



ODISHA PUBLIC SERVICE COMMISSION

ADVERTISEMENT NO. 02 OF 2019-20

Recruitment to the post of Assistant Agriculture Engineers (Group-B) of Odisha Agriculture and Food Production service under Agriculture & Farmers Empowerment Department.

WEBSITE: <http://opsconline.gov.in> and <http://opsc.gov.in>

Applications are invited Online through the proforma only to be made available on the WEBSITE (<http://opsconline.gov.in>) from **17.07.2019 to 16.08.2019** (Note: **21.08.2019** is the last date for payment of application fees) for recruitment to the posts of Assistant Agriculture Engineers (Group-B) of Odisha Agriculture & Food Production Service (Method of Recruitment & Conditions of Service) Rules, 2018 under Agriculture & Farmers Empowerment Department, in the pay scale of Rs.9,300-34,800/- carrying Grade Pay of Rs.4600/- with usual Dearness and other allowances as may be sanctioned by the Government of Odisha from time to time. The posts are temporary, but likely to be made permanent.

2. VACANCY POSITION: As per requisition filed by the Agriculture & Farmers Empowerment Department, Government of Odisha, the category-wise vacancy position along with reservation thereof is given below:-

Sl. No.	Category	No. of vacancies
1.	Unreserved	41(13-w)
2.	SEBC	27 (09-w)
3.	Scheduled Caste	27 (09-w)
4.	Scheduled Tribe	35 (11-w)
	Total	130 (42-w)

NB: Out of vacancies mentioned above, 04(four) posts are reserved for Ex-serviceman,05(01-W) (five) posts are reserved for P.H.(Persons with Disabilities) and 01 (one) post is reserved for Sports Persons.

Further it is clarified that the [one leg affected (MNR), PD (with suitable aid) categories of disabled are suitable for the post of Assistant Agriculture Engineers.] PH persons with disability of one leg affected (Right or Left) & Partially Deaf (PD) should be able to perform work by standing, walking, speaking/hearing and seeing which is required for the post of Assistant Agriculture Engineer. Only those Persons With Disabilities, whose nature of disability, is permanent and is 40% and more shall be eligible to apply for the post.

Candidates belonging to Ex-Servicemen, PWD (Persons with Disabilities) & Sports Persons shall be adjusted against the categories to which they belong.

NOTE:-

- (a) In case of non-availability or availability of insufficient number of eligible/suitable women candidates belonging to the respective category the unfilled vacancies or the remaining vacancies reserved for women candidates shall be filled up by male candidates of the same category.

Contd...

(2)

- (b) Exchange of reservation between ST and SC candidates will NOT be considered.
- (c) The number of vacancies to be filled up on the basis of this recruitment is subject to change by Government without notice depending upon the exigencies of public service at the discretion of the State Government.
- (d) The post is permanent and the period of probation is 2 years.

3. **EDUCATIONAL QUALIFICATION:** A candidate must have possessed a Bachelor's Degree in Agricultural Engineering from any University or Institution recognised by any State Government or the Government of India.

4. **AGE:** A candidate must be under 32 (thirty two) years and above 21 (twenty one) years of age as on the 1st day of January 2019, i.e. he/she must have been born not earlier than 2nd January 1987 and not later than 1st January 1998. Age relaxation shall be as per Govt. Rules prescribed for the purpose. The upper age limit is relax-able by 5 (five) years for candidates belonging to the categories of Scheduled Castes (S.C.), Scheduled Tribes (S.T.), Socially & Educationally Backward Classes (S.E.B.C.), Women, Ex-servicemen, and by 10 (ten) years for candidates belonging to PWD category, whose disability is 40% and more. As per G.A Department notification No. 17376/GAD-SC-Rules-008/2016/Gen, dated 10.8.2016 the Persons with Disabilities shall be entitled to cumulative age relaxation of 10 years over and above the normal age relaxation.

Provided that a person who comes under more than one category mentioned above shall be eligible for only one benefit of upper age relaxation, which shall be considered most beneficial to him/her

SAVE AS PROVIDED ABOVE THE AGE LIMITS PRESCRIBED CAN IN NO CASE BE RELAXED.

The date of birth entered in the High School Certificate or equivalent certificate issued by the concerned Board/Council will only be accepted by the Commission.

5. **EXAMINATION FEE:**

A candidate is required to pay a non-refundable and non-adjustable fee of Rs 500/- (Rupees five hundred) only. Candidates belonging to Scheduled Caste/ Scheduled Tribe of Odisha only and Physically Handicapped candidates whose disability is 40% (forty percent) and more are exempted from payment of this fee. **Deposit of application fees by way of any other mode, except SBI challan generated through the computer, shall not be accepted.**

6. **METHOD OF SELECTION:**

The selection of candidates for recruitment to the posts will be made on the basis of

(i) Written Test (MCQ):- Shall be of 200 (two hundred) Marks consisting of two papers with 100 marks each (each question shall carry one mark) The examination shall be of 2 hours duration. There shall be no negative marking for wrong answer.

(ii) Viva Voce Test :- 25 (twenty five) Marks.

On the basis of marks secured by the Candidates in the written Test and Viva Voce Test, the Commission shall prepare a common list and category wise list of selected candidates in order of merit, equal to the number of vacancies advertised and publish the same.

The broad outline of the syllabus of written examination is available at

ANNEXURE- A.

7. **PLACE OF EXAMINATION**

The written examination will be held at Cuttack/ Bhubaneswar.

8. **OTHER ELIGIBILITY CONDITIONS:**

(i) The candidate must be a citizen of India;

(ii) The candidate must be of (a) good moral character and (b) sound physical and mental health, good physique and active habits and free from organic defects or bodily infirmities (except Physically Handicapped) so as not to create an impairment in the due discharge of duties;

Cont..

- (iii) The candidate must have Knowledge in Odia: he/she must be able to read, write and speak Odia and have:-
- (a) Passed Middle School Examination with Odia as a Language subject; or
 - (b) Passed Matriculation or equivalent Examination with Odia as medium of examination in non- language subjects; or
 - (c) Passed in Odia as language subject in the final examination of Class-VII from a School or Educational Institution recognized by the Government of Odisha or the Central Government; or
 - (d) Passed a test in Odia in Middle English School Standard conducted by the School and Mass Education Department of the Government of Odisha.
- (iv) A candidate, who has more than one spouse living will not be eligible for appointment unless the State Government has exempted his/her case from operation of this limitation for any good and sufficient reasons;
- (v) Government servants, whether temporary or permanent, are eligible to apply provided that they possess the requisite qualification and are within the prescribed age-limit as provided under Para 3 and 4 of this advertisement. **They must inform their respective Heads of Offices/Departments in writing regarding submission of their applications for this recruitment and obtain "No Objection Certificate".**
- (vi) If a candidate has at any time, been debarred for certain period/chance(s) by the Odisha Public Service Commission or other State Public Service Commission or U.P.S.C. from appearing at any examination/interview, he/she will not be eligible for such recruitment for that specified period/chance(s);
- (vii) **Only those candidates, who possess the requisite qualification, are within the prescribed age limit and fulfil other eligibility conditions etc. by the closing date of online applications, will be considered eligible;**

9. **OTHER CONDITIONS:**

- (i) A candidate found guilty of seeking support for his/her candidature by offering illegal gratification or applying pressure on any person connected with the conduct of the recruitment process or found indulging in any type of malpractice in course of the selection or otherwise, shall, in addition to rendering himself/herself liable to criminal prosecution, be disqualified not only for the recruitment for which he/she is a candidate, but also may be debarred, either permanently or for a specified period, from any recruitment or selection to be conducted by the Commission;
- (ii) The provisions of the Odisha Conduct of Examination Act, 1988 (Odisha Act-2 of 1988) are applicable to the examinations conducted by the Odisha Public Service Commission;
- (iii) **Online Applications submitted to the OPSC, if found to be incomplete in any respect are liable to rejection without entertaining any correspondence with the applicants on that score;**
- (iv) Admission to the Viva Voce test will be **provisional**. If on verification at any stage before or after Viva Voce test, it is found that a candidate does not fulfil any of the eligibility conditions, his/her candidature will be liable to rejection. Decision of the Commission in regard to eligibility or otherwise of a candidate shall be final;

Cont..

- (v) This advertisement should not be construed as binding on the Government to make appointment.
- (vi) Concession meant for SEBC/S.C/S.Ts by birth are admissible to the SEBC/Scheduled Caste/Scheduled Tribes Candidates of Odisha only;
- (vii) No one will be admitted to the examination unless he/she holds a Certificate of admission. The eligible candidates are required to download their Admission Certificate from the website of the Commission and produce the same before the Centre Supervisor for admission to the examination. No separate Admission Certificate will be sent to the candidates.
- (viii) All persons appointed under the Government of Odisha on or after 1st January, 2005 shall not be eligible for pension as defined under sub-rule(1) of Rule-3 of the Odisha Civil Service (Pension) Rules, 1992; but shall be covered by the defined Contribution Pension Scheme in accordance with the Odisha Civil Services (Pension) Amendment Rules, 2005;
- (ix) Any misrepresentation or suppression of information by the candidate in the Online Application Form, will result in cancellation of his/her candidature or penalty, as may be decided by the Commission, be imposed on the candidate.
- (x) Mere empanelment in the select list shall not confer any right for appointment unless the Government is satisfied after making such enquiry as may be deemed necessary that the candidate is suitable in all respects for appointment to the Service.
- (xi) A candidate who claims change in his/ her name after having passed the High School Certificate Examination or equivalent examination is required to furnish copy of publication of the changed name in the local leading daily news paper as well as copy of notification in the Odisha Gazette in support of his /her change of name.
- (xii) If one candidate furnishes more than one online application the Commission will consider the information/ data of the latest application having higher ID No.
- (xiii) Any attempt on the part of a candidate to obtain for his/her candidature by any means or any attempt to gain undue advantage in the selection shall disqualify him/her for recruitment.

10. CERTIFICATES/DOCUMENTS TO BE ATTACHED:

Only those, who are called for the viva voce test, will be required to submit the printout/hard copy of online applications, true copies of the following documents duly self attested by the candidates with full signature with date on the same original certificates, mark-sheets etc. for verification on the date fixed by the Commission.

If a candidate fails to produce any of the original documents in respect of the attested copies submitted with the application form for verification on the date of verification fixed by the Commission, he/she shall not be allowed to appear at the viva voce test and his/her candidature shall be rejected.

Cont..

- (i) H.S.C. or equivalent certificate in support of declaration of age issued by the concerned Board/Council.
- (ii) Intermediate/12 Sc. Pass Certificate issued by the concerned University/Council;
- (iii) Degree (i.e. Agricultural Engineering) pass certificate issued by the recognized University of India;
- (iv) Mark-sheets of all above semesters/annual examinations in support of Degree(Agricultural Engineering) passed including fail marks, if any, issued by the concerned Board/Council/University;

NOTE 1:

(a) Candidates who have not been awarded percentage of marks, but only "grade marks", should, along with their applications, produce the Conversion Certificate from the concerned University indicating the actual equivalent percentage of marks and the conversion formula, failing which, their applications are liable to be rejected.

(b) While filling up the relevant box of the online application form, the candidate has to mention the marks secured (**excepting marks secured in the Extra Optional/4th Optional Subject**) in each examination passed (i.e. H.S.C. to Bachelor Degree in Agricultural Engineering).

- (v) The candidates must take utmost care in filling up the marks secured and maximum marks for each year. The career evaluation will be done as per the data furnished by the candidates. Any mistake in filling up the marks will be at the risk of the candidates.
- (vi) A "No Objection Certificate" from the Head of Office/Head of the Department in case of Government servant.
- (vii) Two recent passport size photographs (unsigned and unattested) with the printout/hard copy of online application form which has been uploaded.
- (viii) Certificates of character and conduct from the Principal/Proctor/Dean or Professor in charge of teaching department of the College or University in which he/she last studied;
- (ix) Caste Certificate by birth in support of claim as SC/ST/SEBC, wherever applicable;

NOTE 2:

Candidates claiming to be belonging to S.C. /S.T./ S.E.B.C Category by birth are required to submit copy of the relevant Caste Certificate issued by the competent authority in the prescribed form. Candidates of SEBC category (other than Creamy Layer) must submit copy of Caste Certificate issued by the competent authority within the last three years from the date of advertisement in the prescribed form.

- (i) Women candidates belonging to S.C. /S.T. /S.E.B.C Categories are required to submit Caste Certificates by birth showing "daughter of". Caste Certificates by virtue of marriage (i.e. showing "wife of") is not acceptable.
- (ii) **O.B.C. CERTIFICATE WILL NOT BE ACCEPTED.**
- (iii) Community (Caste status) once mentioned by the candidates shall not be changed under any Circumstances.

Cont...

The competent authorities are: - District Magistrate/ Collector or Additional District Magistrate or Sub-divisional Magistrate/Sub-Collectors or Executive Magistrates or Revenue Officers, not below the rank of Tahasildar /Additional Tahasildar of Government of Odisha;

- (x) Required Odia Pass Certificate from the Board of Secondary Education, Odisha indicating Odia as a language subject equivalent to M.E. School Standard or a certificate from the Principal/Headmaster of the recognized school indicating that the candidate has passed Odia upto M.E. standard; if not passed Odia as a subject in the High School certificate examination or equivalent examination;
- (xi) Discharge Certificates of Ex-Serviceman issued by the Commanding Officer of the Unit last served wherever applicable; A Court Affidavit regarding not holding any civil post after retirement from military service.
- (xii) Ex-Servicemen candidates must submit an undertaking that he/she has not appointed against a civil post after retirement from military service.
- (xiii) Disability Certificate (**indicating percentage of permanent disability**) issued by the concerned Medical Board, wherever applicable;
- (xiv) If a candidate claims to possess qualification, equivalent to the prescribed qualification, the rule/authority (with number and date) under which it is so treated, must be furnished with the print out/hardcopy of online application form.
- (xv) Candidates claiming to be Sports persons are required to submit Identity Card issued by the Director of Sports, Odisha, wherever applicable;

NOTE-3: Degree Certificate, Caste Certificate, Odia test Pass Certificate, Certificate issued by the Director of Sports, Discharge Certificate of Ex-Serviceman and Disability certificate of Persons with disabilities must have been issued by the competent authority within the last date fixed for receipt of application form as indicated above.

11. “GROUNDS OF REJECTION OF APPLICATION”

Applications of the candidates will be rejected by the Commission on any of the following grounds:-

- (a) In-complete online application form.
- (b) Non-receipt of hard copy of online application form at the time of verification of original documents.
- (c) Declaration not signed by the candidate in the hard copy of online application.
- (d) Age limit of candidate not coming under Para-4 of Advertisement (overage relaxation shall not be allowed to P.W.D. candidates with less than 40% permanent disability/with temporary disability).
- (e) No required educational qualification as provided under Para-3 of Advertisement.
- (f) Non furnishing copies of certificates/documents as provided under Para-10 of Advertisement.
- (g) Odia Test (M.E. standard) not passed/Odia Test Pass evidence not furnished as required under Para-8 (iii) of the Advertisement.

Cont..

- (h) Submission of wrong information /false information about qualification/ experience/(if any)/age//O.T. pass evidence/category status (SC/ST/SEBC/ PH/Sports Person /Ex-serviceman/Woman etc)
- (i) Suppression of facts/ information about eligibility, if any.
- (j) Any other grounds as per decision of the Commission.

NOTE:- Application submitted by the candidate to OPSC, if found to be incomplete in any respect and at any stage, shall be rejected by the Commission without any intimation.

12. HOW TO APPLY:

- (a) Candidates must go through details of this Advertisement available in the Website of OPSC before filling up the online application form.
- (b) Candidates must apply online through the concerned website of the OPSC <http://opsconline.gov.in>. Application received through any other mode would not be accepted and summarily be rejected.
- (c) Before filling up the online application form, the candidate must go through the following documents available at OPSC portal.
 - i) Instructions to fill up online application form
 - ii) Guidelines for scanning and Uploading of Photograph, Full Signature & Left Thumb Impression.
- (d) Candidates are required to upload the scanned images (only in jpg format) of latest passport size colour photograph along with scanned image of his/her full signature and scanned image of Left Thumb Impression(LTI) in the online application form. Uploaded photograph, specimen (full) signature and LTI must be clearly identifiable / visible, otherwise the application of the candidate is liable to be rejected by the Commission and no representation from the candidate will be entertained.
- (e) Candidates should keep at least 02 (two) copies of latest passport size photograph which is uploaded to the online application form for future use.
- (f) On successful submission of the Online Application Form, a Unique Registration ID will be displayed on the screen as well as on the top of the application form. Candidates are required to note down the Unique Registration ID and use it in future correspondence.
- (g) The candidates are advised to submit the Online Application well in advance without waiting for the closing date to avoid last hour rush.
- (h) Intimation letter and Attestation Forms for the interview to the eligible shortlisted candidates will be uploaded in the website of the O.P.S.C. prior to the date of viva voce test/ interview which will be published in the website and local dailies. The candidates are required to download their Intimation letter along with Attestation Form and Biodata Form from the website of the Commission. No separate correspondence will be made on this score.

Cont..

13. FACILITATION COUNTER:

During filling up the online application form, the candidates may contact facilitation counter of OCAC over Toll free Telephone number 18003456770 or 155335 between 10.30 A.M. to 1.30 P.M. & 2.00 P.M. to 5.00 P.M on any working days of Government of Odisha.

In case of any guidance/information on advertisement & recruitment, candidates may contact the OPSC Facilitation Counter over Telephone No.0671-2304141/2305611 in any working day between 10.30 A.M. to 1.30 P.M. & 2.00 P.M. to 5.00 P.M.

The candidates are required to visit the Website of the Commission at <http://opsc.gov.in> for detailed information about rejection of applications, defects in the applications, the date of interview and also keep track of publication of various notices to this effect in the leading local daily newspapers for information.

CLOSING DATES

ONLINE APPLICATIONS WILL BE AVAILABLE IN THE WEBSITE FROM 17.07.2019 TO 16.08.2019 TILL 11.59 P.M.

NB: THE ONLINE APPLICATIONS, IF FOUND DEFECTIVE IN ANY RESPECT, ARE LIABLE TO BE SUMMARILY REJECTED.

CUTTACK
DATED-


SECRETARY,
ODISHA PUBLIC SERVICE COMMISSION,
CUTTACK.

Syllabus for A. A .E. Recruitment Examination

Paper-I		Full Marks: 100
(A) General Engineering		
(B) Farm Machinery and Power		
A. General Engineering (30 Marks)		
Computer Programming and Data Structures	(a)	Data types, variables, operators, building and evaluating expressions, standard library functions.
	(b)	Managing input and output, decision making
	(c)	Branching, looping, arrays, string functions
	(d)	Structures and union, queues, insertion and deletion operations
Workshop practice and Workshop technology	(a)	Measuring tools
	(b)	Welding, lathe, shaper, drilling, milling machines- their types, components, specification, tools and functions
Applied Electronics and Instrumentation	(a)	Diode, transistors, logic circuits
	(b)	Generalized instrumentation
	(c)	Measurement of displacement, temperature, velocity, pressure and force
	(d)	Transducer types and applications, strain gauge
Common Statistical data on agriculture	(a)	Statistics on Agriculture (Odisha & India)
	(b)	Land distribution pattern, land use, land holding sizes, major crops, their production and productivity
	(c)	Farm power availability, agriculture workers and draft animals, sale and population of tractors, power tillers, pump sets and implements
	(d)	Water resource availability, irrigation potential
Units and dimensions	(a)	Units and measurement, Fundamental and derived units. Relation between different units of measurement
	(b)	Dimensional analysis
Surveying and levelling	(a)	Linear measurements
	(b)	Types of survey and their applications, estimation of errors in measurements
	(c)	Levelling and contouring
Building construction and cost estimation	(a)	Building materials, building design and construction, agricultural structures, lead and material statement, Building codes
	(b)	Estimates of buildings and agricultural structures
Design and maintenance of Greenhouse	(a)	Types of greenhouse, its components, site selection, design criteria and construction, applications, repair and maintenance
B. Farm Machinery and Power (70 Marks)		
Farm Machinery	(a)	Need of farm mechanization, classification of farm implementations and their suitability
	(b)	Seed bed preparation machineries- MB plough, disc plough, sub-soilers, cultivators, rotavator, harrows, puddlers: their types, components, function & adjustments. Forces acting on tillage tools, hitching systems and controls, draft measurement

	(c) Seeding and planting equipment-their types, parts, function and adjustment. Metering mechanisms for small and bold seeds, calibration. Rice transplanters-types, component, functions and seedling raising techniques
	(d) Fertilizer application equipment, weeders, plant protection equipment- sprayers and dusters, their calibration, components and adjustments
	(c) Principles & types of cutting mechanisms, crop harvesting machinery- reapers, reaper binders and combine harvesters, mowers and chaff cutters
	(f) Threshers- types, components, functions and principles of threshing. Cotton pickers, sugarcane harvester, potato digger, groundnut digger cum shaker, fruit harvesting tools and machines
	(g) Testing of farm machines, test codes & procedure
Farm power	(a) Sources of farm power. Classification of tractors and IC engines. Engine components and their construction, functions and adjustment.
	(b) Engine systems- valves, fuel & air supply, governing, ignition, cooling, lubrication and electrical systems.
	(c) IC engine fuels and lubricants- their properties. Detonation and knocking
Tractor systems and controls	(a) Transmission systems- clutch, gearbox, differential and final drive. Brake, steering and hydraulic system, P.T.O. shaft, belt pulley and drawbar
	(b) Mechanics of tractor chassis, determination of C.G. of tractor, overturning of tractor, weight transfer
	(c) Tractor maintenance and trouble shooting
Farm power and machinery management	(a) Role of farm mechanization in increasing production and productivity and reducing drudgery. Index of farm mechanization.
	(b) Performance analysis- machine performance, capacity, field pattern, time efficiency, field efficiency. Power analysis
	(c) Cost analysis of farm machines. Break-even analysis- method of finding break-even hour and area of machines. Reliability analysis
Human engineering and safety	(a) Importance of the human engineering in design of farm machinery and workspace
	(b) Ergonomic parameters for evaluation of workers. Anthropometry and its use in machine design. Effect of noise, heat and vibration on operator's efficiency
	(c) Safety aspects of tractors and farm machinery. Safety measures and preventions of accidents.
Precision agriculture	(a) Concepts of precision agriculture- requirements and applications in agricultural production system. Farm implements for precision agriculture

Renewable energy engineering	(a) Biomass conversion technology-types of biogas plants, design & construction and their defects, gasifier technology. Technology and production process of bio-diesel and bio-ethanol
	(b) Solar Energy-fundamentals of solar energy, solar photo Voltaic (PV) system, solar thermal system and their applications in agricultural system
	(c) Wind energy conversion system, its applications and limitations
Systems Engineering	(a) System concepts, Linear programming- formulation and applications, Simplex method, Big M method
	(b) Transportation problems. Assignment problems
	(c) Project management by PERT/CPM
	(d) Waiting line theory.

Paper-II

Full Marks: 100

(A) Agricultural Processing and Food Engineering

(B) Soil and Water Conservation Engineering

A. Agricultural Processing and Food Engineering (35 Marks)

Engineering properties of Food materials

- (a) Importance of engineering properties of biological materials
- (b) Physical, thermal, frictional and aerodynamic characteristics of grains, fruits and vegetables.

Grain Processing

- (a) Cleaning and grading of food grains: Aspiration, scalping, size separators, screens, sieve analysis, capacity and effectiveness of screens, various types of separators, shape graders
- (b) Size reduction: Principle, Different laws governing size reduction, size reduction machineries
- (c) Milling of rice: Conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods of parboiling, pressure parboiling method, types of rice milling (traditional and modern rice milling), different unit operations and equipment
- (d) Milling of wheat and corn: Unit operations and equipment for wheat milling ; Milling of corn and its products: Dry and wet milling
- (e) Milling of pulses: Traditional milling methods, commercial methods, dry milling and wet milling methods, pulse milling machines
- (f) Milling of oilseeds: Preconditioning of oilseeds; Mechanical expression, solvent extraction methods, refining of oil, stabilization of rice bran; By-products utilization (Paddy)
- (g) Material handling equipment: Types of conveyers (belt, roller, chain and screw), elevators, trucks (refrigerated/ unrefrigerated), pneumatic conveying.

Drying and Storage of crops

- (a) Drying: Moisture content and water activity, isotherm, hysteresis effect, EMC determination, psychrometric chart and its use in drying, drying principles and theory, thin layer and deep bed drying analysis, falling rate and constant rate drying periods, drying equations and factors affecting drying, mass and energy balance, Shedd's equation, different methods of drying, tempering during drying, different types of grain dryers, dryer performance.

	(b) Storage of food grains: Basics of Storage, functional requirement of storage, Types and causes (factors) of spoilage respiration of grains, moisture and temperature changes. Control measures of storage environment; Ventilation/Aeration; symptoms, damages, control measures of destructive agents like rodents, birds, insects and microbes. Bag and bulk storage; traditional storage structures; Bag storage design. Improved and modern storage systems. Shallow and Deep bin/silo, Rankine, Janssen and Airy's equation. Storage of seeds, hermetically sealed and CAP storage. Godown and Ware house design.
Horticultural Produce Processing	(a) Fruits and Vegetables processing: Cleaning, sorting, grading; Juice extractors; Mechanical filtration-plate and frame filter press, shell and leaf filter, bag filter, Different types of dryers for fruits and vegetables
	(b) Storage of fruits and vegetables: Evaporatively cooled storage structures; Refrigerated storage; Calculation of refrigeration load; sizing and economics of cold storage. Modified and Controlled atmospheric storage. Advantages of CAS/MAP, active and passive MAP, different types of active agents for controlling oxygen, CO ₂ and ethylene in packages; Shrink and Cling packaging, Vacuum and gas packaging; antimicrobial food packaging; Smart packaging.
	(c) Thermal processing: Thermal death time, D and Z value, Process time, thermal processing equipment
	(d) Evaporation: Objectives of evaporation, basic components of evaporators, different types of evaporators. Multiple effect evaporation, mass and energy balance in evaporation
	(e) Freezing: Freezing time, freezing curve, different types of freezing equipment
	(f) Food laws: Food Laws and Regulations in India (FSSAI); Food Standards (BIS Standards and specifications, Codex Alimentarius Standards, International Standards Organisation (ISO).
	B. Soil and Water Conservation Engineering (65 Marks)
Fluid Mechanics	(a) Properties of fluids: Ideal and real fluid
	(b) Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, metacentre and metacentric height
	(c) Kinematics of fluid flow
	(d) Dynamics of fluid flow, flow in pipes, power transmission through pipe
	(e) Dimensional analysis, types of similarities, dimensionless numbers

<p>Irrigation Engineering</p>	<p>(a) Major, medium and minor irrigation projects</p> <p>(b) Sources of irrigation water, Measurement of irrigation water, water conveyance, design of irrigation field channels, underground pipe conveyance system, irrigation structures, channel lining.</p> <p>(c) Land grading, different design methods and estimation of earth work and cost</p> <p>(d) Soil water plant relationship, infiltration, evapotranspiration, soil moisture constants, depth of irrigation, frequency of irrigation, irrigation efficiencies</p> <p>(e) Surface irrigation methods of water application</p> <p>(f) Basic concepts of command area- definition, need, scope and development approaches: command area development authorities. Planning and execution of on farm development activities within the scope of command area development, design of field channels; cross drainage works, Participatory irrigation management</p> <p>(g) Types and Components of micro-irrigation system, Micro-irrigation system; Sprinkler and Drip irrigation- design, installation and maintenance.</p>
<p>Drainage Engineering</p>	<p>(a) Drainage, objectives of drainage. Surface drainage, drainage coefficient, types of surface drainage.</p> <p>(b) Sub-surface drainage purpose and benefits, investigations of design parameters, hydraulic conductivity, drainable porosity, water table etc., types and use of subsurface drainage system.</p> <p>(c) Design of sub-surface drains, interceptor and relief drains. Derivation of ellipse (Hooghoudt's) and Ernst's drain spacing equations</p> <p>(d) Design of surface drainage system. Drainage materials, drainage pipes, drain envelope. Layout, construction and installation of drains, Drainage structures.</p> <p>(e) Salt balance, reclamation of saline and alkaline soils. Leaching requirements</p>
<p>Groundwater, Wells and Pumps</p>	<p>(a) Occurrence and movement of ground water, aquifer and its types, classification of wells.</p> <p>(b) Well Hydraulics, Well interference, multiple well systems, Design of open well.</p> <p>(c) Tube well design, design of gravel pack, well screen, sanitary protection. Methods of drilling of wells; and development of well</p> <p>(d) Quality of ground water, Conjunctive use, artificial groundwater recharge planning</p> <p>(e) Pumping Systems: Water lifting devices; classification of pumps, component; parts of centrifugal pumps: pump selection, installation and troubleshooting; performance curves, hydraulic ram.</p>

<p>Hydrology</p>	<p>(a) Introduction; hydrologic cycle; precipitation-forms, rainfall measurement, mean rainfall, depth and frequency analysis of point rainfall</p>
	<p>(b) Geomorphology of watersheds</p>
	<p>(c) Runoff- factors affecting, measurement; stage and velocity, rational method, Curve number method; hydrograph</p>
	<p>(d) Head water flood control- methods, retards and their location</p>
	<p>(e) Flood routing- graphical methods of reservoir flood routing.</p>
<p>Soil, Water Conservation Engineering and Watershed Management</p>	<p>(a) Soil erosion- causes, types and agents of soil erosion; gullies and their classification, stages of gully development, Universal soil loss equation</p>
	<p>(b) Erosion control measures- agronomical measures; engineering measures- terraces- types, their design, layout procedure and planning, bunds and their design; temporary gully control structures, Permanent gully control structures- drop, chute and pipe inlet spillway and their design.</p>
	<p>(c) Wind erosion- types and control measures</p>
	<p>(d) Sedimentation in reservoirs and streams; estimation, measurement and control measures, Introduction to stream water quality and pollution.</p>
	<p>(e) Land use capability classification</p>
	<p>(f) Grassed waterways and their design</p>
	<p>(g) Introduction to water harvesting techniques</p>
	<p>(h) Small earth embankments- their types and design principles, farm ponds and reservoirs, cost estimation of structures</p>
	<p>(i) Watershed management- problems and prospects; Watershed based land use planning, watershed characteristics- physical and geomorphologic parameters, factors affecting watershed management, planning and formulation of project proposal.</p>