INFORMATION BULLETIN

All India Competitive Examination for ICAR’s Senior Research Fellowship for pursuing Ph.D. Programmes

2011

SRF-Examination Cell
National Academy of Agricultural Research Management
Rajendranagar, Hyderabad - 500 407
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Sample of OMR Answer Sheet
Identity Verification Form
Important Information at a glance:

Download of Application Form from NAARM Website: http://www.naarm.ernet.in & http://www.icar.naarm.ernet.in
or from ICAR Website: http://www.icar.org.in.

Demand Draft of Rs.1200/- for General/OBC and Rs.600/- for SC/ST/PH categories should be drawn in favour of “ICAR Unit Account NAARM” and payable at Hyderabad should be sent along with the application form.

IMPORTANT DATES

(i) Last date for receipt of filled in applications August 30, 2011
(ii) Last date for receipt of filled in applications from remote areas; namely Assam, Meghalaya, Arunachal Pradesh Mizoram, Manipur, Nagaland, Tripura, Sikkim, Laddakh Division of J&K State, Lahaul & Spiti district and Chamba district of Himachal Pradesh, Andaman & Nicobar Island, and Lakshdweep September 6, 2011
(iii) Date of Examination (Change, if any, will be notified) December 4, 2011 (Sunday)
(iv) Likely date of declaration of result End of March 2012
Directions for Candidates

1. Day and date of examination: Sunday, the 4th December 2011
   (Change, if any, will be notified)

2. Duration:
   Paper I: 10.30 AM to 12.00 Noon
   Paper II: 2.00 PM to 4.30 PM

3. (a) Please verify before mailing the application that:
   (i) The application, to be sent in duplicate, has been signed at specified places on the Form
   (ii) Recent photographs (passport size) have been pasted in the space earmarked

(b) Please arrange application in the following order:
   (a) Application form, in duplicate, along with D.D.
   (b) Caste certificate (SC / ST / PH / OBC - wherever applicable)
   (c) Identity Verification Form
   (d) Attested photocopy of
      i) UG Degree
      ii) PG Degree
      iii) UG Marks
      iv) PG Marks

Candidates are advised NOT TO FOLD THE FILLED-IN APPLICATION FORM. SUITABLE ENVELOPES MAY BE USED ACCORDINGLY. DOCUMENTS SENT ALONG WITH APPLICATION SHOULD NOT BE STAPLED TO THE APPLICATION FORM.

4. Incomplete application forms, without accompanying documents indicated above, will be rejected.

5. Application Form is to be despatched by Speed Post / Registered Post well in advance so as to reach on or before 30-08-2011 and from remote areas as specified in the Information Bulletin by 06-09-2011.

6. Minor changes, if any, in the scheme of examination will be notified.

Please Note:
   i) The Academy shall not be held responsible for non-receipt of applications within time schedule due to postal delay or any other reason for delay.
   ii) Applications received after the due date will not be considered at all.

Controller of Examination
National Academy of Agricultural Research Management
Rajendranagar, Hyderabad - 500 407 (Andhra Pradesh)

Contact Numbers
Phone No.: 040-24015318
Fax No.: 040-24015912
INTRODUCTION

1. BACKGROUND

Agricultural education plays an important role in the overall development of the country. Considering the importance of agricultural education, the Education Commission in 1948 recommended the establishment of Rural Universities in the country. As a result of the recommendation made under the Chairmanship of Dr S Radhakrishnan, the first State Agricultural University was established in 1960 at Pantnagar on the pattern of the Land Grant Colleges of the United States. Today, the country has 44 State Agricultural Universities (SAUs), 4 Deemed Universities (DUs), 4 Central Universities (CUs) having faculty of agriculture and a Central Agricultural University. Thus, the National Agricultural Research and Education System of India is one of the largest in the world, training more than 15,000 graduates, 7,500 post-graduates, and 1,000 Ph.Ds annually, in different disciplines of agricultural and allied sciences.

In order to make the National Agricultural Research and Education System more effective, to improve standards of education and to develop human resources to meet the requirement of the 21st century, the Indian Council of Agricultural Research awards 202 Senior Research Fellowships to the candidates who will be selected through this competitive Examination and will take admission for Ph.D. degree programmes with partial course work. The competitive examination would be conducted at 12 centres in the country to enable a large number of students to appear for this examination in different disciplines of Agriculture, Veterinary and Allied Sciences. Senior Research Fellowships (SRF) for pursuing Ph.D. degree will be awarded in different disciplines based on merit, which includes 75% weightage for the marks obtained in written examination and 25% weightage for past academic performance.

2. DISCIPLINE/SUBJECT-WISE GROUPS, SUBJECT CODE AND TENTATIVE NUMBER OF SENIOR RESEARCH FELLOWSHIPS

NOTE: Candidates are advised to select one major subject group for appearing in the Examination based on compatibility with their subject area at Postgraduation level.

<table>
<thead>
<tr>
<th>Major Subject Group Code</th>
<th>Major Subject</th>
<th>Sub-Subjects in Ph.D. with Sub-Subject code</th>
<th>Total No. of Fellowships(SRF)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>General</td>
</tr>
<tr>
<td>A</td>
<td>Plant Sciences</td>
<td>A – 1 Agronomy</td>
<td>9</td>
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<tr>
<td></td>
<td></td>
<td>A – 2 Genetics</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td>A – 3 Plant Breeding</td>
<td>7</td>
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<td></td>
<td></td>
<td>A – 4 Seed Technology</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>Soil Science &amp; Agricultural Chemistry</td>
<td>B – 1 Soil Science Pedology</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>B – 2 Soil Chemistry/Fertility/Soil Microbiology</td>
<td>4</td>
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<tr>
<td></td>
<td></td>
<td>B – 3 Soil Physics/Soil and Water Conservation</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>B – 4 Agricultural Chemistry/ Agric. Chemicals</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B – 5 Agricultural Meteorology</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>Biochemistry &amp; Biotechnology</td>
<td>C – 1 Biochemistry (Agric./ Plant Sciences)</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>C – 2 Biotechnology (Agric./ Plant Sciences)</td>
<td>7</td>
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<td></td>
<td></td>
<td>C – 3 Microbiology (Agriculture)</td>
<td>5</td>
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<td>C – 4 Plant Physiology</td>
<td>4</td>
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<td>Horticultural Sciences and Forestry</td>
<td>D – 1 Horticulture (Fruit Crops/ Pomology)</td>
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<td></td>
<td></td>
<td>D – 2 Horticulture (Floriculture)</td>
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<td>D – 3 Horticulture (Vegetable Science)</td>
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<td></td>
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<td>D – 4 Forestry/Agro Forestry/Silviculture</td>
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</tr>
<tr>
<td>Major Subject Group Code</td>
<td>Major Subject</td>
<td>Sub-Subjects in Ph.D. with Sub-Subject code</td>
<td>Total No. of Fellowships(SRF)</td>
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<td>E – 1</td>
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<td>Nematology (Agriculture)</td>
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<td>E – 3</td>
<td>Plant Pathology</td>
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<td>F – 1</td>
<td>Animal Genetics and Breeding</td>
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<td>F – 2</td>
<td>Animal Reproduction and Gynaecology</td>
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<td>Livestock Production and Management</td>
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<td>Poultry Science</td>
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<td>Veterinary Extension Education</td>
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<tr>
<td>G – 1</td>
<td>Animal Nutrition</td>
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<td>G – 2</td>
<td>Animal Physiology</td>
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<td>G – 3</td>
<td>Biochemistry (Animal Science)</td>
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<td>Biotechnology (Animal Science)</td>
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<td>G – 5</td>
<td>Veterinary Microbiology</td>
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<tr>
<td>G – 6</td>
<td>Veterinary Pathology</td>
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<td>1</td>
</tr>
<tr>
<td>H – 1</td>
<td>Veterinary Medicine</td>
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<tr>
<td>H – 2</td>
<td>Veterinary Parasitology</td>
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<tr>
<td>H – 3</td>
<td>Veterinary Pharmacology</td>
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<td>H – 4</td>
<td>Veterinary Public Health</td>
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<td>H – 5</td>
<td>Veterinary Surgery</td>
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<td>H – 6</td>
<td>Veterinary Anatomy</td>
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<td>Dairy Chemistry</td>
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<td>Food Science &amp; Technology</td>
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<td>J – 5</td>
<td>Dairy Engineering</td>
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<td>Farm Machinery &amp; Power</td>
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<tr>
<td>K – 3</td>
<td>Soil &amp; Water Conservation Engineering</td>
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<td>L – 1</td>
<td>Child Development</td>
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</tr>
<tr>
<td>L – 2</td>
<td>Food &amp; Nutrition</td>
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<tr>
<td>L – 3</td>
<td>Home Management/ Family Resource Management</td>
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<tr>
<td>L – 4</td>
<td>Home Science Extension Education</td>
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<tr>
<td>L – 5</td>
<td>Textile and Clothing</td>
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<td>M – 1</td>
<td>Fisheries Science</td>
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<td>M – 2</td>
<td>Fish Processing Technology</td>
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<td>Agricultural Economics</td>
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<td>N – 3</td>
<td>Agricultural Statistics</td>
<td>2</td>
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**Total** 151 30 15 6 202

**Note 1:** Eligibility qualification is M.Sc. in the relevant subject.
3. CONDITIONS FOR THE GRANT OF AWARD

(i) ICAR-SRF (PGS) will be awarded on the basis of merit in the All India Competitive Entrance Examination for ICAR-SRF (PGS) and admission to Ph. D. degree programme at State Agricultural Universities (SAUs), Deemed Universities, viz. IARI (New Delhi) / IVRI (Izatnagar) / NDRI (Karnal) / CIFE (Mumbai) / SHIATS (Allahabad), Central Agricultural University (Imphal, Manipur), and Central Universities having faculty of agriculture, viz. Banaras Hindu University (BHU), Aligarh Muslim University (AMU), Viswa Bharti, and Nagaland University, hereinafter referred to as the Agricultural Universities (AUs). The fellowship will NOT be available for admission in any university other than the AUs as mentioned above. ICAR-SRF (PGS) is effective from the date of registering in the Ph.D. programme in any Agricultural University (SAUs, ICAR DUs, CAU or CUs having faculty of agriculture) or effective from the date ICAR-SRF (PGS) is awarded, whichever is later.

(ii) The fellowship will be admissible to persons of Indian Nationality as defined in the Constitution of India or persons domiciled in India.

(iii) The award of ICAR-SRF (PGS) can be availed within a period of one year from the date of issue of this award letter for seeking admission in Ph.D. programme in the qualifying subject at any Agricultural University (AU). It will not be extended in any case.

(iv) If already registered as full time Ph.D. Scholar, he/she should not have completed two years on the date of examination.

(v) Duration of ICAR-SRF (PGS) will be three years and in no case it will be extended beyond the period of three years.

(vi) SRF will be awarded subject to verification of credentials by award administration authority, viz. the University/Institute where the candidate gets admission.

(vii) No TA and DA will be paid to the candidates for appearing in the Examination at the Centres or for joining the University.

(viii) For admissions, eligibility conditions of the admitting University/Institute will be applicable.

(ix) Fellowship would be granted only when the candidate gets eventually admitted and pursues Ph. D. degree from an Agricultural University (AU) other than the Agricultural University (AU) of completing M. Sc./ M.V.Sc./ M.E./ M.Tech. degree, except for ICAR - Deemed to be Universities.

(x) In case of in-service candidates, the awardee joins/has joined the University/Institute other than where he/she is working. In case of an in-service candidate, who is in receipt of full/partial leave salary from his/her parent organization, the amount of ICAR-SRF shall be limited to Rs.3000/- pm in addition to the research contingency as available to fresh candidates.

(xi) The awardee joins/has joined the University/Institute where Ph.D. programme consists of both course work and research.

4. ELIGIBILITY REQUIREMENTS

Candidates having completed their Master's Degree programme with a minimum of 55 per cent marks or equivalent OGPA from any recognized university in India and abroad would be eligible. For SC/ST and Physically Handicapped candidates, the minimum per cent of marks will be relaxed by 5 per cent or equivalent OGPA. The equivalence of OGPA to per cent marks, where needed, will be certified by the Registrar of the concerned University and must have to be produced by the candidates. Candidates appearing in the final semester would also be eligible provided they complete the Postgraduate degree in all respects by the date of examination and produce the degree-completion certificate from the Registrar to this effect. The candidates who have already joined Ph.D. and have completed more than two years as on the date of examination are not eligible to apply for Senior Research Fellowship. The above condition will also apply to in-service candidates. It is the sole responsibility of the candidate to check his/her eligibility for admission before applying. NAARM will not be held responsible for refusing ICAR-SRF (PGS) to any non-eligible candidates.

NOTE:  
(i) Senior Research Fellowship is a financial assistance given by ICAR for pursuing Ph.D. programmes in the field of Agriculture and Allied sciences.

(ii) Merely qualifying the examination will not guarantee SRF. Only those candidates will be eligible for SRF who come in the merit list and join the University within stipulated time.

(iii) Candidates will have to take admission on their own and there will not be any responsibility of ICAR/NAARM in securing admission for the candidates.

(iv) In many courses, the Universities have diversified eligibility conditions. The candidate has to meet the prescribed eligibility conditions of the University where admission is sought.

(v) The in-service candidates qualifying for SRF will themselves arrange for study leave/leave of the kind due from their respective organizations themselves and that ICAR/NAARM will not intervene in this regard.

(vi) The in-service candidates will be those working in ICAR Institutes, SAUs, CAU, CUs having faculty of agriculture, Central Government/State Government Departments dealing in agriculture and allied sectors and Public Sector Undertakings dealing with agriculture and allied sectors.
5. **AGE**

The minimum and maximum age limit shall be 21 years and 30 years respectively for General Category. Relaxation in upper age limit of 5 years will be admissible to candidates from SC/ST and PH categories. For candidates belonging to OBC, relaxation in upper age limit for 3 years will be admissible.

For in-service candidates, the maximum age limit shall be 45 years in all cases. The crucial date for determining the minimum and maximum age limit for all categories will be the date of examination.

Candidates seeking age relaxation should submit an attested copy of the Caste Certificate issued by the prescribed authority of Government of India in the form given in the bulletin at Annexure – II (for SC/ST) candidate and at Annexure III for OBC.

A Physically Handicapped (PH) and Visually Handicapped (VH) person seeking to apply for this examination should submit an attested copy of certificate about being handicapped from a Government Hospital/ Medical Board alongwith his/ her application form.

6. **RESERVATION**

15% of the total SRF are reserved for SC candidates, 7.5% for ST candidates and 3% for PH candidates subject to their being otherwise suitable. The responsibility of verification of the genuineness of SC/ST/OBC and PH certificates will be of the concerned Agricultural University (AU) where the candidate has been granted admission.

If suitable candidates are not found for reserved seats for PH candidates, the same will be filled as per merit from general category. In case sufficient number of candidates of a category are not available to fill up the seats, the fellowships will not be awarded/ transferred to another category.

7. **(A) PROCEDURE FOR APPLYING**

(i) The course and the sub-subject (with code) to which the admission is sought, must be quoted in all correspondence.

(ii) The Information placed in web contains the following.
   (a) Application Form
   (b) Specimen copy of answer sheet (OMR sheet)
   (c) Caste certificate
   (d) Identity verification form

(iii) A candidate can apply for ICAR-SRF for one Major Subject Group only. No change would be allowed thereafter.

(iv) The Application Form (filled neatly and correctly by the applicant as per the instructions) should be sent by Registered Post to The Controller of Examination, ICAR-SRF (PGS), National Academy of Agricultural Research Management, Rajendranagar, Hyderabad - 500 407.

The candidate has to send the following documents:
   (a) Filled-in application form, in duplicate, along with D.D.
   (b) Caste certificate (SC / ST / PH / OBC - wherever applicable)
   (c) Identity Verification Form
   (d) Attested photocopy of
      i) UG Degree
      ii) PG Degree
      iii) UG Marks
      iv) PG Marks

Applications sent without the accompanying documents indicated above will not be considered.

CANDIDATES ARE ADVISED NOT TO FOLD THE FILLED-IN APPLICATION FORM. SUITABLE ENVELOPES MAY BE USED ACCORDINGLY. DOCUMENTS SENT ALONG WITH THE APPLICATION SHOULD NOT BE STAPLED TO THE APPLICATION FORM.
(v) If a candidate furnishes wrong information or suppresses any relevant information, his/her admission in Ph.D. will be cancelled even during the course of study.

Admit Cards for the Examination will be sent by Post in advance to all eligible candidates, who have submitted their application form complete in all respects by the due date. However, if any candidate does not receive the Admit Card in time, he/she may get it downloaded from NAARM website http://www.naarm.ernet.in and http://www.icar.naarm.ernet.in

7. (B) General Instructions for Filling up of Application Form

(This form will be scanned by computer. Please use black pen and write clearly)

1. Use only CAPITAL LETTERS
2. Write only one character/number in one box
3. Start writing from first box on the left of each group
4. Leave one box blank between two words
5. Item specific columns of the Application form are as under:
   1. Roll number: To be filled by Office
   2. Name of the applicant
   3. Father’s name: Give father’s name in full
   4. State of Domicile: For State use the codes as in Table 2
   5. Date of Birth: Write date in first set of blocks, month in next set and year in the last set in figures
   6. Sex: Male M
      Female F
   7. Category: GN/ SC/ ST/ PH/ OB
   8. Nationality: Indian 1
      Others 2
   9. (i) Percentage of marks secured in B.Sc. (U.G. level) & M.Sc. (P.G. level)
      (ii) If P.G. is not completed, likely date of completion
   10. College from where Post Graduation was done (refer Table 3)
   11. Stream at Masters level (refer Table 4)
   12. Code of the University last attended (refer Table 7)
   13. Employment: Status of in-service candidates (for this use Codes as in Table 6)
   14. Major subject group code for SRF (refer Table 1 and select appropriate major subject group code)
      Sub-Subject code for SRF (refer Table 1 and select appropriate Sub-Subject code within the group)
   15. Appropriate Sub-Subject Code (Refer Table 1)
   16. Choice from the list of City Centre Codes where the Examination Centres will be located as given in Table 5 may be given by the candidates. No change of examination center will be allowed as it creates problems and confusion for the candidate.
   17. STD Code and Telephone No: Write the telephone Number clearly.
   18. Mailing Address: Write clearly with black ball pen. It will be scanned and used for all correspondence with the candidate. Signature shall be put with black pen within the box.
   19. Details of examination fee paid

NOTE 3: If a candidate gives wrong information in the Application Form, Verification Card, or enters wrong information in the OMR sheet about his name, roll number, centre, category etc., his/her candidature will stand cancelled. No subsequent request for corrections in this regard will be entertained.

8. Selection of the Candidates

Candidates will be selected for the award of ICAR Senior Research Fellowship for pursuing Ph.D. degree on the basis of merit in this Competitive Examination and his/her past academic performance. Merit weightage would be: 75% for the examination and 25% for academic performance. The marks of Paper-I and Paper-II both will be added for total score in the Examination. The weightage for academic performance in U.G. will be 10% and 15% for P.G. For example a candidate scoring 64% marks (or equivalent CGPA/OGPA) in U.G. if competes for the SRF examination
he/she gets \((64) \times (10/100) = 6.4\) marks on this account. Whereas, if he/she has scored 70% marks (or equivalent CGPA) in M.Sc./M.V.Sc. etc. his score for P.G. will be \((70) \times (15/100) = 10.5\) marks. The total of these two i.e. 6.4 + 10.5 = 16.9 marks will be added to his marks scored in written examination (The written examination will have weightage of 75%). Ranking would be arrived at with the top ranks for highest score and subsequent ranks for lesser scores. In case of a tie in total score, the candidate with higher marks in this examination will be ranked senior.

9. VALUE AND TENURE OF FELLOWSHIP

The Fellowship will be awarded to meritorious candidates seeking admission in the listed State Agricultural Universities, ICAR Deemed Universities, Central Universities having faculty of agriculture, Central Agricultural University or any other approved University/Institute where Ph.D. Degree programme consists of course work with definite credit hours and research work/thesis. The fellowship will be at the following rates:

- Postgraduate other than in Veterinary Science: Rs. 12000/- p.m. (fixed) for 1st & 2nd year.
- Postgraduate in Veterinary Science: Rs. 14000/- p.m. (fixed) for 1st & 2nd year.
- Rs. 14000/- p.m. (fixed) for 3rd year.
- Rs. 15000/- p.m. (fixed) for 3rd year.

(Contingent grant of Rs. 10,000/- per year for procurement of essential chemicals, books, and travel connected with research work will also be paid to all the awardees).

10. LEGAL JURISDICTION

All disputes pertaining to the conduct of examination and any other issue relating to All India Competitive Examination for SRF leading to Ph.D. degree programme conducted by the ICAR shall fall within the jurisdiction of Hyderabad Courts only. As per Rules and Bye-laws of ICAR, it may sue or be sued in the name of Secretary, ICAR.

11. EXAMINATION PROCEDURE

The candidate who fulfills the eligibility requirement may appear in the written competitive examination. There will be two papers in written examination, i.e. Paper – I & Paper – II. The examination will be in English.

Paper – I: will be a composite paper on General Knowledge common for all subjects. The questions will be designed to test the ability of candidate’s awareness of the environment around him/her and its application to the society. It will contain questions on General Knowledge in Agriculture, Animal Husbandry, Dairying, Fisheries and Allied Sciences, etc. including current events and such matters of every day observation and experience as may be expected to be known to a research scholar. It will be of one and a half hour (90 minutes) duration having 100 objective type questions with multiple choice answers, for a total of 100 marks. The weightage of this paper will be 25%. There will be negative marking (–25%) for each wrong answer. The paper will be evaluated through computer scanning.

Paper – II: This paper will also be objective type having subject-specific multiple choice OMR based questions. This paper will be of two and a half hours (150 minutes) duration, having a total of 200 objective type questions with multiple choice answers, for a total of 200 marks. These 200 questions in each major subject paper would cover questions from all the sub-subjects listed under each major subject. For example, in the major subject of Plant Sciences, there will be equal distribution of questions from the sub-subjects Agronomy, Genetics, Plant Breeding, and Seed Technology, making a total of 200 questions. The weightage of this paper will be 50%. The paper will be evaluated through computer scanning.

Paper – II will be evaluated of those candidates only who qualify in Paper – I. Cut-off percentage for Paper – I would be decided at the time of evaluation. No request for re-evaluation of papers will be entertained.

The candidates are advised to fill OMR Sheet strictly as per instructions. Any wrong information in the OMR sheet regarding Roll No., Code etc., and also carelessness on the part of candidates in filling the bubbles of OMR sheet will result in cancellation of his/her candidature. No request for re-evaluation, etc. will be entertained.

Final ranking for SRF would be drawn subject area-wise on the basis of marks obtained by a candidate in the written examination (25% weightage for Paper I and 50% weightage for Paper II) and his/her academic performance at undergraduate and postgraduate level (25% weightage). Candidates who have not produced attested copies of their degree and final mark sheets will not be considered at all.

The in-service candidates will be awarded SRF, only if they come in the overall merit list of their concerned subject areas.

A list of those candidates who qualify as per cut-off marks, but do not come in the merit list for award of SRF will also be prepared and circulated to the Agricultural Universities to facilitate their admissions in Ph.D. without grant of SRF.
### TABLE 2

<table>
<thead>
<tr>
<th>State or Union Territory</th>
<th>Code No.</th>
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<tbody>
<tr>
<td>Andaman &amp; Nicobar islands (UT)</td>
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<tr>
<td>Andhra Pradesh</td>
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<tr>
<td>Arunachal Pradesh</td>
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<td>Assam</td>
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<td>Chhattisgarh</td>
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<td>Dadara &amp; Nagar Havelli, (UT)</td>
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<td>Daman &amp; Diu (UT)</td>
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<td>Goa</td>
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<td>Himachal Pradesh</td>
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<td>Karnataka</td>
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<td>Uttarakhand</td>
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<td>West Bengal</td>
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### TABLE 3

<table>
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<th>College from where post-graduation was done</th>
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<tbody>
<tr>
<td>College of Agriculture</td>
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<tr>
<td>College of Horticulture</td>
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</tr>
<tr>
<td>College of Veterinary and Animal Sciences</td>
<td>03</td>
</tr>
<tr>
<td>College of Agricultural Engineering and Technology</td>
<td>04</td>
</tr>
<tr>
<td>College of Forestry</td>
<td>05</td>
</tr>
<tr>
<td>College of Fisheries</td>
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<tr>
<td>College of Home Science</td>
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<td>College of Basic Sciences and Humanities</td>
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<tr>
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### TABLE 4

<table>
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<tr>
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<td>Agriculture</td>
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<td>Agricultural Coop. &amp; Marketing</td>
<td>02</td>
</tr>
<tr>
<td>Basic Sciences</td>
<td>03</td>
</tr>
<tr>
<td>Dairy Science/Technology</td>
<td>04</td>
</tr>
<tr>
<td>Engineering/Technology</td>
<td>05</td>
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<tr>
<td>Fisheries</td>
<td>06</td>
</tr>
<tr>
<td>Forestry</td>
<td>07</td>
</tr>
<tr>
<td>Home Science</td>
<td>08</td>
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<tr>
<td>Horticulture</td>
<td>09</td>
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<tr>
<td>Veterinary Science</td>
<td>10</td>
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<td>Sericulture</td>
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<tr>
<td>Computer Science</td>
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<td>Biotechnology</td>
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<td>Food Science</td>
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### TABLE 5

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<tr>
<td>Anand</td>
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<tr>
<td>Bhubaneshwar</td>
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<tr>
<td>Chennai</td>
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<tr>
<td>Delhi</td>
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<tr>
<td>Guwahati</td>
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<tr>
<td>Hyderabad</td>
</tr>
<tr>
<td>Jodhpur</td>
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<tr>
<td>Kolkata</td>
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<td>Ludhiana</td>
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<tr>
<td>Nagpur</td>
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<td>Patna</td>
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### TABLE 6

Employment status of in-service candidates

<table>
<thead>
<tr>
<th>Institutes/Agric. Universities/Other Organizations</th>
<th>Code Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAR Institutes and ICAR Institute based Deemed-to-be Universities</td>
<td>1</td>
</tr>
<tr>
<td>State Agricultural Universities including Veterinary Universities, CAU and CUs having faculty of agriculture</td>
<td>2</td>
</tr>
<tr>
<td>Central Government Departments dealing in agriculture and allied sectors</td>
<td>3</td>
</tr>
<tr>
<td>State Government Departments dealing in agriculture and allied sectors</td>
<td>4</td>
</tr>
<tr>
<td>Public Sector Undertaking dealing in agriculture and allied sectors</td>
<td>5</td>
</tr>
<tr>
<td>Any other organization</td>
<td>6</td>
</tr>
<tr>
<td>Not serving in any of the above organizations</td>
<td>9</td>
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</table>

### TABLE 7

List of SAUs/DUs/CAU/CUs

<table>
<thead>
<tr>
<th>S.No.</th>
<th>State Agricultural Universities</th>
<th>Code Name</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Assam Agricultural University, Jorhat-785 013</td>
<td>AAU</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Acharya NG Ranga Agricultural University, Hyderabad-500 030</td>
<td>ANGRAU</td>
<td>02</td>
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<tr>
<td>3.</td>
<td>Sri Venkateswara Veterinary University, Tirupati-517 502</td>
<td>SV</td>
<td>03</td>
</tr>
<tr>
<td>4.</td>
<td>Andhra Pradesh University of Horticulture, Venkataramannagudem, West Godawari - 534 101 (A.P.)</td>
<td>APUH</td>
<td>04</td>
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<tr>
<td>5.</td>
<td>Rajendra Agricultural University, Pusa-848 125</td>
<td>RAU (P)</td>
<td>05</td>
</tr>
<tr>
<td>6.</td>
<td>Indira Gandhi Krishi Vidyalaya, Raipur-492 012</td>
<td>IGKV</td>
<td>06</td>
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<tr>
<td>7.</td>
<td>Anand Agricultural University, Anand-388 110</td>
<td>AND</td>
<td>07</td>
</tr>
<tr>
<td>8.</td>
<td>Junagarh Agricultural University, Junagarh</td>
<td>JAU</td>
<td>08</td>
</tr>
<tr>
<td>9.</td>
<td>Navsari Agricultural University, Navsari-396 450</td>
<td>NAU</td>
<td>09</td>
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<tr>
<td>10.</td>
<td>Sardar Krushinagar Dantiwada Agricultural University, Dantiwada-385 506</td>
<td>SDA</td>
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<tr>
<td>11.</td>
<td>Chaudhary Charan Singh Haryana Agricultural University, Hisar-125 004</td>
<td>CCHAU</td>
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<tr>
<td>12.</td>
<td>Ch. Sarwan Kumar Krishi Vidyalaya, Palampur-176 062</td>
<td>HPKV</td>
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<tr>
<td>14.</td>
<td>Sher-e-Kashmir University of Agricultural Sciences &amp; Technology, Jammu-180 004</td>
<td>SKUAS&amp;T-J</td>
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</tr>
<tr>
<td>15.</td>
<td>Sher-e-Kashmir University of Agricultural Sciences &amp; Technology, Srinagar-191121</td>
<td>SKUAS&amp;T-S</td>
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<tr>
<td>16.</td>
<td>Birsia Agricultural University, Ranchi-834 006</td>
<td>BAU</td>
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<td>17.</td>
<td>University of Agricultural Sciences, Bangalore-560 065</td>
<td>UAS (B)</td>
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<tr>
<td>18.</td>
<td>University of Agricultural Sciences, Dharwad-580 005</td>
<td>UAS (D)</td>
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<tr>
<td>19.</td>
<td>Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar-585 401</td>
<td>KVA</td>
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<td>20.</td>
<td>Kerala Agricultural University, Thrissur-680 656</td>
<td>KAU</td>
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<td>21.</td>
<td>Jawaharlal Nehru Krishi Vidyalaya, Jabalpur-482 004</td>
<td>JNKV</td>
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<td>22.</td>
<td>Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior - 474 002, M.P.</td>
<td>RVSKV</td>
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<tr>
<td>23.</td>
<td>Dr Balasaahib Sawant Konkan Krishi Vidyapeeth, Dapoli-415 712</td>
<td>KKV</td>
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<td>24.</td>
<td>Maharashtra Animal &amp; Fisheries Sciences University, Nagpur-440 006</td>
<td>MA&amp;FSU</td>
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<td>25.</td>
<td>Marathwada Agricultural University, Parbhani-431 402</td>
<td>MAU</td>
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<tr>
<td>S.No.</td>
<td>State Agricultural Universities</td>
<td>Code</td>
<td>Name</td>
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<tr>
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<td>-------------------------------------------------------------------------------------------------</td>
<td>------</td>
<td>-----------------</td>
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<td>26.</td>
<td>Mahatma Phule Krishi Vidyapeeth, Rahuri-413 722</td>
<td>MPKV</td>
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<td>27.</td>
<td>Dr Panjabrao Deshmukh Krishi Viswa Vidyalaya, Akola-444 104</td>
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<td>28.</td>
<td>Orissa University of Agriculture &amp; Technology, Bhubaneshwar-751 003</td>
<td>OUA&amp;T</td>
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<td>29.</td>
<td>Punjab Agricultural University, Ludhiana-141 004</td>
<td>PAU</td>
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<td>30.</td>
<td>Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana-141 004</td>
<td>GADVASU</td>
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<td>31.</td>
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<td>32.</td>
<td>Swami Keshwanand Rajasthan Agricultural University, Bikaner-334 002</td>
<td>RAU</td>
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<td>33.</td>
<td>Tamil Nadu Agricultural University, Coimbatore-641 003</td>
<td>TNAU</td>
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<td>34.</td>
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<td>TNVASU</td>
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<td>35.</td>
<td>Sam Higginbottom Institute of Agriculture Technology &amp; Sciences, Naini, Allahabad-211 007</td>
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<td>36.</td>
<td>Chandra Shekhar Azad University of Agriculture &amp; Technology, Kanpur-208 002</td>
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<td>Central Agricultural University, Imphal, Manipur-795 004</td>
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<td>45.</td>
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<td>46.</td>
<td>Kerala Veterinary and Animal Sciences University, Pookot, Wayanad-673 576</td>
<td>KV&amp;ASU</td>
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<td>47.</td>
<td>Lala Lajpat Rai University of Veterinary &amp; Animal Sciences, Hisar, (Haryana)</td>
<td>LLRUVAS</td>
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<td>48.</td>
<td>Rajasthan University of Veterinary &amp; Animal Sciences, Bijay Bhawan</td>
<td>RUV&amp;AS</td>
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<td>49.</td>
<td>Bihar Agricultural University, Sabour - 813210 Distt. Bhagalpur, (Bihar)</td>
<td>BAU</td>
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<td>50.</td>
<td>Madhya Pradesh Pashu Chikitsa Vigyan Vishwavidalaya, Jabalpur-482 004 (MP)</td>
<td>MPCCVV</td>
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<tr>
<td>51.</td>
<td>University of Horticultural Sciences, Sector, 60, Navanagar, Bagalkot-587 102</td>
<td>UHS</td>
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<td>52.</td>
<td>University of Agricultural Sciences, Raichur - 584 102 (Karnataka)</td>
<td>UAS</td>
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</table>

**ICAR Deemed to be Universities**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>State Agricultural Universities</th>
<th>Code</th>
<th>Name</th>
<th>Code</th>
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<tbody>
<tr>
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<td>Indian Agricultural Research Institute, New Delhi-110 012</td>
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<td>National Dairy Research Institute, Karnal-132 001</td>
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<td>56.</td>
<td>Central Institute of Fisheries Education, Mumbai-400 061</td>
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**Central Universities having faculty of Agriculture**

<table>
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<th>State Agricultural Universities</th>
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<th>Name</th>
<th>Code</th>
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<tbody>
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SYLLABUS FOR THE COMPETITIVE EXAMINATION FOR THE SELECTION OF ICAR SENIOR RESEARCH FELLOWS

PAPER-I

GENERAL KNOWLEDGE

Section 1:
- History and Geography of India—Events of significance with specific reference to scientific, cultural and economic life in India.
- General Awareness. Current events and analysis of their significance. Books, authors, persons, awards, places, projects, sports and athletics.
- Famous personalities and their achievements in Arts/Science/Social life and trends of thought.
- Major development programmes in India relating to poverty alleviation, agriculture, rural development etc. Five-Year Plans and their achievements—changes in the economic policies in the country and their impact on the agricultural scenario.

Section 2:
- Agriculture in India. Basic information and data on the natural resources of the country; Agro-climatic and agro-ecological zones, Crops and their production; agricultural inputs and their use.
- Basic information on animal sciences and fisheries; Major breeds of livestock and their geographic distribution; Information on production and major recent achievements.
- Nutrition and agriculture—Basic information on foods and human nutrition.
- Quantitative analysis of data relating to agriculture/animal sciences/fisheries. Drawing of conclusions from data, based upon reasoning and logic.
- Policies in India relating to science, industry, agricultural, forestry. World trade agreement and its possible impact on Indian agriculture.
- Current trends and achievements in science and scientific research on the global scene. Recent scientific achievements of significance in the country in major areas and their impact on agriculture, animal and fisheries.

PAPER-II

A. PLANT SCIENCE

A 1. AGRONOMY

Section 1: Basic Principles

Section 2: Crop Ecology and Geography

Section 3: Weed Management

Section 4: Water Management

Section 5: Soil and Fertilizer Use

Section 6: Dryland Agronomy

Section 7: Crop Production in Problem Areas

Section 8: Crop Production
Crop production techniques for cereals, legumes, oilseeds, fibre crops, sugarcane, tobacco, potato, onion, fodder and pasture crops including history, distribution, season, adaptability, climate, soil and water requirements, and component technology, quality characteristics, uses and seed production techniques.

Section 9: Agricultural Statistics
Frequency distribution, mean, media and mode, Correlation and response function. Tests of significance—t, f and chi-square tests. Designs of experiments—basic principles, completely randomised, randomised block design, latin square split, strip, factorial and simple confounding designs.

Section 10: Sustainable Land Use Systems

A 2. GENETICS

Section 1: Basic Genetic Principles

Section 2: Genetic Material

Section 3: Chromosomes

Section 4: Structural and Numerical Variations of Chromosomes

Section 5: Genome Analysis and Cytogenetics of Crop Plants
Wheat, maize, rice, Brassica, cotton, Vigna, potato and sugarcane.

Section 6: Mutation

Section 7: Genetics of Development

**Section 8: Genetic Engineering and Biotechnology**

**Section 9: Population Genetics**

**Section 10: Quantitative and Biometrical Genetics**

**Section 11: Statistics**
Frequency distribution, Measures of central tendency. probability theory and its implications in genetics, probability distributions and tests of significance. Correlation, linear, partial and multiple regression. Genetic divergence. D² Design of experiments-basic principles, CRD, RBD and Split plot.

**A 3. PLANT BREEDING**

**Section 1: Role of Plant Breeding in Agriculture**

**Section 2: Reproductive Systems**

**Section 3: Genetic Principles**

**Section 4: Quantitative Inheritance and Selection**

**Section 5: Breeding plans**

**Section 6: Genotype × Environment Interactions**

**Section 7: Breeding for Biotic and Abiotic Stresses**

**Section 8: Special Techniques for Plant Improvement**
Use of cytogenetical and biotechnological tools and techniques-haploids, aneuploids, wide-hybridization, embryoculture, meristem culture, cell and tissue culture, somaclonal variation, protoplast fusion, RFLP, RAPD, QTL and molecular marker assisted selection, gene tagging and antisense RNA technology.

**Section 9: Genetic Resources and Germplasm Conservation**

**Section 10: Release, Seed Production and Distribution of Cultivars**
Section 11: Statistical Methods and Field Plot Techniques

A 4. SEED TECHNOLOGY

Section 1: Seed Biology

Section 2: Seed Production
Introduction to crop breeding methods. Varietal testing, release and notification. Genetic purity, concept, and factors responsible for deterioration of varieties. Maintenance breeding. Generation system of seed multiplication. Seed production agencies. Identification of seed production areas and factors affecting. Compact area approach in seed production. Seed production planning, equipment, input and manpower requirement. Factors affecting pollination and seed set—temperature, humidity, wind velocity, insect pollinators, supplementary pollination. Male sterility, self-incompatibility and their role in hybrid seed production. Principles and methods of seed production of varieties and hybrids of cereals like wheat, paddy, sorghum, pearl millet and maize; pulses like chickpea, pigeonpea, greengram, blackgram, soybean and cowpea; oilseeds like groundnut, brassica, sesame, sunflower and castor; fibre crops like cotton and Jute; vegetable crops like tomato, brinjal, okra, chilli, important oleo and cucurbitaceous crops; important forages legumes and grasses, and true seed production in potato with reference to land requirements, isolation, roguing, seed crop management, time of harvesting, threshing/extraction methods. Seed production technology of plantation crops like coffee, tea, rubber, cocoa, cardamom and pepper. Disease-free clonal propagation of crops like potato, sugarcane, sweet potato, tapioca, colocasia, betelvine; fruit crops like mango, citrus, banana, guava, sapota, pineapple, grape, apple, pear, plum, peach, apricot, tea rose; and seed production and clonal propagation of annual and perennial flowers like rose, gladiolus, chrysanthemum, marigold, dahlia, flex and petunia. Clonal standards and degeneration.

Section 3: Seed Processing
Principles of seed processing. Seed drying—principles and methods Pre-cleaning, grading, treating, and packaging. Seed processing machines like cleaner-cum-grader, specific gravity separator, indented cylinder; seed treater, weighing and bagging machines, their operation and maintenance. Seed quality maintenance during processing.

Section 4: Seed Quality Control
Seed legislation—Seed Act, seed rules, Seed Control Order and seed law enforcement. Seed certification—history, concept, organization, phases and minimum certification standards. Field inspection principles and methods. Inspection at harvesting threshing and processing. Pre-and post-quality testing for genetic purity. Seed testing—concepts and objectives, role in seed quality control, seed sampling, seed moisture testing, purity analysis, germination testing, tolerance tests and equipments. Testing of treated and pelleted seeds. Quick viability tests. Seed vigour—concept, significance in productivity and storage, seed vigour tests. Testing for genuineness of varieties—principles and methods based on seed, seedling and plant characters, biochemical techniques namely electrophoresis of proteins and isoenzymes and DNA fingerprinting.

Section 5: Seed Storage

Section 6: Seed Health

Section 7: Seed Marketing
B. SOIL SCIENCE & AGRICULTURAL CHEMISTRY

B1. SOIL SCIENCE—Pedology

Section 1: Soil Genesis

Section 2: Soil Mineralogy

Section 3: Soil Survey, Mapping and Cartography
Soil survey techniques. Types of soil surveys, base maps and mapping units. Remote-sensing techniques including aerial photo interpretation for soil resource inventory and Cartography-techniques for preparation of base maps, soil and other interpretive maps, processing of field sheet, compilation and abstraction of maps in different scales.

Section 4: Soil Classification

Section 5: Soil Correlation and Land-Use Planning
Soil correlation-concepts and correlation at various levels. Interpretation of soil resources information for agricultural and non-agricultural uses. Land capability and land irrigability classification. Land evaluation and land use planning. Concept of benchmark soils for agrotechnology transfer.

Section 6: Soil Physics

Section 7: Soil Chemistry

Section 8: Soil Fertility, Fertilizers and Manures

Section 9: Methods of Soil Analysis

Section 10: Statistics

B2. SOIL CHEMISTRY/ SOIL FERTILITY/SOIL MICROBIOLOGY

Section 1
Section 2

Section 3

Section 4

Section 5

Section 6

Section 7

Section 8

Section 9

Section 10

B3. SOIL PHYSICS, SOIL AND WATER CONSERVATION

Section 1

Section 2
Section 3

Section 4

Section 5

Section 6

Section 7

Section 8

Section 9
Soil and water as natural resources. Land degradation—acid, saline, sodic and waterlogged soils, shifting cultivation, and management of their soil physical properties. Soil conservation survey. Land capability classification, land use—land cover mapping using conventional and remote sensing techniques. Productivity rating. Watershed concept—its characterization and management. Soil moisture conservation under rainfed and limited water supply. Rain water harvesting and recycling. Use of mulches, grasses and afforestation for soil and water conservation.

Section 10

B4. AGRICULTURAL CHEMISTRY/AGRICULTURAL CHEMICALS

Section 1: Inorganic and Physical Chemistry

Section 2: Organic Chemistry

Section 3: Analytical Chemistry

Section 4: Statistics

Section 5: Manures

Section 6: Fertilizers

Section 7: Plant Nutrients

Section 8: Soil Amendments and Reclamation

Section 9: Agricultural Chemicals and Soil Health
Chemistry of synthetic pesticides (chlorinated hydrocarbons, organophosphates, carbamates, synthetic pyrethroids etc.), pesticides of plant origin, and natural and synthetic plant growth regulators. Persistence, metabolism and environmental fate of pesticides. Heavy metal pollution. Waste disposal and soil health. Chronological development, classification, structures, general properties and uses of major conventional, synthetic and natural agrochemicals including plant production chemicals, nitrification inhibitors, chemical hybridizing agents and hydrogels. Formulation, quality control, safety aspects, pesticide poisoning and antidotes. Production, consumption and trade statistics of pesticides. Spectroscopic and Chromatographic Techniques including principles, instrumentation and application of spectroscopic (UV, IR, NMR, and mass spectrometry) and chromatographic (thin layer, high performance liquid, gas liquid, ion-exchange, gel, flash and supercritical fluid chromatography) techniques. Tandem techniques (GC-MS, LC-MS, GC-MS-IR, MS-MS, LC-NMR, GC-IR) with reference to isolation, purification and structure elucidation. Analytical Chemistry including application of latest techniques like GC, HPLC, GC-MS, GC-MS-MS and LC-MS for estimation of pesticide residue in crops, soil and formulated products.

Section 10: Chemistry of Feeds and Fodders

B5. AGRICULTURAL METEOREOLOGY

Section 1: General Meteorology
Section 2: General Climatology


Section 3: Agricultural Climatology


Section 4: Micrometeorology


Section 5: Evapotranspiration


Section 6: Crop-Weather Modelling


Section 7: Weather Forecasting for Agriculture


Section 8: Agrometeorological instruments

Principles, exposure conditions and operation of meteorological equipment in agrometeorological observatory. Principles and working of instruments for measurement of solar radiation; direct, diffuse and photosynthetically active radiation; soil heat flux; soil temperature; wind speed and direction; humidity and precipitation; evaporation, sunshine and dew. Automatic weather station, infra red thermometer, spectral radiometer and net radiometer.

Section 9: Supporting Disciplines and Topics


Section 10: Statistical Techniques in Agroclimatology

C. BIOCHEMISTRY AND BIOTECHNOLOGY

C1. BIOCHEMISTRY (Plant Science)

Section 1: Biomolecules and Biophysical Principles


Section 2: Intermediary Metabolism


Section 3: Nutrition


Section 4: Enzymes


Section 5: Molecular Biology


Section 6: Biotechnology/Genetic Engineering


Section 7: Immunology


Section 8: Techniques


Section 9: Photosynthesis and Photorespiration


Section 10: Nitrogen Fixation, Plant Growth and Development

C2. BIOTECHNOLOGY (Agriculture Science)

Section 1: Cell Structure and Function

Section 2: Biomolecules and Metabolism
Structure, characterization and functions of carbohydrates, lipids, proteins and nucleic acids, isolation and purification of enzymes, their classification, catalytic site, mechanism of action, regulation of enzyme activity, basic enzyme kinetics, inhibition, immobilized enzymes and their application, Catabolism, synthesis of carbohydrate, glycolysis, HMP, citric acid cycle, purine and pyrimidine biosynthesis, metabolic regulation, bioenergetics, etc. Oxidative phosphorylation and substrate level phosphorylation.

Section 3: Molecular Genetics
Concept of gene mutation, recombination, transformation, transduction, conjugation and transposition. Organisation of prokaryotic and eukaryotic genes and genomes including operon, exon intron, enhance sequences and other regulatory elements in prokaryotes and eukaryotes.

Section 4: Gene Expression
Replication, transcription and transposition of genetic material prokaryotes and eukaryotes. RNA processing and post-transcriptional modifications, post-translational modification and their significance. DNA modification and repair mechanism. Function of mitochondrial and chloroplast genome.

Section 5: Biophysical

Section 6: Molecular Biology Techniques
Isolation and hybridization of nucleic acids. Cot analysis, southern, northern and western blottings and hybridization. Construction and screening of genomic and DNA libraries. Current methods of radioactive and nonradioactive labelling of proteins and nucleic acids. DNA sequenencing. Restriction fragment length polymorphism (RFLP), randomly amplified polymorphic DNA sequences (RAPD), gene mapping, genome mapping, gene tagging and targetting, polymerase chain reaction (PCR), DNA synthesis, monoclonal and polyclonal antibodies, ribozyme, antisense RNA methodology, radioimmune assay, enzyme-linked immunosorbant assay (ELISA).

Section 7: Gene Cloning
Restriction enzymes. Salient features and uses of most commonly used vectors i.e., plasmids, bacteriophages, phagmids and cosmids: expression vectors. Cloning, sub-cloning strategies and transformation. Plant genetic vectors.

Section 8: Tissue Culture

Section 9: Plant Genetic Engineering

Section 10: Fermentation Technology

C3. MICROBIOLOGY (Agriculture)

Section 1: History of Microbiology
Evolution of microbial life. Theory of spontaneous generation. Contributions of various scientists to the development of different areas of microbiology.

Section 2: Microbial Taxonomy
Eucaryotes, procaryotes and archaeabacteria, Kingdom procaryote and detailed classification of procaryotes. Techniques used in identification and classification of bacteria-numerical taxonomy, DNA base composition, nucleic acid hybridization,

Section 3: Morphology and Cytology
Cell structure—procaryotes and eucaryotes. Chemical composition. structure and function of cell wall, cytoplasmic membrane, capsule, flagella, pill, cytoplasmic inclusions, nuclear material and other specialized cell structures-endospore, cysts, heterocysts, akinetes, etc.

Section 4: Microbial Ecology
Principles of microbial ecology and their application to different ecosystems. Microbiology of ecosystems—soil, rhizosphere, phyllosphere, water—fresh and marine, and air. Microbial interactions—symbiosis, synergism, commensalism, parasitism, amensalism, antagonism and predation. Adoption of micro-organism to various ecosystems.

Section 5: Microbial Physiology

Section 6: Microbial Genetics

Section 7: Microbial Biotechnology

Section 8: Food Microbiology
Microbiology of various foods, milk and water. Role of microbes in fermented and processed foods—sauerkraut bread, pickles, cheese, vinegar, bottled and canned foods. Spoilage of fruits, vegetables and processed foods. Methods of food preservation. Food-born diseases and intoxication.

Section 9: Soil Microbiology

Section 10: Environmental Microbiology

Section 11: Microbiological Techniques

Section 12: Statistics
Elementary principles of statistics. mean, mode and median. Experimental designs, analysis of variance and chi-square test. Correlation and regression.
C4. PLANT PHYSIOLOGY (Agriculture and Horticultural Crops)

Section 1: Structure and Function of Plant Cell and Organelles
- Biological membrane, nucleus, genome size, microbodies, cytoskeleton and cell wall.

Section 2: Energy and Enzymes

Section 3: Water and Plant Reactions

Section 4: Mineral Nutrition

Section 5: Photosynthesis

Section 6: Respiration and Lipid Metabolism

Section 7: Nitrogen and Sulphur Metabolism

Section 8: Secondary Plant Products
- Cutin, suberin, waxes, terpenes, and phenolic compounds—lignin, flavonoids, anthocyanins. tannins, photo-alexins, alkaloids, glycosides, glucosinolates, salicylic acid and essential oils. Importance of secondary products in plants.

Section 9: Environmental and Stress Physiology

Section 10: Plant Growth Regulators

Section 11: Photo-morphogenesis and Seed Physiology
- Cellular basis of growth and morphogenesis. Anatomical and ultrastructure aspects of growth. Polarity Molecular basis of differentiation. Morphogenesis in roots and shoots. Phytochrome as a photoreceptor. Structure and properties of phytochrome,
dark reversion and destruction, and phytochrome—induced whole plant responses. Seed germination, development and dormancy, and methods of breaking dormancy. Adaptive and ecological advantages and seed viability.

Section 12: Control of Flowering

Section 13: Crop Productivity and Modelling
Crop growth analysis, key growth parameters, canopy architecture, light interception, and concept of source-sink relationships. Allometric growth relationships, partitioning efficiency and harvest index. Plant growth analysis techniques, yield analysis, theoretical and actual yields. Physiology of major field crops. Plant ideotypes. Crop growth models—empirical models, model testing, and yield prediction.

Section 14: Statistics

D. HORTICULTURAL SCIENCES AND FORESTRY
D1. HORTICULTURE—FRUIT SCIENCE

Section 1: Importance of Fruit Crops
Importance, area, production and productivity; nutritional value and importance in national economy of fruit and plantation crops. Origin, distribution and classification of fruits/plantation crops into temperate, tropical, sub-tropical, arid zone crops. Classification of edible parts. Regions of cultivation. Export potential of different fruits.

Section 2: Nursery Management and Propagation

Section 3: Growth and Development
Definition of growth and development. Dormancy, rest period chilling requirements and heat units. Physiology of flowering and chemical induction of flowering. Fruit bud differential and fruit set, development, fruit drop and its control; pathenocarpy and seedlessness. Maturity and ripening. Biochemical changes associated in fruit ripening. Role of auxins, gibberellins, cytokiins, ethylene, morphactin and other growth retardants in fruit production.

Section 4: Fruit Breeding
Principles, problems and prospects of fruit breeding. Method of improvement e.g. introduction, clonal selection, hybridisation, mutation breeding, polyploidy and heterosis breeding. Breeding of stock and scion. Breeding objectives, problems and advances made in important crops like mango, citrus, banana, grape, papaya, guava, apple, aonla and pomegranate, etc.

Section 5: Plantation Crop Breeding
Principles, problems and prospects of breeding of plantation crops. Methods of improvement e.g. introduction, clonal selection, hybridisation, mutation breeding, polyploidy and heterosis breeding. Breeding objectives, problems and advances made in plantation crops e.g. coconut, arecanut, oilpalm cashew, tea, coffee, etc.

Section 6: Fruit Production
Modern production technology of fruit covering soil and clin propagation varieties; planting and population density; training and pruning; nutrition and irrigation; weed, disease and pest control including IPM and other orchard management practices of important fruit crops e.g. mango, citrus, banana, pineapple, papaya, guava, sapota, grape, litchi, pomegranate, ber, apple pear, stone fruits, etc.

Section 7: Plantation Crop Production
Modern production technology of plantation crops covering soils and climate; propagation, varieties; planting and planting density; training and pruning; nutrition and irrigation; weed, disease and pest control including IPM of important plantation crops, e.g. coconut, arecanut, oilpalm cashew, cocoa, tea and coffee.

Section 8: Special Problems
Causes and recent advances in the control of alternate bearing, malformation, spongy tissue in mango; granulation and decline in citrus; bunchy top in banana; fruit drop and fruit cracking in citrus, mango, litchi and pomegranate; guava wilt; internal breakdown and bitter pit in apple, barrenness in grapes and coconut wilt.
Section 9: Post Harvest Technology
Importance of post harvest handling in fruit and plantation crops; Maturity indices for harvesting and ripening; pre-cooking, various types of storage and storage temperatures; grading, packing and transportation; Storage disorders and use of chemicals, skin coatings and growth regulators for control of spoilage during storage and transit.

Section 10: Statistics
Frequency distribution, mean, medium and mode; standard, normal and binomial distribution; correlation, partial and multiple regression and regression coefficient, path co-efficient analysis; tests of significance, t, f and chi-tests experimental designs, basic principles, 'Completely randomised block design (CRBD), Latin square, split plot factorial and simple confounding designs.

D2. HORTICULTURE-FLORICULTURE

Section 1: Importance of Flower, Aromatic and Medicine Plants
Importance, area, production and productivity. Importance in national economy of flower, aromatic and medicinal plants. Origin, distribution and classification of flowers e.g. cut, loose, dry flowers, pot plants and aromatic and medicinal plants and classification of ornamental plants e.g. annuals, biennials, edges, hedges, shrubs, climbers, trees bulbous plant, foliage plants, succulents, cactus and water loving plants. Regions of cultivation, import and export.

Section 2: Nursery Management and Propagation
Selection of site, layout, rooting media and its sterilization, recent propagation techniques stock and scion relationship (rose), Method and time of propagation, Raising or seedlings, Transplanting pruning, grading, packing and marketing. Role of chemicals in seed germination, root induction and seedling growth, Use of propagation of structures. e.g. hot bed, cold frame, mist propagation chamber, plastic tunnels and green houses. principles of seed production, development, environmental factors for seed set, pollination system, isolation, roguing and certification, Hybrid seed production, seed harvesting, cleaning, storing, packing and marketing.

Section 3: Ornamental Plant Breeding
Principles, problems and prospects of ornamental plant breeding. Methods of improvement i.e. introduction, clonal selection, hybridization for specific purposes, mutation breeding, polyploidy and heterosis breeding. Breeding for stock and scion (rose), Breeding objectives and advances made in important crops like rose, gladiolus, carnation, chrysanthemum, marigold, aster, orchids, lilies, lotus, begonia and bougainvillea.

Section 4: Aromatic and Medical Plant Breeding
Principles, problems and prospects of ornamental plant breeding. Methods of improvement i.e. introduction, clonal selection, hybridization for specific purposes, mutation breeding, polyploidy and heterosis breeding. Breeding objectives and advances made in important aromatic plants, like jasmine, mentha, basil, scented geranium, lavender, citronella, palmarosa, cymbopogan, rosemary and patchouli and medicinal plants like Dioscorea, Solanum, Papaver somniferum, Atropa belladona, catharanthus, digitalis, Plantago ovata, senna, dawana, vetiver, saffron and cinchona.

Section 5: Flower Production
Soil and climate varieties, population density (seed rate) and planting, nutrition, irrigation, training, pruning and staking, weed, disease and pest control of important flower e.g. rose, carnation, chrysanthemum, gladiolus, marigold, tuberose, gerebra, aster, orchids, irises, antherium, lilies, tulip, lotus and begonia.

Section 6: Aromatic and Medicinal Plant Production
Soil and climate varieties, population density (seed rate) and planting, nutrition, irrigation training, pruning and staking, weed, disease and pest control of important aromatic plants, like jasmine, mentha, basil, scened geranium, lavender, citronella, palmarosa, cymbopogan, rosemary and patchouli and medicinal plant like Dioscorea, Solanum, Papaver somniferum, Atropa belladona, Catharanthus, digitalis, Plantago ovata, senna, dawana, vetiver, saffron and cinchona.

Section 7: Growth and Development
Definition of growth and development. Dormancy and rest period, physiology of flowering and biochemical changes during flower senescence, effect of preharvest factors on post harvest quality of cut flowers, stages of harvest of commercial flowers, decline in vase life, floral preservatives, pulsing and holding solutions, grading packing, storage and transportation of cut flowers.

Section 8: Post Harvest Technology of Flowers
Factors affecting bud development, flower development and senescence physiology and biochemical change during flower senescence, effect of preharvest factors on harvest qualify of cut flower, stages of harvest of commercial flowers, decline in vase life, floral preservatives, pulsing and holding solution, grading packing, storage and transportation of cut flower.

Section 9: Gardening
History of gardening in India, styles of gardening, their principles and practices with special reference to Mughal, Japanese, and English gardens. Visual aspects of plants arrangement view, vista and axis. Garden parts (features) their materials, and
methods of development including garden ornament. Classification and utilization of ornamental trees, shrubs, climbers, annuals, edges, hedges, bulbous, succulents and cactus, foliage and water loving plants. Preparation and management of shrubbery, herbaceous borders, lawn and bonsai. Planning of roadside, home gardens, children, amusement and zoological parks.

**Section 10: Statistics**

Frequency distribution, mean, median, and mode. Standard, normal and binomial distribution; Correlation-partial and multiple, regression coefficient, multiple regression and path coefficient regression. Tests of significance-F, t and chi-square tests, Experimental designs, basic principles, completely randomised design, randomised block design, factorial randomised experiment, latin square, split plot and simple confounding designs.

**D3. HORTICULTURE-VEGETABLE SCIENCE**

**Section 1: Importance of vegetables & Spices**

Importance, area, production and productivity, nutritional value and importance of vegetable, tuber crops and spices. In national economy. Origin, distribution: classification of vegetables, types of vegetable growing, regions of cultivation and export and import of these commodities.

**Section 2: Vegetable Crop Breeding**

Principles, problems and prospects of vegetable improvement. Introduction, selection including clonal selection and hybridization, mutation breeding, polyploidy and heterosis breeding for specific purposes like productivity, resistance to biotic and abiotic stresses and processing. Recent advances in breeding including biotechnological approaches. Breeding objectives and advances made in important vegetables like tomato, brinjal, okra, onion, chillies, important cucurbits and cole crops.

**Section 3: Tuber and Spice Crop Breeding**

Principles problems and prospects of tuber and spice crops improvement. Introduction, selection including clonal selection and hybridization; mutation breeding, polyploidy and heterosis breeding for specific purposes like productivity, resistance to biotic and abiotic stresses and processing. Recent advances in breeding including biotechnological approaches. Breeding objectives and advances made in potato, sweet potato, cassava, ginger, turmeric, coriander, fenugreek, black pepper, cardamom etc.

**Section 4: Vegetable Crop Production**

Soil and climate; seed rate, important varieties, nutritional requirements, deficiency disorders and corrective measures, irrigation spacing. Off-season production of vegetables. Weed, insect nematode and disease control including IPM and organic farming of important vegetables e.g., cole crops, cucubitaceous, bulb and root, solanaceous, leguminous vegetables and okra, etc.

**Section 5: Tuber Crops and Spices Production**

Soil and climatic seed rate, important varieties, spacing, irrigation, nutritional requirement, deficiency disorders and corrective measures. Pest and disease including IPM and organic farming of potato and other tuber crops and spices including hops and chicory.

**Section 6: Seed Production of Vegetable and Spice Crops**

Seed morphology, development, environmental factors responsible for belting and flowering, pollination systems, isolation, roguing and certification. Seed production in poly/green houses. Seed legislation. Stages in the production of certified seed, storage and viability in important crops like tomato, chilli, brinjal, okra, onion, cucurbits, cole crops, and seed spices like fenugreek, coriander, cumin, fennel, etc. Production of F₁ hybrid seeds in solanaceous, cole and bulb crops, Nursery establishment, preparation of soil mixtures, soil sterilization, containers, watering and plant protection practices, Use of vegetative propagation, selection of shoots in pepper and nutmeg, selection of rhizomes in cardamom, turmeric and ginger Saffron cultivation Nursery management.

**Section 7: Growth and Development**

Definition of growth and development, dormancy and rest period, physiology of flowering, chemical induction of flowering, sex expression and alteration, fruit set and development, fruit drop, parthenocarpy, seedlessness and biochemical changes associated with fruit ripening. Role of auxins, gibberellins, cytokinins, ethylene and other growth regulators including retardants in vegetable, tuber and spices crop production.

**Section 8: Hi-tech Production Technology**

Use of plastics, structures including low cost polyhouses/green houses and other structures in vegetable, tuber and spice production. Drip and sprinkler irrigation, fertigation, shading, hydroponics and other production technologies for enhancing productivity and off-season production of high value vegetable crops like tomato, capsicum, cucumber, watermelon, asparagus, broccoli, brussels sprout, gherkin and other important vegetables.
Section 9: Post Harvest Technology
Harvesting with reference of maturity indices, grading, packing including consumer packaging, transport. Different methods of storage, storage temperatures disorders. Pre and post harvest treatments to control disorders, value addition and export of vegetables, tuber crops and spices.

Section 10: Statistics
Frequency distribution, mean, median and mode; standard, normal and binomial distribution; simple, partial and multiple correlations, regression coefficients, path coefficient analysis; test of significance ‘t’ and ‘f’ and chi square test; basic principles and analysis of randomised block design (RBD), completely randomised block design (CBRD), factorial experiments (FRBD),

D4. FORESTRY

Section 1

Section 2

Section 3
Biomass, species composition and functions on agroforestry. Productivity, nutrient cycling, and root and light competition in agroforestry systems. Selection of superior trees with multiple uses like fuel, fodder and fibre. Regeneration potential and coppicing ability with high calorific value, preferably nitrogen fixers.

Section 4
Extent and causes of land denudation. Effects of deforestation on soil erosion, land degradation, environment and rural economy. Utilization of denuded low fertility soils for agro-industrial use of woody biomass. Biomass production for fuel wood, small timber, raw material for plant based cottage industries, minor forest products such as gums, resins and tannins, drug plants, essential oils, hardy fruits, pasture and silvi-pastoral management.

Section 5
Forest mensuration, surveys, inventory preparation and photointerpretation. Forest economics. Integration of trees with agricultural operations.

Section 6
Definition and scope of silviculture. Forest environment. Climatic edaphic, physiographic and biotic factors affecting regeneration and growth of trees. Forest regeneration: natural and artificial. Silviculture. Practices such as thinning-ground thinning, silvicultural thinning, felling, felling cycle, improvement felling, regeneration felling, cleaning, pruning, girding etc. Silvicultural systems of forest management with special reference to species suitable for soil and water conservation.

Section 7

Section 8
Forest management. Management systems for agro-forestry plantations and monocultures. Lopping of top-feed species such as frequency and intensity of lopping. Coppice management and energy plantations.

Section 9
Techniques for free crop improvement and mass propagation: Tree breeding, selection and other improvement techniques. Techniques for tissue culture, mist chamber etc. for propagation of difficult species. germplasm and agroforestry system evaluation: Collection, maintenance and evaluation of germplasm. Field plot techniques for the evaluation of agroforestry systems. Diagnosis and design of agroforestry systems.
Section 10


E. PLANT PROTECTION AND RELATED SCIENCES

E1. AGRICULTURAL ENTOMOLOGY

Section 1: Systematics


Section 2: Internal Anatomy and Physiology of Insects


Section 3: Ecology


Section 4: Biological Control


Section 5: Insect-Host Plant Relationships


Section 6: Toxicology


Section 7: Insect Vectors of Plant Diseases


Section 8: Pests of Crops and Stored Products and their Control

Biology, nature, extent of damage and control of pests of paddy, sorghum, maize, millets, wheat, barley, pulses, fruits, vegetables, cotton and other fibre crops, tobacco, oilseeds, sugarcane, ornamental plants, plantation crops such as tea, coffee, coconut, arecanut, cashew, cocoa, spices and condiments like pepper, cardamom, clove, nutmeg and chillies.


Section 9: Useful Insects

Honey bees, lac insect and silk worms.
Section 10: Statistics
Frequency distribution, means, median and mode, Standard, normal, binomial and Poisson's distribution, correlation, partial and multiple regression. Tests of significance: t, F and chi-square test. Design of experiments. Basic principles of completely randomised, randomized block, latin square and split-plot designs, Probit analysis.

E2. NEMATOLOGY (Agriculture)

Section 1: History and Morphology of Nematodes

Section 2: Nematode Taxonomy

Section 3: Nematological Techniques

Section 4: Plant Diseases Caused by Nematodes
Diseases caused by plant-parasitic nematodes-symptomatology, biology, distribution, economics and control of plant parasitic nematodes of economic importance (Pratylenchus, Radopholus, Hirschmanniella, Meloidogyne, Nacobbus, Heterodera, Globodera and other cyst forming nematodes, Rotylenchulus, Tylenchulus, Ditylenchus, Anguina, Aphelenchoidea, Bursaphelenchus, Rhadinaphelenchus, Tylenchorhynchus, Xiphinema, Longidorus, Trichodorous, Paratrichodorous, Rotylenchus, Helicotylenchus, Hoplolaimus, Scutellonema, Criconematids etc.).

Section 5: Nematode Ecology

Section 6: Plant Nematode Relationships

Section 7: Nematode Physiology

Section 8: Nematode Management
Principles and methods of nematode management-physical, cultural, biological, legislative and chemical methods. Nematicides—their formulations, applications and mode of action. Concept of host resistance for nematode control including their mechanisms. Integrated nematode management.

Section 9: Disease Complexes Caused by nematodes and Other Pathogens
Interaction of nematodes with other nematodes (predatory and parasitic). Interaction with other disease causing agents like bacteria, fungi, viruses and mycorrhiza. Nematodes as biological indicators of toxic environmental contaminants.

Section 10: Statistics
Frequency distribution. Measures of central tendency and dispersion-mean, median, mode, standard deviation etc. Population distributions-normal, binomial and poisson. Correlations-partial and multiple. Regression—simple and multiple. Test of significance, t, F and Chi-square tests. Experimental designs—basic principles of randomized block, Latin square and split plot designs.

E3. PLANT PATHOLOGY

Section 1: History and Principles of Plant Pathology
Milestones in phytopathology with special reference to mycology, bacteriology, virology and mycoplasmatology. History of development of epidemilogical, physiological and molecular plant pathology. Development of chemical, legislative and biological
protection measures including breeding for disease resistance. Nature and classification of plant diseases; Koch’s postulates. Inter-relationships between various plant pathogens and their hosts, Growth, reproduction and dispersal of plant pathogens. Factors influencing infection. Entry of pathogens into plant. Colonization of infected plant, result of infection, and symptomatology.

Section 2: Laboratory and Analytical Techniques

Section 3: Physiological and Molecular Plant Pathology

Section 4: Mycology and Fungal Physiology

Section 6: Plant Disease Epidemiology

Section 7: Phanerogamic Diseases and Abiotic Stress
Diseases caused by phanerogamic parasites and their management. Abiotic stresses. Diseases due to unfavourable soil environment, atmospheric pollution and nutritional deficiencies.

Section 8: Fungal Diseases of Crops
Fungal diseases of cereals, millets, oilseeds and pulses, fruits and vegetables, and plantation, fibre, spices and ornamental crops with special reference to the etiology, disease cycle, perennation, epidemiology and management. Post-harvest diseases in transit and storage, and their management.

Section 9: Bacterial and Vival Diseases of Crop Plants
Crop diseases of cereals, pulses, oilseeds, vegetables, fruits, plantation and fibre crops caused by bacteria, fastidious prokaryotes, viruses and viroids. Mode of transmission, virus-vector relationships, epidemiology and management.

Section 10: Management of Plant-Diseases
Section 11: Statistics

F. VETERINARY AND ANIMAL SCIENCES-I
F1. ANIMAL GENETICS AND BREEDING
Section 1: Overview of Genetics

Section 2: Advanced Genetics

Section 3: Overview of Breeding
Brief history of domestication of farm livestock. Scientific animal husbandry for more milk, meat, egg, wool, power, pashmina and mohair. Evolution of genetic systems. Isolating mechanisms and origin of species and sup-species—their adaptation, hybridization and evolution.

Section 4: Genetic Properties of Population

Section 5: Population Genetics

Section 6: Breeding Systems

Section 7: Selection Experiments

Section 8: Genetic Laboratory Techniques
Culturing Drosophila stock. Study of Drosophila with markers. Gene sequencing- Blood group typing. Chromosomal mapping. Basic concepts of genetic engineering, i.e., recombinant DNA technology, nucleic acid hybridization etc.

Section 9: Techniques for Research in Quantitative Animal Genetics
F2. ANIMAL REPRODUCTION/GYNAECOLOGY

Section 1: Development and Functional Anatomy of Reproductive organs

Section 2: Reproductive Cycle

Section 3: Infertility and Sterility in Female Animals

Section 4: Techniques for improving efficiency

Section 5: Obstetrics

Section 6: Reproductive Pattern in Males

Section 7: Artificial Insemination

Section 8: Infertility and Sterility in Males
F3. LIVESTOCK PRODUCTION AND MANAGEMENT

Section 1. General
Review of animal production systems in different parts of country. Present status and future prospects of livestock and poultry development in India. Livestock and poultry development programmes currently in operation in the country. Cattle and buffalo production trends in the last two decades and factors affecting them. Important breeds of cattle and buffalo, trails of economic importance and their inter-relationships. Production trends of sheep and goat including important breeds and their economic importance. Trends in swine production and population and factors affecting them.

Section 2: Breeding Management
Basic principles of inheritance, Concept of heritability, repeatability and selection. Importance methods of selection and systems of breeding in farm animals and birds. Maintaining breeding records and their scientific interpretation. Principles of biotechnology in animal improvement. Scope of reproductive biotechnology in augmenting animal productivity.

Section 3: Feeding Management
Nutritional requirements and feeding management of different categories of livestock and poultry. Antibiotic and probiotic feeding in farm animals and birds. Computation and formulation of ration for various categories of livestock and poultry. Linear programming and least-cost ration formulation for maximum profits in farm animals. Feeding principles in birds and their differences from ruminant feeding. Systems of feeding livestock and birds. NRC, ICAR and BSI standards of feeding livestock and poultry. Feeding of draft and meat animals. Importance of applied feed biotechnology in relation to animal productivity. Processing and storage of conventional and nonconventional feed ingredients. Industrial uses of animal and poultry by products.

Section 4: Reproduction Management

Section 5: Shelter Management Including Hygiene and Sanitation
Housing systems, selection of site and arrangement of animal and poultry houses. Space requirement for livestock and poultry. Housing designs based on different agro-climatic regions. BIS standards for livestock and poultry housing. Lay-out plans of buildings for different species and categories. Microclimatic changes and modifications in animal houses. Engineering aspects and sub-tropics. Improving the existing farm structures. Common disinfectants and sanitizers used on animal farms. Disposal of animal wastes under urban and rural conditions. Disposal of carcasses.

Section 6: Health Management

Section 7: Production and Management of other Animals

Section 8: Wild Life Management: Status of Wild Life in India and its Conservation
Section 9: Forage Production and Conservation


Section 10: Economics and Marketing of Livestock and Poultry and their Products


Section 11: Research Methodology in Livestock Production and Management


F4. LIVESTOCK PRODUCTS TECHNOLOGY

Section 1: Basic and General Aspects of Livestock Products


Section 2: Abattoir and Poultry Processing Plants


Section 3: Processing and Preservation


Section 4: Fish Products

Fishery resources. Marine and freshwater fish. Production, transportation, processing, preservation, grading, standards, quality control, packaging, labelling and marketing of fish and fish products. Utilization of fish processing waste.

Section 5: Wool, Mohair and Fur

Basic aspects of wool science. Shearing, physical and chemical characteristics, processing, grading, standardization and marketing of wool mohair and fur.

Section 6: Packaging

Section 7: Quality Control

Section 8: Marketing

F5. POULTRY SCIENCE

Section 1: Poultry Genetics and Breeding

Section 2: Poultry Nutrition

Section 3: Avian Physiology

Section 4: Poultry Products Technology

Section 5: Poultry Management
Section 6: Economics and Marketing


Section 7: Poultry Health Management


F6. VETERINARY EXTENSION EDUCATION

Section 1: Fundamentals of Extension Education

Extension Education in India and abroad as a discipline. Concept, definition, philosophy, principles and scope of extension education in livestock development. History of Veterinary Extension programme developed and implemented by HAU, IVRI, NDRI and other institutions and organisations. Importance of study of Veterinary extension by veterinarians, animal husbandry and dairying students. Specific aims, objectives and philosophy of veterinary extension. Agricultural extension Vs. Veterinary Extension. Role of veterinarians as a social scientist. Role of extension education in development and socioeconomic upliftment of vulnerable sections of the society. Special animal husbandry promotion programmes i.e. Operational Flood in its historical perspective, -ICDP, key village scheme, Gaushala scheme and T&V system and TOT projects of ICAR. Approaches and models of extension education. Extension systems in State Agricultural Universities, State Departments with special reference to animal husbandry and veterinary services. Development of efficient linkages between research and extension, challenges and problems in promotion of Veterinary extension in rural areas.

Section 2: Communication, Diffusion and Adoption of Innovations

Definition, concept, nature and scope of communication for animal husbandry and dairy development. Models of communication with special and efficient feedback. Types of communication media and their utilization for specific jobs related to veterinary extension activities. Utilization of internet for promoting advanced veterinary and animal husbandry practices, communication with rural, semi-urban and urban livestock owners. Acquiring communication skills for development of local leaders and key communicators for livestock development. Rapport building with clientele. History taking and follow-up appraisal on prognosis and treatment on scientific lines. Problems and barriers in communication.

Diffusion process, adoption process, models of diffusion and adoption, adopter categories and their characteristics. Factors influencing adoption, attributes of innovation. Diffusion of Veterinary innovations. Important researches in veterinary extension.

Section 3: Research Methodology

Scope and nature of social research, research process, hypothesis, forms and importance, formulation of null hypothesis and its testing. Drawing of scientific inferences. Nature and types of variables. Sampling versus complete enumeration. Sampling from a finite and infinite population, estimation of samples size, simple random, stratified random, systematic, purposive, two stage, multi stage and cluster sampling. Sampling with probability proportional to size, sources of errors. Methods of data collection. Steps involved in the conducting of survey. Techniques for preparation of schedule, questionnaire, observations, and case studies. Surveys in the field of animal husbandry and dairying, socio-economic surveys and review of studies conducted in social research. Social research designs ex post facto and experimental, reliability and validity.
Section 4: Social Statistics
Types of hypothesis, Mean, Mode and Median Normal distribution. Chi-square test, correlation, simple, partial and multi-regression, ANOVA, Path analysis, and sampling techniques.

Section 5: Veterinary Extension Management

Section 6: Rural Sociology
Definition, concept, scope and its relation with other social sciences including Veterinary extension. Concept of social systems and their major elemental and master social processes. Rural social systems as differentiated from urban social systems. Social structure: groups, primary, secondary and references groups. Social stratification, basic rural social institutions—family kinship, marriage, rural educational institution, panchayat, co-operatives etc. Socialization and social control. Social change Vs animal development. Factors affecting social changes in rural areas—indicators and types of social change.

Section 7: programme Planning for Livestock Development
Steps in programme planning for livestock development, organizing campaigns, mass vaccination programmes and variety of extension activities, evaluation of veterinary extension programmes, compilation and report writing, impact studies on animal husbandry development programmes and schemes. Concept of training and education and their interrelationship. Historical background and present status of training programmes in various institutions and organizations in India. Scope and importance of training.

Section 8: Extension Methods and A.V. Aids

G. VETERINARY & ANIMAL SCIENCES-II

G1. ANIMAL NUTRITION

Section 1: Energy and Proteins

Section 2: Minerals, Vitamins and Feed Additives
Minerals: Sources, physiological functions and deficiency symptoms. Inter-relationships-synergism and antagonism. Inter-relationships among minerals and vitamins. Mineral toxicity and its effects. Vitamins: Sources, physiological functions and deficiency symptoms, hyper-vitaminosis. Antibiotics: Probiotics, hormones and other growth-promoting factors,

Section 3: Rumen Eco-system and Function

Section 4: Non-ruminant Nutrition

Section 5: Nutrient Requirements
Energy and protein requirements for maintenance, growth, reproduction, milk, work and wool production by different ruminant species. Mineral, vitamin and water requirements. Factors affecting energy and protein requirements. Factors affecting
Section 6: Forage Conservation and Evaluation

Section 7: Feed Processing and Technology

Section 8: Antimetabolites and Toxic Principles
Natural occurrence and metabolism of herbage toxins like alkaloids, glycosides, glycoproteins and phenolic compounds. Aflatoxins and Salmonella poisoning. Insecticide and pesticide residues in feeds. Detoxification of various antimetabolites/toxic principles.

Section 9: Elements of Research Methodology

G2. ANIMAL PHYSIOLOGY

Section 1: Biophysical and Biochemical Principles Related to Physiology

Section 2: Blood and Circulation

Section 3: Respiration

Section 4: Excretion

Section 5: Digestion

Section 6: Muscle Physiology

Section 7: Nervous System
Section 8: Endocrinology

Section 9: Reproduction

Section 10: Physiology of Growth

Section 11: Climatology

G3. BIOCHEMISTRY (Animal Science)

Section 1

Section 2

Section 3

Section 4

Section 5

Section 6

Section 7
Section 8

Section 9
Biochemistry of body fluids, water, electrolytes and acid-base balance, function and mechanism of action of major trade elements.

Section 10

G4. BIO TECHNOLOGY (Animal Science)

Section 1: Cell Biology

Section 2: Molecular Biology

Section 3: Gene Structure and Expression

Section 4: Recombinant DNA Technology and Genetic Engineering

Section 5: Animal Tissue Culture

Section 6: Technique of Biotechnology
Isolation and purification of DNA from prokaryotes and eukaryotes. Quantitation of nucleic acids. Restriction endonucleases digestion of DNA and restriction regiment analysis of DNA by gel electrophoresis.

G5. VETERINARY MICROBIOLOGY

Section 1: General Bacteriology

Section 2: Systematic Bacteriology
Section 3: General Virology

Section 4: Systematic Virology

Section 5: Mycology

Section 6: Immunology

Section 7: Molecular Cell Biology

G6 VETERINARY PATHOLOGY
Section 1: Introduction, History and Etiology

Section 2: Hemodynamic Derangements, Degenerations and Necrosis
Disturbances of circulation/hemodynamic derangements-hyperemia, ischemia, haemorrhage, sludges blood, thrombosis, embolism, infarction, edema and shock. Disturbances of cell metabolism- cell swelling, mucinous and mucoid degeneration, amyloid infiltration, hyaline degeneration, glycogen, infiltration, fatty changes, gout, calcification, ossification disturbances of pigment metabolism, lcerus, necrosis and gangrene.

Section 3: Inflammation, Healing and Fever
Inflammation: Introduction, definition, etiology and cardinal signs, chemical mediators, circulatory and cellular changes, exudate, phagocytosis and body defences. Classification of inflammation: serous, mucous, fibrinous, haemorrhagic, purulent, lymphocytic, granulomatous and allergic. Peracute, acute, sub-acute and chronic inflammations. Healing and fever.

Section 4: Immunopathology

Section 5: Oncology and Malformations
Section 6: Postmortem and Histopathologic Techniques
Principles and techniques of necropsy of morbid materials. Techniques of preservation. Despatch and section cutting. Staining and identification of sections prepared from pathological lesions.

Section 7: Clinical Pathology
Haematology, blood chemistry, urine and faecal examination in important diseases of livestock and poultry.

Section 8: Systemic Pathology
Pathology of cardiovascular, haemopoietic, respiratory, digestive, urinary, genital, nervous and musculoskeletal systems, endocrine glands, eye, ear, skin, hoof and nails.

Section 9: Infectious Pathology
Pathology of bacterial diseases, mycotic infections, viral disease, PPLO and rickettsial infections and parasitic diseases.

Section 10: Avian Pathology

Section 11: Nutritional and Production Pathology
Pathology of nutritional diseases, protein, carbohydrate, mineral and vitamin deficiencies. Pathology of production diseases—milk fever, magnesium tetany, ketosis etc.

Section 12: Toxic Pathology
Pathology of toxicity of heavy metals, mycotoxins, pesticides, toxic plants and drugs.

H. VETERINARY AND ANIMAL SCIENCES-III

H1. VETERINARY MEDICINE

Section 1: Diagnostic Approaches to Animal Diseases

Section 2: General Medicine

Section 3: Gastroenterology

Section 4: Cardiovascular and Pulmonary Disorders

Section 5: Urogenital Disorders

Section 6: Musculo-skeletal and Nerbour Disorders

Section 7: Dermatology

Section 8: Metabolic and Nutritional Disorders
Section 9: Diagnostic and therapeutic Approaches to Common Toxic Conditions of Livestock

Lead, arsenic, fluorine, mercury, HCN, nitrate and nitrite, chlorinated hydrocarbon, organophorous compounds and urea poisoning. Diseases caused by physical agents and environmental pollutants. Combating radiation hazards.

Section 10: Infectious Diseases of Livestock and Poultry


Section 11: Jurisprudence and Ethics


Section 12: Special Therapeutic Techniques in Veterinary Practice


H2. VETERINARY PARASITOLOGY

Section 1

Classification, structure, physiology, life cycle, mode of transmission, occurrence and distribution of the parasites of Veterinary importance belonging to the following:

A. Helminthology

(b) Platyzelminthes-Cestoda
(c) Nemathelminthes-Nematoda

Ascardinae, Anisakidae, oxyuridae, heterakidae, Subuluridae, Rhabditidae, Strongylidae, Strongylidae, Trichonematidae, Amidostomiae, Stephanuridae, Syngamidae, Ancylostomatidae, Trichostrongylidae, Dicyocaulidae, Metastronugylidae, Protostrongylididae, Filarioidea, Spiruridae, Thelazidae, Aculuridae, Tetrameridae, Physalopteridae, Gnathostomatidae, FILARIDAe, Setariidae, Onchocercidae, Dracunculidae, Trichinellidae, Trichuridae Capillariae, and Dictophymatidae.
(d) Acanthocephala-Polyphagidae, Oligacanthorhychidae.

B. Protozoa

Trypanosomatidae, Trichomonadidae, Monocercomonadidae, Hexamitidae, Endoamoebidae, Cryptosporididae, Eimeriidae, Sarcocystidae, Haemogregarinae, Plasmodidae, Babesiidae, Theileriidae and Balantiidae.

C. Arthropoda

(a) Insecta: Amblycera, Ischnocera, Haematopinidae, Linognathidae, Culicidae, ceratopogonidae, Simulidae, Psychodiidae, Tabanidae, Oestridae and Hippobosciidae.
(b) Arachnida: Dermayssidae, Argaidsae, Ixodidae, Trombiculidae, Pediculidae, Demodicidae, Sarcoptidae and Psoroptidae.
(c) Pentastomida: Linguatulidae.

Section 2: Parasitic Pathology

It includes pathogenesis, pathology clinical symptoms, lesions, and hematological and biochemical changes of important groups of parasites of great economic importance with particular reference to those widely prevalent in domestic mammals and bird in India.

Section 3: Parasitic Zoonoses

Consideration of these parasites that are of great public health importance globally and for India. Each zoonotic disease thus identified should be analyzed in terms of its different components to establish its chain of transmission cycle from animals to man and vice-versa.
Section 4: Parasitic Techniques
Laboratory techniques used for diagnosis of parasitic diseases; collection of biological materials, coprological examination, preparation and training of blood and organ smears, section cutting and staining of tissue sections. Identification of cysts, eggs, larval and immature stages and adult parasites, use of laboratory animals: for diagnosis; methods of laboratory culture of prepatent stages.

Section 5: Treatment and Control of Parasites
(a) Information regarding different anthelmimtics, antiprotozoan compounds, and insecticides including acaricides; mode of their administration and their therapeutic and prophylactic doses with due precautions wherever applicable; and problems of drug resistance.
(b) Various practical measures recommended for controlling common and economically important parasites of domestic mammals and birds, and their rationale; mass drenching schedules and methods of their formation for organized livestock and poultry farms.

Section 6
(a) Immunity to Parasites
Nature and mechanism of immunity to parasites especially helminths, protozoa, and ixodid ticks. How it differs from immunity to bacterial and viral infections? Humoral and cellular factors in immunity. Information on auto-immune reactions and other immunopathological conditions in parasitic diseases. Information on premunition, self-care and types of antibodies produced against parasites. How parasites circumvent the immune-surveillance of the host?

(b) Immunoprophylaxis
Use of vaccines against some important parasites available so far, and their rationale. Information on different immune-diagnostic tests and their techniques used against different parasites, their relative specificity and sensitivity; methods for preparation of antigens and their fractionation; methods of preparation of antisera/hyper-immune sera.

H3. VETERINARY PHARMACOLOGY
Section 1: General Pharmacology

Section 2: Drugs Acting on Central Nervous System

Section 3: Drugs Acting on Humoral and Autonomic Nervous Systems

Section 4: Drugs Acting on Cardio-vascular and Respiratory Systems

Section 5: Drugs Acting on Digestive System

Section 6: Drugs Affecting Uro-genital System
Drugs altering fluid balance. Diuretics and antiuretics. General principles of electrolyte and fluid therapy. Drugs acting on uterus (oxytocics and tocolytics). Drugs used for improving fertility and conception. Drugs used in synchronization of estrus.

Section 7: Autacoids

Section 8: Antiseptics and Disinfectants
Sulphonamides (gut acting and systemic), trimethoprim and nitrofurans. Antibiotics (natural and semisynthetic) including aminoglycoside, microcide and surface-acting antibiotics. Antifungal antibiotics and other emerging antibiotics. Antitubercular, antiviral and antineoplastic drugs. Antiprotozoan and anthelmintic drugs.
Section 9: Toxicology

Section 10: Miscellaneous Topics
Hormones including pituitary hormones, thyroid and antithyroid drugs, insulin and antidiabetic agents, adrenocorticoids, and sex hormones. Drugs affecting calcification - parathyroid hormone, calcitonin, vitamin D and other compounds. Production pharmacology. Feed additives. Ionophore compounds. Agents used in restraining of wild animals and doping. Drug control and regulation.

H4. VETERINARY PUBLIC HEALTH
Section 1: Veterinary Public Health
Definition. International and national organization and administration of veterinary public health education—methods and channels.

Section 2: Milk Hygiene

Section 3: Meat Hygiene

Section 4: Food-borne Infection and Intoxication

Section 5: Zoonoses

Section 6: Environmental Hygiene

Section 7: Epidemiology

Section 8: Experimental Medicine
Species of experimental animals. Care and management practices. Raising specific pathogen-free, gnotobiotic and germ-free animals and their specific utility in biomedical research.

Section 9: Health Education
Personal hygiene and health education of workers engaged in animal husbandry activities, slaughter houses, milk plants, and animal by-products, and industrial enterprises.
Section 10: Standards, Guidelines and Legislation


Section 11: Microbiology in Public Health


H5. VETERINARY SURGERY

Section 1: General Surgery


Section 2: Anaesthesia


Section 3: Radiology


Section 4: Orthopaedics and Lameness


Section 5: Surgery of Head and Neck Region

- Surgical affections and management of sinuses, nasal and buccal cavity, tongue, salivary gland, larynx, teeth pharynx, trachea, oesophagus and eye.

Section 6: Thoracic Surgery

- Various approaches for thoracic surgery in large and small animals. Different congenital and acquired surgical affections of thoracic wall and thoracic organs viz. lung, mediastinum, oesophagus, heart and diaphragm in large and small animals. Various diseases of the vascular system.

Section 7: Abdominal Surgery


Section 8: Integumentry System

- Afflictions of horn, ear, skin, udder and teat, and tail and their surgical management. Cosmetic surgery.

H6. VETERINARY ANATOMY

Section 1

- Gross anatomy. Ox is taken as a “Type” animal and structures of other domestic animals are to be compared. Bones of fore and hind limbs, axial system viz. skull, vertebrae, ribs and sternum in domestic animals. Joints, their classification and important joints in ox. Myology in general, muscles of appendicular and axial system in ox. Heart, systemic and pulmonary

Section 2
Study of various bones and organs of digestive, respiratory and urogenital system in fowl.

Section 3

J. DAIRY SCIENCE/ DAIRY TECHNOLOGY AND FOOD SCIENCE

J1. DAIRY CHEMISTRY

Section 1

Section 2

Section 3

Section 4

Section 5

Section 6
Section 7

Section 8

Section 9

Section 10

J2. FOOD SCIENCE AND TECHNOLOGY

Section 1: Introductory Food Technology

Section 2: Fruit and Vegetable Technology
Grading and selection of fruits and vegetables for processing. Thermal process time evaluation for canned products. Spoilage of canned products. Dehydration and problems of browning in storage of dried products. Utilization of fruit and vegetable juices for the manufacture of beverages such as squashes, cordials, nectars, aerated and fermented fruits juice. Chemistry and manufacture of protein, role in jell formation and products like jellies and marmalades. Technology of preserved, canned fruits, pickles, chutneys and sauces. Nature and control of spoilage in pickles. By products of fruit and vegetable industry.

Section 3: Cereal Technology

Section 4

Section 5: Meat and Meat Products

Section 6: Egg and Egg Products

J3. DAIRY MICROBIOLOGY

Section 1

Section 2

Section 3
Types of micro-organisms in raw cream and different varieties of cream. Ripening of cream. Microbes in desi and creamery butter, and their growth during storage. Defects in cream and butter due to microbial growth. Microbiology of frozen dairy products such as ice creams, ice, kulfi and desserts. Standards of frozen products and their ingredients. Sources of contamination during production, handling storage and distribution.

Section 4
Microbes in indigenous milk products such as khoa and chhana based sweets, sources of these microbes, and spoilages they cause in these products. Growth and multiplication of pathogenic microbes in indigenous dairy products during storage and marketing. Types of microbes surviving in concentrated and dried milk, and baby foods. Role of initial microbial load of milk on the microbiological quality of products.

Section 5

Section 6

Section 7

Section 8
Microbiological aspects of quality control and quality assurance in production of milk and milk products, limitation of these systems. Value of HACCP in preventing health hazard due to consumption of milk products. Methods of preventing food poisoning due to infection and intoxication. Importance of total quality control management in dairy industry.
J4. DAIRY PROCESSING

Section 1: Market Milk

Section 2: Fat-rich Dairy Products

Section 3: Frozen-milk Products
Definition, classification and composition of ice cream and other frozen desserts. Status, trends and projections for frozen-milk products industry in India. Role of milk constituents, other ingredients, process steps, packaging and storage on ice cream quality. Technological aspects of ice cream manufacture. Recent advances in ice cream industry and their impact. Technology for preparation of dried ice cream mix. Indigenous frozen desserts-kulfi, malai-icebaraf, filled and imitation ice cream, their production techniques and quality.

Section 4: Cheese and Fermented Milk Products

Section 5: Concentrated and Dried-milk Products
Newer concepts in milk quality in relation to processing and manufacture of concentrated and dry milks. Principles and methods of manufacture, packaging and storage defects in SCM, EM, and UHT sterilized concentrated milk, RSCM, REM, and dried milk whole milk powder (WMP, SMP) and instant milk powder. Advances in processing, manufacture, packaging and storage of concentrated and dried milks. Critical evaluation of current status, need for modifications, newer technologies and formulations for infant foods and weaning foods. Special problems in handling buffalo milk for manufacture of concentrated and dried milk, and infant milk foods.

Section 6: Indigenous Milk Products
Significance and role of indigenous dairy products in Indian dairy industry and economy. Characteristics, composition and legal aspects of various indigenous products, their prospects and constraints. Status of organized and unorganized sectors in the manufacture of these products. Methods of production, physical-chemical changes during manufacture, quality attributes, shelf life, preservation, packaging and latest processing innovations of khoa, chhana and paneer, and sweets based on these products.

Section 7: Utilization of Milk-By Products
Status, availability and utilization of dairy by-products. Associated economic and pollution problems. Manufacture of casein, sodium and calcium caseinates, edible casein, hydrolysates, coprecipitates, whey protein concentrates, why
beverages, why syrups and lactose. Use of butter milk. Application of membrane processing and other separation/fractionation processes used for milk components, and development/formulation of new products.

Section 8: Advances in Packaging

Section 9: Cleaning and Sanitization

Section 10: Advances in Dairy Technology

J5. DAIRY ENGINEERING

Section 1

Section 2
Introduction to design of pressure vessels, codes and regulation, allowable stresses, design pressures and working temperatures. Combination of direct and centrifugal stresses, fabrication requirements, inspection tests and quality control, corrosion and corrosion control/ allowance. Process plant piping, codes, piping material, testing and stress evaluation, overall economic and safety considerations, costs and selection of the heat exchangers.

Section 3
Transport properties and proportionality constants in momentum energy and mass transfer. Steady state equation. Newtonian and non-Newtonian fluids, continuity equation in different coordinates. Navier-Stockers equations and their applications. Velocity, temperature and concentration distribution in turbulent transport mechanism. Friction factors, analogies among mass heat and momentum transfer, mathematical analysis, application of dimensional analysis in transport phenomena and boundary layer content.

Section 4

Section 5

Section 6

Section 7

Section 8

Section 9
Control of temperature and humidity. Synchronetics. Load estimation for specified design conditions. Design of air ducts and room air distribution. Transducers-resistive, inductive, capacitive, magnetic, optical and other types. Use of transducers in measurement—level, pressure, flow velocity, humidity, temperature, movement, mass, electrical properties, radiation.

K. AGRICULTURAL ENGINEERING

K1. AGRICULTURAL STRUCTURES AND PROCESS ENGINEERING

Section 1: Farm Structures

Section 2: Off-farm Structures

Section 3: Planning

Section 4: Materials Handling and Transport

Section 5: Post-harvest Operations

Section 6: Design

Section 7: Environment Control
Section 8: Processing and Processing Equipment

Machinery for processing of agricultural products-cereals, pulses, oilseeds, oil palms, fruits and vegetables, animal products, tubers, spices and condiments, farm residues, apiary, tobacco, seed processing, biofertilizers and bio-pesticide formulations.

Section 9: Design and Management


Section 10: Basic Sciences and Allied Engineering Subjects


K2. FARM MACHINERY AND POWER

Section 1

Status and scope of farm mechanization in India. Power availability on the farm. Identification of need based priorities of mechanization for various cropping systems. Hand tools used for different kinds of farm work, design considerations and materials for construction. Functional requirements, principles of working, construction, design, operation and management of animal-and power-operated equipments for tillage, land development, sowing, planting, fertilizer application, inter-cultivation, mowing, chaff cutting and baling. Special equipment for crops such as sugarcane, cotton, groundnut, potato and jute.

Section 2


Section 3

Force analysis on machine elements. Pull, draft, unit draft and energy calculations for animal and power operated equipment. Methods of testing of tillage equipments, seed-drills, seeders, plants, sprayers, threshers, and combines. Farm machinery selection for different soils, crops and operations. Cost analysis of implements and operations. Methods and materials for manufacturing and quality control of farm equipments.

Section 4

Source of power on the farm: human, mechanical, wind solar, biogas and producer gas. Energy conversion, capacities and efficiencies of energy utilization from these sources. Fuels and combustion in internal combustion engines, fuel properties and combustion equations. Lubricants and their properties. Thermodynamic processes and calculations on energy exchange.

Section 5

Various systems of spark and compression ignition engines. Operations, adjustment and trouble shooting on the working of the systems. Design of engine components. Calculations on horse power, torque, speed, firing arrangement and intervals, heat load and power transmission from piston to the fly wheel.

Section 6


Section 7


Section 8

K3. SOIL AND WATER CONSERVATION ENGINEERING

Section 1: Water Resources of India


Section 2: Water Conveyance and Control


Section 3: Soil-Plant-Water Relationships


Section 4: Hydrologic Processes


Section 5: Watershed Management


Section 6: Special Land Development Problems


L. HOME SCIENCE

L1. CHILD DEVELOPMENT

Section 1

Major factors influence human growth and development. Principles of human growth and development. Study and analysis of significant areas of development; physical and motor aspects, cognitive processes, acquisition of language, creativity, learning and motivation. Study of emotional aspects, social behaviour, moral development and values, and personality development.

Section 2


Section 3

Section 4

Section 5

Section 6
Physical, social, intellectual and emotional development during late childhood and their characteristic. Physical, moral, social, emotional and intellectual development during adolescence. Adulthood and old age. psychological, economic and social problems of the aged and rehabilitation of the aged. National and community services for the aged.

Section 7
Concept, need and principles of guidance. Aims and objectives of individual and group guidance. Sources of information and methods of group guidance. Use of psychological tests and criteria for testing and measurements. Guidance services: meaning, scope, principles of counselling services, methods and techniques in counselling service for children, parents and youth.

Section 8

Section 9
Meaning and need for community education. Child rearing practices of community. Objectives and principles of parent education. The disadvantaged family. Problems and needs of the disadvantaged family and child. Subject matter or areas of knowledge for parent education. Role of parents and teachers in children. Methods and procedures of parent and community education.

L2. FOOD AND NUTRITION

Section 1
Food production and consumption trends in India and their consequences on nutrition situation. Cereals, millets, pulses, oilseeds, vegetables, fruits, milk, eggs, meat and other animal foods. Nutritional value of these food groups and their contribution towards nutrients in Indian diets.

Section 2
Grain storage practices in India. Quantitative and qualitative losses during post-harvest handling and storage of foodgrains. Improved and scientific methods of storage of foodgrains.

Section 3
Food processing-physical and chemical changes in foods during processing including cooking and preservation with special reference to sensory characteristics and nutritional value. Traditional methods of processing such as steaming, parboiling, germination, malting and fermentation and their nutritional advantages. Food colours, flavours and enzymes, and their importance.

Section 4
Food safety-natural toxicants, pesticide residues, common adultrants and mycotoxins, their harmful effects on health, and methods of eliminating harmful effects.

Section 5

Section 6
Major nutrition problems in India—causes, magnitude and distribution. Nutritional problems of vulnerable segments—pregnant and lactating women, and pre-school children.
Section 7

Section 8
Nutritional requirements of pregnant and lactating women, and pre-school children. Consequences of chronic nutritional deficiencies in these groups. Infant and child feeding practices in India and importance of promoting good feeding practices.

Section 9

L3. HOME MANAGEMENT/FAMILY RESOURCE MANAGEMENT

Section 1: Family Resources Management
Interdisciplinary nature of management and systems approach to family management. Philosophy and concepts of management: goal types and goal setting, and value types. Sources of learning values and their importance to family. Standards-type and relationship with values and goals. Process of management-planning, controlling, evaluating, organizing and their application to resource use and resource development. Decision making in use and development of resources. Decision types. Application of management processes to time and energy for work simplification. Application of Mudell’s classes of change in household work and agricultural task.

Section 2: Art Principles and Interior Enrichment
Importance of good taste. Elements and principles of art and their application to interior decoration. Selection of art objects and making of decorative accessories for homes. Flower arrangement.

Section 3: Housing and Space Designing

Section 4: Household Energy and Equipments

Section 5: Family Finance and Consumer Education

Section 6: Entrepreneurship Management
Scope for enterprise. Sources of information for projects proposals and kinds of information needed. Role of government and private organization in financing.

Section 7: Markets and Marketing
Types of markets, their functions and pricing. Marketing information systems. Sales management and product promotion.

L4. HOME SCIENCE EXTENSION

Section 1: Fundamentals of Extension Education

Section 2: Rural Institutions
Structure and functions of rural institutions, process of activating them, and factors influencing their involvement in rural development. Leadership-concept, types, identification, training and mobilizing local leaders for community participation. Panchayati Raj: philosophy, concept, functioning and scope.

Section 3: Programme planning and Evaluation
for monitoring an evaluation. Five-year plans—critical analysis with special reference programmes for women, children and youth. Development programmes viz. Integrated Child Development Service (ICDS), Integrated Rural Development Programme (IRDP), Development of women and Children in Rural Areas (DWCRA), Training of Rural Youth for Self Employment (TRYSEM), Krishi Vigyan Kendras (KVKs) etc. Role of Non-government Organizations (NGOs) in extension.

Section 4: Extension Management
Meaning, nature, principles, process, functions and scope of administration and management. Critical analysis of organizational set up of extension administration at various levels. Training—principles and importance of extension training, methods of training; factors affecting extension training; identifying training needs; and assessment of training impact.

Section 5 Entrepreneurial Development
Concept, significance and scope. Programmes and agencies promoting women as entrepreneurs.

Section 6: Extension Methods and Communication Techniques

Section 7: Communication for Development
Concept, functions, key elements, theories and models of communication. Barriers to communication. Concept and models of development. Diffusion and adoption for social change—concept, process, models and theories. Revolution in communication strategies. Advanced techniques in mass communication and software production.

Section 8: Research Methods in Home Science Extension

Section 9: Social Statistics

L5. TEXTILE AND CLOTHING

Section 1

Section 2

Section 3
Study of dyes and pigments—composition, properties, advantages and disadvantages. Advanced dyeing and printing methods.

Section 4
Importance of quality testing in textiles and clothing. Fibre, yarn and fabric testing methods. Methods of texturization and their applications. Fabric blending methods and their applications. Role of textile testing standards and methods.

Section 5

Section 6
Role of textile industry in Indian economy. Status of textile industry in the last decade with reference to cotton, rayon, jute, silk, wool, garments and hosiery. Domestic and international consumption. Export and import policies of textiles and garments. Five Year Plans and their influence on textile and clothing related policies. Associations and research organisations related to textiles, garments, hosiery and consumer. Sales promotion techniques for textiles and garments. Consumer education and protection methods.
M1. FISH AND FISHERY SCIENCE

Section 1: Capture Fisheries

Section 2: Aquaculture
History, scope and importance of aquaculture. Aquaculture practices in different part of the world. Cultivable organisms for aquaculture and criteria for their selection. Different systems of aquaculture such as pond culture, cage culture, pen culture, aquaranching etc. Impact of aquaculture on environment. Hatchery and grow out practices for cultivable species of freshwater fishes (trouts, mahser, carps, catfishes, snakeheads etc.), prawns (giant freshwater prawn, riverprawn). Integrated aquaculture. Waste water aquaculture. Pearl culture. Frog culture. Hatchery and grow out practices for culture of brackishwater fishes (milkfish, mullets, pearlspot, seabars), prawns (tiger prawn, white prawn, banana prawn etc.) and mud crabs. Present status of sea farming in India. Culture of molluscs (clams, oysters and mussels), echinoderms (sea cucumber) and sea-weeds.

Section 3: Aquaculture Engineering
Site survey techniques. Principles of engineering design for aqua farms and hatcheries. Source of water supply and retentivity. Water/soil quality and nutrient status. Rehabilitation of problem soils, seepage control, prevention of soil erosion etc. Important equipments and machineries of aqua farms and hatcheries such as pumps, air compressors, blowers, aerators, biofilters, windmills, deweeders etc.

Section 4: Genetical Engineering and Biotechnology

Section 5: Nutrition and Feed Formulation

Section 6: Diseases and their Control

Section 7: Fisheries Technology
Present status and scope of fishing technology in India. Gear materials, different types of gears, their maintenance and operation. Fishing craft materials, different types of crafts and their maintenance. Economics of fishing operations. Proximate composition of fish. Principles and methodology of fish handling. Fresh fish spoilage and methods of preservation and processing. Modern transportation systems.

Section 8: Economics, Statistics and Marketing

Section 9: Extension

M2. FISH PROCESSING TECHNOLOGY

Section 1: Process Biochemistry
Major and minor constituents in fish-moisture, proteins, lipids, carbohydrates, vitamins and minerals. Extractives of fish muscle and their differences in teleost fishes, crustaceans elasmobranchs and molluscs. Nutritional significance of fish as food. Postmortem changes in fish leading to spoilage-asphyxia, hyperaemia, rigor mortis, autolysis and bacterial action.
Section 2: Process Microbiology

Section 3: Fresh Fish Handling

Section 4: Freezing and Cold Storage

Section 5: Canning of Fish

Section 6: Salted, Dried and other Cured Fish Products

Section 7: Additives in Fish Products

Section 8: Fishery Byproducts
Production of fish meat-wet and dry reduction processes. Quality assessment of fish meal. Fish meal as a feed supplement. Fish protein concentrates with improved functional properties. Fish body oils. Shark liver oil, its preparation and uses. Chitin, chitosan, pearl essence, isinglass, shark finrays, and shark skin for leather. Fish silage. Liquid fish meal. Production of agar, alginic acid and their uses.

Section 9: Minced Fish Technology

Section 10: Recent Advances in Process Technology

Section 11: Quality Control and Commodity Standards

Section 12: Packaging, Storage and Transport
Packaging materials for wet fresh fish, frozen fish, meat processed fish, salted dried fish, fish meal and byproducts. Styles and packaging of wet fish. First-in-first-out concept in storage. Transportation systems for fresh fish, frozen fish and other fish products. Layout of machinery for wet fish or frozen fish sales counter, freezing plant, canning plant, fish meal plant and shark liver oil plants.
N. AGRICULTURAL ECONOMICS, STATISTICS AND EXTENSION EDUCATION

N1. AGRICULTURAL ECONOMICS

Section 1: Economic Theory

Section 2: Economics of Development

Section 3: Public Finance and International Economics

Section 4: Farm Management Economics
Section 5: Agricultural Production Economics

Section 6: Agricultural Finance and Co-operation

Section 7: Agricultural Marketing

Section 8: Agricultural Project Appraisal and Analysis

Section 9: Research Methodology

N2. AGRICULTURAL EXTENSION
Section 1: Fundamentals of Extension Education and Teaching Methods

Section 2: Communication, Diffusion and Adoption of Innovations
Section 3: Planning, Execution and Evaluation of Extension Programme


Section 4: Research Methodology

Science and scientific approach. Characteristics of social research, hypothesis, types of variables and levels of measurement. Validity and reliability. Different methods of data collection. Research design—meaning, purpose and principles. Types of research designs—ex-post-facto research, field experiments, field studies, survey research, case study methods, action research and participatory research. Computer software packages in social research. Principles of analysis and interpretation.

Section 5: Rural Sociology, and Social and Educational Psychology


Section 6: Extension Management


Section 7: Training for Development


Section 8: Social Statistics


N3. AGRICULTURAL STATISTICS

Section 1: Statistical Methods I


Section 2: Statistical Methods II

Section 3: Statistical Genetics I


Section 4: Statistical Genetics II


Section 5: Computer Applications


Section 6: Design of Experiments I


Section 7: Design of Experiments II


Section 8: Sample Surveys I


Section 9: Sample Surveys II


NOTE 4: The syllabus mentioned above is illustrative only. Questions relating to recent/current developments taking place in agriculture and allied sciences in general and in the concerned subject areas in particular can also be included in the question papers as may be deemed appropriate by subject-paper experts.
ALL INDIA COMPETITIVE EXAMINATION FOR ICAR’s SRF FOR Ph.D. PROGRAMME 2010

Date of Examination: December 12, 2010

OMR Answer Sheet Side - 1

1. Full Name

2. Father’s Name

3. Roll No.

4. Centre of Examination (write Centre code)

5. Major Subject Group (write full name)

6. Sub-Subject Group (write full name)

7. Major Subject Code (write Code No).

8. Sub-Subject Code (write Code No).

INSTRUCTIONS FOR FILLING SIDE - 1

1. Write all information in capital letters with a ball point pen under serial nos. 1 to 5 including your full name as it appears in the application form.

2. Put your signature in column number 7 in the bottom with a ball pen only. If it is not signed Answer Sheet would be rejected. Signature must tally with signature on application form.

INSTRUCTIONS FOR FILLING SIDE - 2

1. Information in serial nos. 9–11 of Side 2 are to be darkened with HB pencil only.

2. For answering multiple choice questions, darken only one circle out of the four in every Question

Example for Multiple Choice Type

\[ \text{A} \quad \text{B} \quad \text{C} \quad \text{D} \]

INSTRUCTIONS FOR MARKING ANSWERS

1. Use a HB Pencil only for shading the circles on Side - 2 of the answer sheet.

2. Darken the circle completely and uniformly so that the letter/number inside the circle is not visible.

3. Darken only ONE circle for each answer as shown in the example below. If you darken more than one circle your answer will be treated as wrong.

\[ \text{O O O O} \quad \text{O O O } \quad \text{1 0 0 1} \quad \text{0 0 0 1} \]

Wrong \quad Wrong \quad Wrong \quad Correct

4. If you wish to change an answer, ERASE completely the already darkened CIRCLE then make a fresh mark.

5. Shade the CIRCLE only in the space provided. Please do not make any stray mark on the answer sheet.

6. Rough work MUST NOT be done on the answer sheet. Use your Question booklet for doing the rough work.

7. SIGNATURE OF THE CANDIDATE BY BALL-POINT PEN ONLY

8. SIGNATURE OF THE INVIGILATOR BY BALL-POINT PEN ONLY
**Answer Sheet (As sample only)**

### 9. Major Subject Code

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### 12. Answer Columns

Note: Item 10, 11 and 12 should be filled using the pattern given as:

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1 2 3 4 5 6 7 8 9 0
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Signature: ____________________________

Date: ____________
IDENTITY VERIFICATION FORM

Date of Examination: December 12, 2010

Roll No. (to be filled in by the Office)

CENTRE CODE (To be filled in by the Office)

Major Subject Group Code (To be filled in by the Candidate)

Sub-Subject Group Code (To be filled in by the Candidate)

RECENT PASSPORT SIZE CLEAR PHOTOGRAPH DULY ATTESTED BY THE DEAN OF THE COLLEGE/INSTITUTION LAST ATTENDED/GAZETTED OFFICER (APPROX 4.5 CMS x 5.5 CMS)

PLEASE DO NOT PIN IT

NAME OF THE EXAMINATION CENTRE

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(To be filled-in by the office)

Name of the Candidate (Leave one space between first name, middle name and surname)

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Signature of the candidate in full (NOT IN BLOCK LETTERS) ATTESTED BY THE HEAD OF THE INSTITUTION LAST ATTENDED WITH OFFICIAL STAMP OR ANY GOVERNMENT OFFICER

POSTAL ADDRESS OF THE CANDIDATE

Name: ________________________________
Postal Address: __________________________
District: ______________________________
State: ________________________________
Pin Code: ______________________________
Phone or Fax No. (if any): __________________________

Name and address of attesting Officer

Name: ________________________________
Postal Address: __________________________
District: ______________________________
State: ________________________________
Pin Code: ______________________________
Phone or Fax No. (if any): __________________________