
February/March-2016
Practical-II

Time: 11.00a.m.onwards

Total Marks: 50

- N.B.** 1) *Draw neat labeled sketches wherever necessary.*
 2) *Show your preparations to the examiners.*
 3) *Do not write about points of theoretical information unless asked specifically*

- Q.1.** Assign the specimen A and B to their respective families on the basis of Characters observed by you in them. Mention important vegetative and floral characters. Draw the floral diagram of specimen A. Show your preparation to the Examiner. (10)
- Q.2.** Identify the genus and species of the given specimen 'C' with help of Cooke's flora (2)
- Q.3** Setup the physiological experiment assigned to you and show it to the Examiner. (No written answer) (10)
- Q.4** Set up the ecological experiment assigned to you and show it to the Examiner. (8)

OR

- Q.4** Prepare the chart quadrat of the marked area and find out percentage frequency of different species there in. (8)
- Q.5** Identification-
- a) Identify and describe the specimen D. [ETS] (2)
- b) Identify and describe the specimen E. [MTS] (2)
- c) Identify and describe the specimen F. [STS] (2)
- d) Identify and describe the specimen G. [Meristem slide] (2)
- e) Identify and describe the specimen H.
 [Ganong's respirometer/Mineral Deficiency] (2)
- Q.6.** a) Submission of Tour report. (5)
- b) Journal (5)
- Q.7.** Cut the given material embedded in paraffin and prepares the slides. Keep the slides for drying.

OR

Take microphotograph of prepared permanent slide and transfer the Image on computer.

SHIVAJI UNIVERSITY, KOLHAPUR
B.Sc.Part-III: Practical Examination in Botany
February/March-2016
Practical-III

Time: 11.00 a.m. onwards

Total Marks: 50

N.B. 1) *Draw neat labeled sketches wherever necessary.*

2) *Show your preparations to the examiners.*

3) *Do not write about points of theoretical information unless asked specifically.*

Q.1. Solve the given problem on polygene inheritance. (6)

Q.2. a) Show the chromosomal abnormalities from the specimen A. (6)

(No written answer)

b) Prepare the ideogram using given Photograph B. (5)

Q.3 Measure the dimensions of the given spore/pollen grain from specimen C under low and high power. Record your readings. (6)

Q.4 Stain the slides of Microtomy prepared earlier and show it to the examiner. (No written answer) (8)

OR

Microphotography-Edit and Format the image of photograph, label, print and show to the examiner (No written answer) (8)

Q.5 Identification-

a) Identify and describe the biochemical test 'D'. (3)

b) Identify and describe the stain / experiment 'E'. (3)

c) Identify and describe the stain / experiment 'F' (3)

Q.6 a) Submission of five Microtomy slides/ Microphotographs (5)

b) Journal (5)

SHIVAJI UNIVERSITY, KOLHAPUR
B.Sc.Part-III: Practical Examination in Botany
February/March-2016
Practical-IV

Time: 08.00a.m.onwards

Total Marks: 50

- N.B.** 1) *Draw neat labeled sketches wherever necessary.*
 2) *Show your preparations to the examiners.*
 3) *Do not write about points of theoretical in formation unless asked specifically*

Q.1. Show the breeding technique in given plant material A and B. (10)

(No written answer)

Q.2. Determine the mean, median and mode by using sample C. (6)

OR

Determine the frequency distribution and prepare a histogram/

Polygon/ line graph from specimen C. (6)

Q.3 Demonstrate the technique of inoculation of explant D on culture medium. (No written answer) (6)

Q.4 Set up the given experiment to assign you. (8)

(No written answer)

Q. 5. Identification:

- a) **Identify and describe the specimen D. [Ethenobotanical plant] (2)**
- b) **Identify and describe the specimen E.[flowering trees/shrub] (2)**
- c) **Identify and describe the specimen F. [Foliage trees/shrub] (2)**
- d) **Identify and describe the specimen G. [Indoor plants/Edge/hedge plants.] (2)**
- e) **Identify and describe the photograph / Nursery instrument H. (2)**

Q. 6.a) Submission of PPT [Power Point presentation]/ submission off ten weed plants with herbarium label (5)

b) **Journal (5)**

List of Books Recommended for B.Sc.III (Botany)

1. Blod, H.C., Aloxpoulos, G.J. and Delevoryas, T. 1980. Morphology Plant and Fungi (4th Edition) Harper and Foul Co., New York.
2. Clifton, A. 1958 Introduction to the Bacteria. McGraw Hill Co., New York.
3. Dube, H.C. 1990. An Introduction to Fungi Vikas Publishing House Pvt.Ltd., Delhi.
4. Gifford, E.M. and Foster, A.S. 1989. Morphology and Evolution of Vascular Plants W.H. Freeman & Co., New York.
5. Gilbert, M.S. 1985. Cryptogamic Botany Vol.I & II (2nd Edition), Tata McGraw Hill Publishing Co., Ltd New Delhi.
6. Kumar, h.D. 1988, Introductory Phycology. Affiliated East-West Press Ltd., New York.
7. Mandahar, C.L. 1998 Introduction to plant Viruses. Chand & Ltd., New Delhi.
8. Puri, P. 1985. Bryophytes. Amarm & Sons, New Delhi.
9. Rangswamy, G. and Mahadevan A. 1999. Diseases of Crop Plants in India Prentice Hall. India Pvt.Ltd., New Delhi.
10. Sporne, K.R. 1991. The Moropology of Gymmosperms. B.I. Publications Pvt., Bombay, Calcutta, Delhi.
11. Wilson, N.S. and Rothwell, G. W. 1983 Palaeobotany and the Evolution of Plants (2nd Edition). Cambridge University Press U.K.
12. Cronquist, A.. 1968. The evolution and classification of flowering plants. Thomas Nelson (Printers) Ltd., London & Edinburgh.
13. Delevoryas, Th. 1965 Plant Diversification. Modern Biology Series, Half Rinehart & Winston, New York.
14. Foster, A.S. and Gifford, A.E.M. jr. 1967. Comparative Morphology of Vascular Plants, Vakils, Peffer & Simons Pvt., Ltd.
15. Sporne, K.R. 1977. The Morphology of Angiosperms. B.I. Publication, Bombay.
16. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms 4th revised and enlarge edition. Vikas Publishing House, Delhi.
17. Johri, B.M. 1984. Embryology of Angiosperms. Springer-Verlag Berlin.
18. Raghvan, V. 1997. Molecular Embryology of Flowering Plants. Cambridge University Press N.Y.
19. Agrios. G.N. 1997. Plant Pathology Academic Press London.
20. Albajes, R., Gullino, M.L. van Lenteren, J.C. and Elad, Y. 2000. Integrated Pest and Disease Management in Greenhouse Crops, Kluwer Academic Publishers.
21. Bridge. P. et. al 1998. Molecular Variability of Fungal Pathogens. CAB International UK.
22. Bridge. P. et. al. 1999. Application of PCR in Mycology, CAB International, UK.
23. Bridge. P. Moore, D.R. and Scott, P.R. 1998. Informational Technology, Plant Pathology and Biodiversity, CAB International. UK.
24. Persley, G.J. 1996. Biotechnology and Integrated Pest Management, CAB International, UK.
25. Skerritt, J.H. and Apples, R. 1995. New Diagnostic in Crop Sciences. CAB International, UK.
26. Davis, P.H. and Haywood, V.H. 1963. Principles of Angiosperm Taxonomy. Oliver and Royd, London.
27. Heywood, V.H. and Moore D.M. 1984. Current Concepts in Plant Taxonomy. Academic Press, London.
28. Jones, S.B. Jr. and Luchsinger, A.E. 1986. Plant Systematics (2nd edition). McGraw-Hill Book Co., New York.

29. Lawrance, G.H.M. 1951. Taxonomy of Vascular Plants. MacMillan, New York.
30. Naik, V.N. 1984. Taxonomy of Angiosperms. Tata McGraw Hill, New York.
31. Radford, A.E. 1986. Fundamentals of Plant Systematics, Harper and Row, New York.
33. Singh, G. 1999. Plant Systematics: Theory and practice, Oxford & IBH Pvt., Ltd. New Delhi.
34. Jeffrey, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge London.
35. Stace, C.A. 1989. Plant Taxonomy and Biosystematics. 2nd Ed. Edward Arnold, London.
36. Woodland, D.E. 1991. Contemporary Plant Systematics. Prentice Hall, New Jersey.
37. Nordenstam, B., El-Gazaly, G. and Kassas, M. 2000. Plant Systematics for 21st Century Portl and Press Ltd., London.
38. Ambast, R.S. 1988. A Text Book of Plant Ecology Students. Friends Co. Varanasi.
39. Botkin, D.B. and Keller, E.A. 2000. Environmental Plane (2nd Ed). John Wiley & Sons Inc. New York.
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41. Cunningham, W.P. and Saifo, S.W. 1997. Environmental Science: A Global Concern, WCB. McGraw Hill.
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44. Collins, H.A. and Edwards, D.H. Lefebvre, D.D. and Layzell, D.B. (eds) 1997. Plant Metabolism (2nd Edition) Longman, Essex, England.
45. Lea, P.J. and Leegood, R.C. 1999. Plant Biochemistry and Molecular Biology (2nd Edition). John Wiley and Sons, Chichester, England.
46. Lodish, H. Berk, A. Zipursky, S.L. Matsudaira, P. Baltimore, D. and Darnel, J. 2000. Molecular Cell Biology (4th Edition) W.H. Freeman and Co. New York USA.
47. Old, R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation. Black well Scientific Publications. Oxford. UK.
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49. Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture, Kluwer Academic Publishers, The Netherlands.
50. Hackett, P.B. Fuchs, J.A. and Messing, J.W. 1988. An Introduction to Recombinant DNA Techniques: Basic Experiments in Gene Manipulation. The Benjamin/Cummings Publishing Co., Inc. Menlo Park California.
51. Hall, R.D. (Ed). 1999. Plant Cell Culture Protocols. Humana Press Inc. New Jersey, USA.
52. Ninfa, A.J. and Ballou, D.P. 1998. Fundamental Laboratory Approaches for Biochemistry and Biotechnology. Fitzgerald Science Press, Inc., Maryland USA.
53. Scott, R.P.W. 1995. Techniques and Practices of Chromatography Marcel Dekker, Inc. New York.
54. Daubenmire, R.F. 1974. Plants and Environment - A Text Book of Plant

- Ecology(3rd edition).JohnWiley&Sons.NewYork.
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 - 56.Kumar.H.D.1996.Modern Concepts of Ecology (3rd.Edition).Vikas Publishing House Pvt.Ltd.,Delhi.
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 - 59.Miller.W.R.and Donahue.R.L.1992.Soils-An Introduction to Soil and Plant Growth (6th edition).Prentice Hall of India,Pvt.Ltd.,NewDelhi.
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 - 61.Pickering.K.T.and OwenL.A.1997.An Introduction to Global Environmental Issues(2ndedition).ButterandTannerLtd.,Great Britain.
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 - 63.SmithL.R.and MithT.M.1998.Elements of Ecology.(4thedition).An imprint of Addison Wesley,Longmanink.,California.
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 - 81.Hartl.D.L.andJones.E.W.1998.Genetics:Principles and Analysis(4th

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 88. Bhojwani, S.S. 1990. *Plant Tissue Culture: Applications and Limitations*. Elsevier Science Publishers, New York, USA.
 89. Devi, P. 2000. *Principles and Methods of Plant Molecular Biology, Biochemistry and Genetics*. Agrobios, Jodhpur, India.
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 94. Kapur, P. and Govil, S.R. 2000. *Experimental Plant Ecology*, S.K. Jain for CBS Publishers and Distributors, New Delhi.
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 104. *Plant Protection*—P.R. Mehta and Verma.
 105. *Microbiology*—Peicar and Reid.
 106. *Microbiology life*—W.R. Sustrum.
 107. *Morphology of vascular Plant (lower groups)*—A.J. Eames.
 108. *Introduction to pteridophyta*—A.Rashid.
 109. *Morphology of Gymnosperms*—J.M. Coulter and C.J. Chamberlain.
 110. *Gymnosperms—Structure & Evolution*—C.J. Chamberlain.
 111. *Embryology in Press*—P. Maheshwari and V. Vasisht.
 112. *Morphology of Gymnosperms*—K.R. Sporne.
 113. *An Introduction to Palaeobotany*—C.A. Arnold.

114. Studies in Palaeobotany–H.N. Andrews.
115. Essentials of Palaeobotany–A.C. Shukla and S.P. Mishra.
116. The flora of Bombay Presidency Vol.- I, II & III–T. Cooke.
117. Taxonomy of the Angiosperms–A.J. Eames.
118. Text book of systematic botany–R.N. Sutar.
119. Methods of Descriptive systematic Botany–A.S. Hitchcock.
120. Taxonomy of the Angiosperms–U.N. Naik.
121. Methods of Descriptive systems Botany–A.S. Hitchcock.
122. Flora of Khandala–H. Santapan.
123. An Introduction to Embryology of Angiosperms–P. Maheshwari.
124. Hand Book of Agriculture–I.C.A.R.
125. Field Crops of India–A.K. Aiyer.
126. An Introduction to plant Anatomy–A.J. Eames and M.C. Daniells.
127. Physiology and Plant Anatomy–G. Haberlandt.
128. Forest Production and wood Science–J.G. Naygreen & Bowyer.
129. Pollen grains of Western Himalayan plants–P.K.K. Nair.
130. Essentials of Palynology–P.K.K. Nair.
131. Pollen morphology of Angiosperms–P.K.K. Nair.
132. Pollen morphology and plant Taxonomy–G. Erdtman.
133. Fundamentals of Cytology–L.W. Sharp.
134. Cytology Cytogenetics–C.P. Swanson.
135. Cytogenetics and Plant Breeding.–S.N. Chandrashekharan and S.V. Partha Sarathy.
136. The Physiology of flowering–W.S. Hiiman.
137. Phytochemical Methods–Hartore.
138. Plant growth substances–H.N. Krishnamurthy.
139. Introduction to Practical Biochemistry–D.T. Plummee.
140. Introduction to plant physiology–Noggle and Fritz (New Edition).
141. Taxonomy of Angiosperms–Dr. Naik V.N.
142. Region Vol. I. BSZ Pub. 1987 Rsico.
143. A text book of plant Physiology–V. Varma
144. Plant Physiology–Malik and Shrivastava (S. Chand and Co.)
145. Cytology and Genetics–Dnyansagar (T. Magre with & Co.)
146. Out line of plant pathology–Shobel G.A. & D.E. Mathre 1970. van Nostrakh Ramhold.
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155. Plant tissue and Organ culture–UNESCO and University of Delhi.
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157. Botanical Microtechnique–Sags.
158. Plant Micro Technique–D.A. Johanson.
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160. An Introduction to Biostatistics–Bhamburdekar S.B. Bandgar S.S and Sukane L.V. 2015 Express Publishing House, Kolhapur (MS), India

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169. Faulks, P.J. 1958. An introduction to Ethnobotany, Moredale pub. Ltd.
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190. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics, John Wiley & Sons Inc., India. 5th edition.
191. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. Benjamin Cummings, U.S.A. 10th edition.
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223. *Biochemistry-Fatima et.al.*, Saras Publication. P.O.-Nagercoil, Kanyakumari, Tamil Nadu.

224. Biotechnology- Kamaresan.,Saras Publication.P.O.-Nagercoil,Kanyakumari,Tamil Nadu.
 225.Text Book of Biochemistry-R.C.Dubey. A.Chand and Company Ltd. New Delhi.
 226.Plant Biotechnology-Practical Mannual.G.C.Giri and A.Giri.JK International Publishing House Ltd.,New delhi.2007.
 227. Practical Plant Biotechnology-S.S.Purohit.,Student Edition,Chopasani Road,Jodhur 2005.

C] OTHER FEATURES:

1. IN TAKE CAPACITY/NUMBER OF STUDENTS:-

As per university rules.

2. TEACHERS QUALIFICATIONS:-

- As prescribed by norms.
- However required number of core faculty should be given for particular course along with paper wise and Specialization wise workload allocation.
- Work load details should be as per Apex body/UGC/State Govt./University norms.

3. The Board of studies should clearly mention the required Books, Journals and specific Equipment's necessary for the Course.

(A) LIBRARY:

Library be equipped with the required Reference and Text Books, Journals and Periodicals for higher and advanced studies as per state din revised syllabus and approved by BOS.

(B) SPECIFIC EQUIPMENTS:

T.V., V.C.R., V.C.P., L.C.D., Overhead Projector, Computers and necessary software and operating systems etc. are necessary to run the course.

- i) Fire extinguishers at least two sets in each laboratory of 600sq.ft. Area.
- ii) Leakage of gases be avoided.
- iii) First aid kit be made available.
- iv) Sugar/Glucose-500gm pack-a pinch of sugar and a cup of drinking water in hypoglycemic condition or in extreme weakness of student or a person concerned

GENERAL SAFETY RULES FOR LABORATORY WORK

1) List of equipment's needed for Laboratory Safety:-

1. Fire extinguisher
2. First Aid Kit
3. Good ear thing and insulated wirings for electrical supply.
4. Emergency exit
5. Apron and goggles wherever necessary
6. Fuming Chambers
7. Masks flows and shoes while handling hazardous chemicals & gases
(Good valves, manometers and regulators for gas supply)
8. Operational manuals for instruments (handling to be made as suggested.)
9. Rules for animals and blanks ethics.
10. Leakage of gases to be avoided.
11. Cylinders or flow pipes to handle Acids.
12. No weighting's for NaOH and hygroscopic substances.

13. Stabilized supply in the laboratory.

2) There Is No Substitute for Safety:

1. Any injury no matter how small, it must be reported to teacher immediately.
2. a) In case any chemical enters our eyes go immediately to eye- specialist.
Flush your eyes and face with large amount of water.
- b) For acid or phenol split, do not use water instead put some bicarbonate.
3. In case of fire, immediately switch off all gas connections in the laboratory and Pour sand on the source of fire or cover it with asbestos or cement sheet.
4. While leaving laboratory, make sure that gas, water taps and electricity are Switched off.
5. Remove your lab coat. Gloves and clean your hands before leaving laboratory.
6. Make your work place clean before leaving the laboratory.
7. Keep your hands away from your face, while working in laboratory.
8. Each laboratory must have a first aid box.
9. Know what to do in case of emergency-e.g.
Know the place of fire extinguisher and first aid box.
10. Don't use cell phones in the laboratory.
11. Remember important phone numbers

3) DO's

1. Always wear lab coat, shoes in the laboratory. Every student must have their weight box, napkin etc.
2. Maintain separate record book for each subject.
3. Keep your belongings at the place allotted for the same.
4. Maintain silence, order, cleanliness and discipline in the laboratory.
5. Work at the place allotted to you or specially used for certain operations.
6. Keep the working table clean.
7. Handle the laboratory equipment's, glassware and chemical with great care.
8. Use only required quantities of material and apparatus of essential size.
9. Perform the test in their proper order.
10. Know the location of eye wash fountain and water shower.
11. Minimize your exposure to organic solvents.
12. The Metal like sodium should be kept under kerosene or liquid paraffin layer in vessel with a cork stopper.
13. Sodium metal should be cut on dry filter paper. The cut off pieces of sodium should be immediately collected in a vessel containing kerosene or liquid paraffin.
14. Always pour acid into water when diluting and stir slightly.

15 All operations involving poisonous flammable gases and vapours should be Carried out in the flame chamber (with exhaust facility)

16. Ladies should avoid wearing sari. If it is there, apron is essential.

4) **DON'T**

1. Don't work alone in the laboratory
2. Don't leave the glass wares unwashed.
3. Don't take apparatus, chemicals out of lab.
4. Don't leave any substance in a vessel or bottle without label.
5. Don't weight the reagent directly on the balance pan.
6. Don't throw the cut off pieces of sodium metal in sink or water. Transfer it immediately in its container.
7. Don't take sodium metal with hands, Use forceps.
8. Don't panic and run in case of fire. Use the fire extinguishers and buckets.
9. Don't breathe the vapors of organic solvents.
10. Don't pour any unused reagent back in its stock bottle.
11. Don't eat or drink any food in laboratory.
12. Don't use inflammable solvents like benzene, ether, chloroform, acetone and Alcohol around flame.
13. Don't distill to dryness.
14. Don't exchange stoppers of flask and bottles containing different reagents.
15. Don't leave reagent bottle lying on the table.
16. Don't disturb the order of reagent bottles in which they are placed.
17. Don't bring reagent on your working table from the general shelf.
18. Don't throw burning match stick in to dustbin.
19. Don't leave the laboratory without permission.

5) **LABORATORY/FIELDWORK CARE AND SAFETY FOR BOTANY STUDENTS**

1. Un necessary wastage of plant material during practical's should be avoided.
2. During study tour/personal collection, more emphasis be given on study of plants in nature and collection of wild plants should not be carried out.
3. If at all the collection of the plant material is needed, it should be carried out under supervision of concerned teacher. Collection of poisonous plants / poisonous mushrooms should be avoided.
4. Oral intake of unknown plant material, out of curiosity, during practical or collection tour is strictly prohibited. Re is any allergic reaction while handling the plants/plant

parts/pollen grains/ fungal specimens it should be immediately brought to the notice of the concerned teacher and reported to the registered medical purloiner.

6. Wearing of hand gloves (and mask) is essential while handling poisonous plants/ herbarium sheets/ toxic and hazardous chemicals/ reagents/ strong acids/ strong alkalis during the experiment should be made with vacuum pipette/ auto pipette/ burette under the supervision of concerned teacher/lab assistant.
7. Highly inflammable organic solvents (alcohol, acetone etc.) should not be kept in vicinity of spirit lamp.
8. The laboratory safety measures adopted for handling of hazardous chemicals in chemistry practicals should be followed for conducting practical's in plant biochemistry/microbiology.
9. Operational manuals for equipment's such as centrifuge, autoclave, spectrophotometer should be followed.
10. In case of minor injuries, preliminary treatment should be under taken with the help of first aid kit available in the laboratory. In case of serious injury, concerned teacher should be immediately contacted for consultant to the physician.
11. The instruction report for breeding, experiment at ion will be submitted in a week period. (Which are laid down by Ministry of Social Justice & Empowerment and Ministry of Environment and Forests, Govt. of India).

Practical Examination In saturations:

- A) Each candidate must produce a certificate from the Head of the Department stating that he/she completed practical course in satisfactory manner recommended by Board of studies and Laboratory journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and written report on each exercise performed. Every journal is to be checked and signed periodically by a teacher-in charge and certified by the Head of the Department at the end of year. A candidate has to produce their journal at the time of practical examination without which he/she will not be allowed to appear for practical examination.
- B) Excursions for the study of plants in their natural habitat in local area or any suitable areas should be arranged. There shall be on a teacher in-charge for not more than 12 students and one additional lady teacher, one field collector and one peon are to be allowed for study tour. T.A. and D.A. be paid to the concerning staff as per university rules.