परिशिष्ट–02

अर्थ एवं संख्याधिकारी परीक्षा– 2018 हेतु परीक्षा योजना

अर्थ एवं संख्याधिकारी परीक्षा– 2018 हेतु प्रतियोगिता परीक्षा में क्रमवार 02 स्तर सम्मिलित हैं, यथा 1. मुख्य लिखित (वस्तुनिष्ठ) परीक्षा 2. साक्षात्कार परीक्षा।

मुख्य लिखित (वस्तुनिष्ठ) परीक्षा   (कुल 200 अंक)

अर्थ एवं संख्याधिकारी परीक्षा– 2018 हेतु मुख्य लिखित (वस्तुनिष्ठ) परीक्षा 02 प्रश्न–पत्रों की होगी। प्रथम प्रश्न–पत्र अनिवार्य प्रश्न–पत्र तथा द्वितीय प्रश्न–पत्र में वैकल्पिक विषय होंगे। अभ्यर्थियों को द्वितीय प्रश्न–पत्र हेतु वैकल्पिक विषयों की सूची में से कोई एक विषय चुनना होगा। प्रत्येक प्रश्न–पत्र 100 अंकों का तथा दो–दो घण्टे अवधि के होंगे। दोनों प्रश्न–पत्र वस्तुनिष्ठ व बहुविकल्पीय प्रकार के होंगें। दोनों प्रश्न–पत्रों में प्रत्येक प्रश्न एक अंक का होगा। प्रथम प्रश्न–पत्र (अनिवार्य प्रश्न–पत्र) में दो भाग होंगे। भाग–एक में सामान्य अध्ययन एवं उत्तराखण्ड राज्य सम्बन्धी ज्ञान के 50 प्रश्न तथा भाग–दो में सांख्यिकीय विश्लेषण की तकनीकें सम्बन्धी 50 प्रश्न होंगे। द्वितीय प्रश्न–पत्र में वैकल्पिक विषय से सम्बन्धित प्रश्नों की संख्या 100 होगी। उतर पत्रक ओ0एम0आर0 आधारित होंगे। मुख्य लिखित (वस्तुनिष्ठ) परीक्षा के लिए पाठ्यक्रम **परिशिष्ट–04** में उल्लिखित है।

द्वितीय प्रश्न–पत्र के वैकल्पिक विषय

01. सांख्यिकी / गणितीय सांख्यिकी।
02. गणित
03. व्यावहारिक अर्थशास्त्र / अर्थशास्त्र।
04. वाणिज्य।

नोट :– मूल्यांकन के उद्देश्य से अभ्यर्थियों को मुख्य लिखित (वस्तुनिष्ठ) परीक्षा के दोनों प्रश्न–पत्रों में सम्मिलित होना बाध्यकारी है। यदि कोई अभ्यर्थी दोनों प्रश्न–पत्रों में सम्मिलित नहीं होता है तो वह अनर्ह (Disqualify) हो जायेगा।

साक्षात्कार परीक्षा–   (कुल 25 अंक)

कुल अंक 225

परिशिष्ट- 03

अर्थ एवं संख्या अधिकारी पद हेतु पाठ्यक्रम
(उत्तराखण्ड अर्थ एवं संख्या विभाग)
सामान्य अध्ययन एवं सांख्यिकीय विश्लेषण की तकनीकें
(लिखित प्रकृति–वस्तुनिष्ठ प्रकार)
प्रथम प्रश्न–पत्र (अनिवार्य प्रश्न–पत्र)

समयावधि : 02 घण्टे   कुल प्रश्नों की संख्या : 100   अधिकतम अंक : 100

भाग—1

सामान्य अध्ययन

प्रश्नों की संख्या : 50   अंक : 50

1. राष्ट्रीय एवं अन्तर्राष्ट्रीय महत्व की सम–सामयिक घटनाएं
2. खेल एवं मनोरंजन
3. भारत का इतिहास (प्राचीन, मध्यकालीन एवं आधुनिक) एवं भारतीय राष्ट्रीय आंदोलन
4. भारत एवं विश्व का भूगोल
5. अर्थव्यवस्था– प्राकृतिक संसाधन, नियोजन, औद्योगिकी एवं कृषि, सतत एवं समावेशी विकास
6. प्राकृतिक आपदाएं एवं आपदा प्रबन्धन
7. भारत में मानव संसाधन विकास सूचकांक एवं सामाजिक विकास सूचकांक।
8. भारतीय संविधान का प्राथमिक ज्ञान–भारतीय संविधान की प्रमुख विशेषताएं, मौलिक अधिकार तथा कर्तव्य, राज्य के नीति निर्देशक तत्व, **संघीय कार्यपालिका**– राष्ट्रपति, प्रधानमंत्री, मंत्रिपरिषद, लोकपाल, **संघीय व्यवस्थापिका**– संसद, **न्यायपालिका** –सर्वोच्च न्यायालय न्यायिक समीक्षा, न्यायिक सक्रियता तथा उच्च न्यायालय, **राज्य सरकार तथा प्रशासन** – राज्यपाल, मुख्यमंत्री, राज्य मंत्रिपरिषद, राज्य विधान सभा, पंचायती राज संस्थाएं, लोकायुक्त, संवैधानिक संस्थायें।
9. **अधिकारों से संबंधित मुद्दे** – शिक्षा का अधिकार, सूचना का अधिकार, सेवा का अधिकार, समाधान योजना, नागरिक अधिकार संरक्षण अधिनियम – 1955, उपभोक्ता संरक्षण का अधिकार, मानवाधिकारों की सार्वभौमिक घोषणाएं (1948), भारत में मानवाधिकार तथा कर्तव्य, राष्ट्रीय मानवाधिकार आयोग एवं अन्य संबंधित मुद्दे, संयुक्त राष्ट्र संगठन– उद्देश्य और उपयोगिता, सुरक्षा–परिषद और भारत।
10. **सामान्य विज्ञान**– भौतिकी, रसायन एवं जीवन विज्ञान का प्राथमिक ज्ञान एवं दैनिक जीवन में विज्ञान की उपयोगिता।

11. **विकास एवं पर्यावरणीय समस्याएं**–विकास से जुड़ी हुई मुख्य समस्याएं, जनसंख्या वृद्धि, ग्रामीण एवं नगरीय विकास के विभिन्न आयाम–सामाजिक, आर्थिक, राजनीतिक, सांस्कृतिक जागरूकता, स्वास्थ्य, संचार एवं बुनियादी सेवाओं का विकास, ग्रामीण परिवेश एवं शहरी परिवेश के मध्य संतुलन इत्यादि, पर्यावरणीय प्रदूषण , ग्रीन हाऊस गैस, पर्यावरणीय कानून, संसाधन एवं संरक्षण, वन्य जीव संसाधन, नेशनल ग्रीन ट्रिब्यूनल (राष्ट्रीय हरित प्राधिकरण)।

12. **जैव–प्रौद्यौगिकी एवं स्वास्थ्य संबंधी मुद्दे** –जैव प्रौद्यौगिकी, आनुवांशिक रूप से विकसित पौधे, अंग प्रत्यारोपण एवं इससे सम्बन्धित समस्याएं, प्रदूषण का जैविक उपचार, सूक्ष्म जीव संक्रमणः विषाणु, जीवाणु, प्रोटोजोआ तथा कवक तथा अन्य मानव संक्रमण की प्रस्तावना। सूक्ष्म जीव द्वारा उत्पन्न संक्रमण की मूलभूत जानकारी जैसे– डायरिया, दस्त, कॉलेरा, टीबी, डेंगू मलेरिया, फाइलेरिया, स्क्रब टाइफस, विषाणु संक्रमण जैसे– एड्स, एनसिफेलाइट्स, चिकनगुनिया, बर्ड फ्लू एवं फैलने के दौरान निवारक/रोकथाम के उपाय। जानवरों द्वारा मनुष्यों में फैलने वाली बीमारियां, प्रतिरक्षा की प्रारम्भिक जानकारी, टीके एवं सार्वभौमिक टीकाकरण।

13. **ऊर्जा एवं जल संसाधन** – ऊर्जा संकट, ऊर्जा संरक्षण, परम्परागत ऊर्जा स्रोत, नवकरणीय ऊर्जा, जैविक ईंधन, भारतीय जल संसाधनों के प्रकार, उपयोग तथा प्रबन्धन।

14. **अंतरिक्ष एवं सुदूर संवेदन**– भारतीय स्पेस प्रोग्राम तथा औद्योगिकी, कृषि, दूर संचार, दूरदर्शन, शिक्षा में उपयोग, रिमोट सेंसिंग, भूमण्डलीय स्थिति निर्धारण प्रणाली (जी0आई0एस0) और मौसम की भविष्यवाणी में इसकी उपयोगिता, आपदा चेतावनी, पानी, तेल और खनिज संसाधन विकास, शहरी योजना और ग्रामीण विकास क्रियाऐं, ग्लोबल पोजिशनिंग सिस्टम और भारतीय रिमोट सेंसिग (आई0आर0एस0) भारतीय प्रक्षेपास्त्र कार्यक्रम।

15. **सूचना तकनीक एवं उपयोगः** कम्प्यूटर के मूलभूत भाग, संरचना एवं उपयोग, सूचना एवं संचार प्रौद्योगिकी, सॉफ्टवेयर एवं हार्डवेयर, प्रिंटर, इनपुट/आउटपुट उपकरण एवं मैमोरी। कम्प्यूटर नेटवर्क, इंटरनेट–ब्राउजर, ई–मेल, ई–कामर्स एवं एम–कामर्स। मोबाईल तकनीक–2जी, 3जी एवं 4जी संचार प्रणाली।

उत्तराखण्ड राज्य संबंधी सामान्य ज्ञान

1. **सामान्य भूगोल** – स्थिति एवं विस्तार, संरचना व उच्चावचन, जलवायु, अपवाह तंत्र, जनांकिकी संरचना, यातायात एवं संचार–तंत्र इत्यादि।

2. **इतिहास, संस्कृति एवं** उत्तराखण्ड राज्य निर्माण आंदोलन इत्यादि।

3. **प्राकृतिक एवं आर्थिक संसाधन** – जलागत प्रबन्धन, जल, वन, खनिज, पशुपालन, कृषि एवं बागवानी, वन्य जीव संरक्षण, पार्क एवं अभ्यारण्य, जैव संरक्षित क्षेत्र इत्यादि।

4. राजनीतिक व प्रशासनिक ढांचा – राज्य, जनपद व तहसील इत्यादि।
5. शिक्षा एवं संस्कृति– उत्तराखण्ड के शिक्षण एवं प्रशिक्षण संस्थान, बोली / भाषा, रीति रिवाज, उत्सव व मेले इत्यादि।
6. समाज सुधार आंदोलन– कुली बेगार, डोला– पालकी, नायक व्यवस्था एवं वन आंदोलन, इत्यादि।
7. आर्थिक विकास– जल–विद्युत्, औद्योगिक, औद्यानिक एवं पर्यटन तथा जड़ी–बूटी उद्योग संवर्द्धन इत्यादि।
8. शासन एवं गैर–सरकारी कल्याणकारी एवं विकासपरक योजनाएं।
9. समसामयिक महत्वपूर्ण घटनाएं, आपदाएं ।
10. खेल कूद एवं मनोरंजन।

भाग–2

सांख्यिकीय विश्लेषण की तकनीकें

प्रश्नों की संख्या : 50   अंक : 50

Statistics, Definition, Scope, Functions, Limitations, Distrust & Misuse.

Collection of data: Primary Data, Secondary Data, Elementary Idea of Sampling Techniques, Classification. Tabulation & Frequency Distribution; Presentation of Data: Graphical and Diagrammatic.

Measures of Central tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median & Mode.

Measures of Dispersions: Range, Quartile Deviation, Mean Deviation, Standard Deviation and Coefficient of Variation, Measures of Skewness & Kurtosis.

Index Number: Meaning, Importance, Construction and their Calculation, Change of Base, Splicing, Deflating.

Simple Correlation: Linear & Rank, Simple Regression Analysis.

Fundamentals of Mathematics: Elementary Set Theory; Number System, Elementary Algebra. Co-ordinate Geometry; Straight Lines; Rates Ratios, Percentage & Logarithms.

Permutations & Combinations, Elementary, Probability Theory, Additive and Multiplicative Theorems, Conditional Probability.

Indian Statistics: Population, Labour, Money & Banking, National Income, Agricultural Production, and Industrial Production, Indian Statistical Systems, C.S.O, N.S.S.O, Directrate of Economics & Statistics (D.E.S.), Govt. of Uttrakhand, Structure, Functions.

नोट – प्रत्येक प्रश्न 01 अंक का होगा।

Syllabus for The Post of Economics and Statistics Officer (Department of Uttarakhand Economics and Statistics)

GENERAL STUDIES and TECHNIQUES OF STATISTICAL ANALYSIS

(Written Nature -Objective Type)
FIRST PAPER (Compulsory Paper)

Time - 02 Hours	Total Number Of Questions - 100	MM: 100
	Part- I	
Number Of Questions - 50		Marks: 50

GENERAL STUDIES

1. Current events of National and International importance.
2. Sports and Entertainment.
3. Indian History (ancient, medieval, modern) and Indian National Movement
4. Geography of India and The World.
5. Economy- Natural Resources, Planning, Industry and Agriculture, Sustainable and Inclusive Development.
6. Natural Calamities and Disaster Management.
7. Human Resource Development Index in India and Social Development Index.
8. Basic Knowledge of Indian Constitution - Salient features of Indian Constitution, Fundamental Rights and Duties, Directive Principles of State Policy. **The Union Executive** – The President, Prime Minister, Council of Ministers, Lokpal, **The Union Legislature** – Parliament, **The Judiciary** – Supreme Court Judicial review & Judicial Activism and High Court, **State Government and Administration** – Governor, Chief Minister and Council of Ministers, Legislative Assembly, Panchayati Raj Institutions, Lokayukt, Constutional bodies.
9. Rights related issues – Right to Education, Right to Information, Right to Service, Samadhan Yojana, Right to civilian protection Act-1955, Right to Consumer protection, Universal Declaration of Human Rights (1948), Human Rights and Duties in India, National Human

Rights Commission and other related issues. United Nations Organisation- Objectives and Utilities, Security Council and India.

10. **General Science-** Basic knowledge of Physics, Chemistry and Bio-Science and their application in day- to - day life.

11. **Development and Environmental Problems-** Main Problems related to development, population growth, Various aspects of Rural and Urban Development- Social, Economic, Political, Cultural Awareness, Health, Communication, Development of basic infrastructure, Balance between rural and urban environment etc. environmental pollution, greenhouse gases, Environmental Laws, Resources and Conservation, Wild life resources, National Green Tribunal (NGT).

12. **Biotechnology and Health Issues:** Biotechnology, genetically modified plants, human organs donation and related problems. Bio remedial control of pollutants. Microbial infections ; Introduction to viral, bacterial, Protozoan, fungal and other infections in Human beings. Basic knowledge of infections caused by different groups of micro organisms- diarrhoea, dysentry, cholera, tuberculosis, dengue, malaria, filaria, scrub typhus, viral infections like AIDS, encephalitis, chickengunia, bird flu- preventive measure during outbreaks. Zoonotic diseases; Basic concepts of Immunology, Vaccine and Universal Vaccination.

13. **Energy and Water Resources:** Energy crisis, energy conservation, conventional energy sources, renewable energy, bio-fuel. Types of Indian water resources, use and management.

14. **Space and Remote Sensing-** Space programme in India and its applications with special reference to industrial, agriculture, telecommunication, television, education. Remote Sensing, Geographical Information System (GIS) and its application in weather forecasting, Disaster warning, water, oil and mineral Resources, urban planning and rural development activities; Introduction to Global Positioning System (GPS), and Indian missile programme.

15. **Information Technology & Application:** Basic components and structure of Computers and its applications. Information &

Communication Technology, Software and Hardware, Printers, I/O devices and Memory. Computer Network. Internet-Browser. E-mail. E-commerce and M-commerce. Mobile Technology- 2G, 3G and 4G Communication.

General Knowledge Related to Uttarakhand State

1. **General Geography-** Location and Extent, Structure and Relief, Climate and Drainage systems, Demography, Transport and Communication network etc.
2. **History, Culture and** Uttarakhand Rajya nirman Andolan etc.
3. **Natural and Economic Resources-** Watershed management, Water, Forest, Minerals, Livestock, Agriculture and Horticulture, Wild-life conservation, Parks, Sanctuaries and Bio sphere reserves.
4. **Political and Administrative Setup-** State, District and Tehsil levels etc.
5. **Education and Culture-** Educational and Training Institutions, Dialects and Languages, Customs and Traditions, Festivals, and Fairs etc.
6. **Social Reform Movements –** Coolie *Begar*, *Dola -palki*, *Naik* system and Forest Movements etc.
7. **Economic Development-** Hydro-electricity, Industry, Horticulture, Tourism, and Herbal Industry development etc.
8. **Government and Non Government Developmental Plans and Welfare schemes.**
9. **Important Contemporary events ,Disasters.**
10. **Sports and Entertainment.**

Part- 2

Number Of Questions - 50   **Marks: 50**
TECHNIQUES OF STATISTICAL ANALYSIS

Statistics, Definition, Scope, Functions, Limitations, Distrust & Misuse.

Collection of data: Primary Data, Secondary Data, Elementary Idea of Sampling Techniques, Classification. Tabulation & Frequency Distribution; Presentation of Data: Graphical and Diagrammatic.

Measures of Central tendency: Arithmetic Mean, Geometric Mean, Harmonic Mean, Median & Mode.

Measures of Dispersions: Range, Quartile Deviation, Mean Deviation, Standard Deviation and Coefficient of Variation, Measures of Skewness & kurtosis.

Index Number: Meaning, Importance, Construction and their Calculation, Change of Base, Splicing, Deflating.

Simple Correlation: Linear & Rank, Simple Regression Analysis.

Fundamentals of Mathematics: Elementary Set Theory; Number System, Elementary Algebra, Co-ordinate Geometry; Straight Lines; Rates Ratios, Percentage & Logarithms.

Permutations & Combinations, Elementary, Probability Theory, Additive and Multiplicative Theorems, Conditional Probability.

Indian Statistics: Population, Labour, Money & Banking, National Income, Agricultural Production, and Industrial Production, Indian Statistical Systems, C.S.O, N.S.S.O, Directrate of Economics & Statistics (D.E.S.), Govt. of Uttrakhand, Structure, Functions.

Note- Each Multiple choice question shall be of 01 Mark

Optional Subject

(Second Paper)

(**NOTE :** Choose / Select one subject and give answers on the following subjects.)

(01)Statistics/Mathematical Statistics

(Written Nature -Objective Type)

Time - 02 Hours   **Total Number Of Questions - 100**   **MM: 100**

Descriptive Statistics

Measures of Central tendency and Dispersion. Moments, Skewness and Kurtosis. Measures of association and contingency.

Linear Regression and correlation for two variables, Rank Correlation, Partial and Multiple Correlation for three variables only. Principle of least squares and fitting of curves.

Probability and Distributions

Random Experiments and Sample space, Classical and Axiomatic definition of Probability, Theorems of probability, Bayes Theorem, Independence of events,

Discrete and continuous random variables and Distribution functions (univariate and bivariate), Marginal and Conditional distributions, Independence of random variables. Expectations, Moments, Moment generating and Characteristic Functions, Probability Inequalities (Tchebychev's, Markov and Jensen)

Weak and Strong Laws of Large Numbers, Central Limit Theorem (Lindberg- levy and Demoivre's Laplace).

Binomial, Poisson, Negative Binomial, Uniform, Normal, Exponential and bivariate normal distribution. Sampling distributions of t, χ^2 and F.

Statistical Inference

Properties of Estimators, Cramer Rao Inequality, Methods of Estimation- Method of Moments, Method of Maximum Likelihood, Interval estimation, Tests based on t, χ^2 , F and Z. Large sample Tests.

Simple and Composite Hypotheses, Two kinds of Errors , Critical regions, Level of Significance, Size and Power of the test, Unbiased tests, MP and UMP tests, Neymann Pearson's lemma and its applications. Likelihood ratio tests.

Order Statistics, their marginal and joint distributions. Distributions of Maxima and Minima, Median, Range, Moments of order Statistics.

Non parametric tests: Ordinary sign test, Wilcoxon signed ranked test, Wald – Wolfwitz run test, Mann –Whiteney U test, Median test. Kolmogrov – Smirnov one and two sample test.

Sampling Theory

Concepts of population and samples, Sampling Units and Sampling Frame, Sampling and Non-sampling Errors, Simple random sampling from finite population with and without replacement, Stratified Sampling, Systematic sampling, Cluster sampling (equal cluster size case), Probability proportional to size sampling, Ratio and Regression methods of estimation.

Designs of Experiment

Principles of experimental designs, Analysis of Variance for one- way, two -way with one observations per cell ,Completely Randomized Design, Randomized Block Design and Latin Square Designs, Missing plot techniques in RBD and LSD. 2^2 and 2^3 factorial experiments. Balanced Incomplete Block Designs.

Applied Statistics

Statistical Quality Control- Concepts of Statistical Quality Control, Control charts for variables and attributes, Natural tolerance limits and specification limits: Modified control limits. Single and Double Sampling Inspection plan, Producer's and Consumer's risk OC and ASN Function.

Demography - Measurement of Mortality; Crude Death Rate, Specific Death Rate, Standardized Death Rate, Infant Mortality Rate. Measurement of fertility: Crude Birth Rate, General Fertility Rate, Age Specific Fertility Rate, Total Fertility Rate, relation between TFR and CBR, Gross Reproduction Rate and Net Reproduction Rate, Construction of a complete life table and its uses.

Index Numbers-Index numbers and their construction, Uses of index numbers. Laspeyer's, Paashce's, Marshall –Edgeworth and Fisher's index Numbers, Tests for index numbers. Fixed base and Chain base Index Numbers, Cost of living index numbers. Base shifting and Splicing.

Time Series-Components of time series, Measurement of Trend and seasonal components, Autocorrelation and Periodogram Analysis.

Multivariate Analysis

Multivariate normal distribution, Wishart distribution(without proof) and properties, T^2 statistic.

Operations Research

Operations Research and its application, Linear programming problems : Formulation and solutions by graphical and Simplex methods. Primal and Dual Problems.

Theory of Games Two person zero sum game, Pure and Mixed strategies, Minimax (Maximin) criterion and Optimal Strategy, Solution of games with and without saddle point, Theory of dominance.

Numerical Analysis

Finite differences, difference operators, Newton's forward and backward interpolation formula, Interpolation with unequal interval arguments, Lagrange's formula, Newton's divided difference formula, Stirling's and Bessels formulae, Numerical Integration, Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Weddle's rule.

Real and Complex Analysis

Finite and Infinite sets, Countable and Uncountable sets, Bounded Sets, Supremum and Infimum, Sequences and Series, Convergence, Uniform convergence.

Analytic Function, Cauchy's theorem, Complex Integration, Zeroes and Poles of Functions, singularities.

Differential Calculus and Differential Equations

Limits and continuity, Differentiability, Rolle's Theorem, Mean Value Theorem, Taylor's Theorem, Maxima and Minima.

Order and Degree of a differential equation, Differential Equation of first order and first degree, Variables Separable, Homogeneous, Linear and Exact Differential equations.

Linear Algebra

Algebra of Matrices. Rank and determinants of Matrices, Inverse Matrix. Eigenvalues and Eigenvectors, Quadratic Forms and classification of quadratic Forms.

Note- Each Multiple choice question shall be of 01 Mark

1. ABSTRACT ALGEBRA:

(i) Theory of Equations: Real and complex roots of polynomial equations. Relations between their roots and coefficients. Elementary symmetric functions, Solutions of cubic and biquadratic equations.

(ii) Modern Algebra: Sets, Relations, Equivalence relations. Groups, Sub groups, Cyclic and permutation groups, Normal subgroups, Homomorphism of groups, Quotient groups, Isomorphism theorems. Rings, Sub rings, Ideals, Integral domains and Fields. Principal ideal domains, Unique factorization domains and Euclidean domains.

2. LINEAR ALGEBRA:

(i) Vector Spaces: Vector spaces, Subspaces, Linear dependence and Independence of vectors, Basis and dimension of a vector space, Examples of infinite dimensional spaces, Ordered bases and coordinates.

(ii) Linear transformations: Definition, Rank and nullity theorem, Algebra of linear transformations, Matrix form, Change of basis, Linear functional, Dual spaces, Canonical forms, Eigen–values of linear operators, Eigen spaces, Minimal polynomial, Diagonalization.

(iii) Inner Product Spaces: Definition of inner product of two vectors, orthogonal and orthonormal vectors, Gram-Schmilt process for orthogonalisation.

3. NUMERICAL ANALYSIS:

(i) Errors: Exact and approximate numbers, Rounding of numbers, Significant and correct digits. Various types of errors encountered in computations, Propagation of errors.

(ii) Solution of equations: Solution of linear simultaneous equations by LU-decomposition method and Gauss- Seidel iterative method. Roots of non- linear equations by Newton- Raphson method, a fixed point iterative method with their convergence criteria for one variable problems.

(iii) Interpolation: Finite difference operators, Newton, Bessel and Stirling's interpotation formulae. Lagrange and Newton divided difference formulae for unequal intervals.

(iv) Numerical differentiation and Integration : First and second order differentiation by various interpolation formulae and their use in solving Boundary Value Problems . Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules with errors, Gauss- Legendre 2- points and 3- points formulae.

(v) Solution of ODE: Solution of first order ordinary differential equation by Picard's method, Euler and Euler- modified method, Runge Kutta fourth order method.

4. CALCULUS:

Limit, continuity and differentiability of a function of two variables. Partial differentiation. Euler's theorem for homogeneous functions. Taylor's theorem. Maxima and minima of a function of two variables. Lagrange's multiplier method. Remainder of Taylor's series. Double

and Triple integrals. Beta function, Gamma function, Dirichlet integral, Jacobians and their applications in finding the area, volume, centre of gravity and moment of inertia.

5. ANALYTICAL/DIFFERENTIAL GEOMETRY:

(i) Analytical Geometry: Two dimensional geometry of straight lines and conics referred to Cartesian and polar coordinates system. Three dimensional geometry for planes, Straight lines, Spheres, Cones, Cylinders and Quadric surfaces.

(ii) Differential Geometry: Curves in space, Curvature and Torsion, Frenet's formulae with their applications.

6. DIFFERENTIAL EQUATIONS:

Solution of linear ordinary differential equations with constant coefficients. Euler- Cauchy Equations. Solution of second order differential equation by changing dependent variable and independent variable. Method of variation of parameters. Series solution about ordinary and singular points. Solution of Bessel and Legendre equations. Elementary properties of Bessel functions and Legendre polynomials.

7. COMPLEX ANALYSIS:

Algebra of complex numbers, Limit, Continuity, Differentiability and Analyticity of a function of a complex variable. Cauchy- Riemann equations, Harmonic functions, Method for finding the Harmonic conjugate, Milne's method for analytic function. Power series, radius of convergence. Uniform convergence. Laurent series, Zeros and poles of a function. Residue at singular points. Cauchy- Residue Theorem, Contour integration and its application. Conformal and Bilinear transformation with applications.

8. MECHANICS:

(i) Statics: Conditions of equilibrium for a system of forces in 3D. Finite and infinitesimal displacement of a rigid body. Work, Potential energy and Virtual work. Center of gravity of a system . Common Catenary,

(ii) Dynamics: Motion of a particle in a straight line, simple harmonic motion and its applications. Projectiles, Central forces, Motion under resisting medium. D'Alembert's principle and Lagrange's equation of motion, dissipation, Hamilton's principle and applications.

9. MATHEMATICAL ANALYSIS:

(i) Sets: Open sets, Closed sets and Countable sets.

(ii) Algebra of real sequences: Limit points of a sequence, Convergent sequences, Cauchy's general principle of convergence.

(iii) Infinite Series: Infinite Series with different tests of convergence. Uniform convergence of the series of functions. Weierstrass M-test.

(iv) Riemann integral: Definition, Refinements of partitions, Conditions of integrability, Riemann sums, Some integrable functions. Fundamental theorem of calculus.

(v) Metric spaces: Definition and examples. Convergence and completeness. Continuity and uniform continuity, Compactness, Connectedness.

(vi) Lebesgue integral: Measurable sets, sets of measure zero, Borel sets. Non-measurable sets. Measurable functions, Measurability of the sum, difference, product and quotient of measurable functions. Lebesgue integral for various types of functions.

(vii) Laplace transform: Definition of Laplace transform and its existence. Properties and its application in solving differential equations related to initial value problems.

Note- Each Multiple choice question shall be of 01 Mark

(03)Economics/Applied Economics

(Written Nature -Objective Type)

Time - 02 Hours   Total Number Of Questions - 100   MM: 100

1. **Micro Economics :-** Consumer's Behaviour, Law of Demand & Utility Analysis, Equi-Marginal Utility, Indifference Curve Approach, MRS, Budget Line, Revealed Preference Approach; Demand Forecasting and Estimation; Concept of Elasticity of Demand and Supply; Elasticity Types: measurement and numerical problems, Decomposing Price Effect into income and substitution effect; Consumer's Surplus; Production Function and the Laws of Returns, Returns to Scale & Producer's Equilibrium; Fixed Coefficient Production Function, RTS, Iso-quant, MRTS, Iso-cost Line, Iso-revenue Line; Internal & External Economies of Scale; Cost and Revenue Function; Relationship between MR & Price, Deriving AR & MR from TR; Relationship between AC, MC and TC; Pricing under various forms of market : Perfect, Monopolistic, Monopoly, Oligopoly: Pricing of factors of production; Welfare Economic : Pareto Optimality.

2. **Macro Economics :-** National Income : Various Concepts, Measurement and Limitation (GNP, GDP. NDP, NNP, Personal Income, Disposable Income, Nominal GDP and Real GNP); Methods of National Income Accounting; Determinants of National Income & Employment : Classical, Keynesian and Neo-Classical theories; Consumption Function-Propensity to Consume and Propensity to Save; Investment Function- Determinants, Marginal Efficiency of Capital and Theory of Multiplier; Macro Theories of Distribution: Classical and Kaldor; Elementary Treatment of General Equilibrium.

3. **Economic Growth and Development :-** Meaning and Measurement; Measurement of Development : Conventional. HDI, Gender Development Index and Human Poverty Index; Growth Models: Harrod and Domar, Mahalanobis, Unbalanced v/s Balanced, Big Push and Unlimited Supply of Labour; Globalisation and LDCs; Sustainable Development: Goals.

4. **Money, Banking and Public Finance :-** Concepts & Functions of Money; Measures of Money Supply (M_1, M_2 & M_3); Quantity Theory of Money-Fisher, Cambridge, Keynesian Fundamental Equations; Derivation of Money Multiplier; Monetary Policy; Functions of Central Bank of a Nation; Quantitative Credit Controls; Inflation- Types, Causes, Effects & Controls; Phillips Curve Analysis; Public Finance : Sources of Public Revenue; Impact, Incidence and Effects of Taxation, Kinds of Taxation. Public Expenditure:- Effects & Evaluation : Savings, Investment and Growth. Public Debt- Sources, Effects, Burden and its management. Fiscal Policy.

5. **Demography :** Demographic Concepts: Population Pyramid, Density, Sex ratio, Total Fertility Rate, Mortality, Population Growth rate; Measures of Fertility & Mortality; Life Table; Population and Economic Development; Migration and Urbanization.

6. **International Economics :-** Theories of International Trade: Comparative Advantage & Heckscher-Ohlin; Terms of Trade; Tariffs; Trade Diverting Custom Union; Foreign Trade Multiplier, Increase in imports & Reverse working of Foreign Trade Multiplier; Balance of Payments & Adjustment Mechanism; Exchange Market:- Theories of Exchange rate determination.

7. **Indian Economy :-** Sectoral Distribution of National Income; Trends in Population Growth & Demographic Changes; NSSO and CSO; Poverty in India:- Measurement, Nature & Poverty Alleviation Programmes; Unemployment : Nature, Problems and Remedies. Economic Planning in India : Constitution, Role and Functions of NITI Ayog. Necessity and

Impact of Demonetization. Centre- State Financial Relations :- Finance Commission & GST (Significance & Implementation)

Role and Problems of Agriculture:- Share of agriculture in National Income and Workforce; Rural Credit, Indebtedness and NABARD; Agricultural Marketing; Food Security and Climate Change;

Industrialization : Role of Public and Private Sector; Role of FDI, Foreign Capital & MNCs; New Economic Policy; Role of Banks; Make in India; Prospects of Digitization in India.

8. **Uttarakhand Economy :-** Features; Natural Resources; Infrastructure; Human Resources; Main Economic Problems: Natural Disaster, Migrations, Environmental Degradation.

Note- Each Multiple choice question shall be of 01 Mark

1- Financial & Management Accounting

Accounting Concepts, Capital & Revenue, Financial Statements-Profit and Loss account, Balance Sheet, Advanced Company accounts- Issue, Forfeiture, Liquidation, Valuation of Shares, Amalgamation, Absorption & Reconstruction, Holding Company accounts.

Cost and Management accounting - Marginal costing and Break-even analysis, Standard costing- Budgetary Control, Costing for decision making, Responsibility accounting, Valuation of goodwill & shares.

2- Banking & Financial Institutions

Central banking.

Banking sector reforms in India, NPA, Capital adequacy norms.

Latest trends in E-Banking.

Development Banking- IDBI, IFCI, SFC's, UTI, SIDBI.

De-monetisation & banking industry.

3- Business organisation & Management

Different forms of Business organisation, Corporate social responsibility & legal aspects.

Management functions- Planning, Planning process & premises.

Organising- Organisational structure, Formal & Informal organisation, Organisational culture.

Management by objectives, Management by exception.

Corporate Governance & Business Ethics.

4- Management and Cost Audit

Concept, Objectives & Need of Management audit.

Need of Cost audit, Cost audit report.

Concept of Environmental audit.

5- International Business

Growing relevance of international business.

Balance of payments.

Export promotion techniques & incentives.

International economic institutions - IMF, World Bank, WTO.

6- Business Statistics and Data Processing

Data types, Data collection and analysis, Interpretation of data .

Correlation and Regression, Small Sample tests-t-test, F-test and Chi-Square test.

Data Processing- Elements, Data entry, Data processing and Computer applications.

Note- Each Multiple choice question shall be of 01 Mark

INTERVIEW- 25 Marks

Total Marks- 225

परिशिष्ट—04

अर्थ एवं संख्याधिकारी परीक्षा— 2018 के विभिन्न चरणों हेतु न्यूनतम् अर्हकारी अंक :–

अनारक्षित वर्ग, अन्य पिछड़ा वर्ग तथा अनुसूचित जाति/अनुसूचित जनजाति के अभ्यर्थियों को प्रश्नगत परीक्षा के प्रत्येक चरण हेतु उत्तराखण्ड लोक सेवा आयोग, परीक्षा परिणाम निर्माण प्रक्रिया नियमावली, 2012, 2013 (प्रथम संशोधन), 2014 (द्वितीय संशोधन), 2015 (तृतीय संशोधन) एवं 2016 (चतुर्थ संशोधन) द्वारा निर्धारित निम्नलिखित न्यूनतम अर्हक अंक प्राप्त करना अनिवार्य है :–

क्र. सं.	आरक्षण की श्रेणी	लिखित (वस्तुनिष्ठ प्रकार) लिखित परीक्षा हेतु निर्धारित न्यूनतम् अर्हक अंक प्रतिशत में।	साक्षात्कार परीक्षा हेतु निर्धारित न्यूनतम अर्हक अंक (प्रतिशत में)
1	अनारक्षित एवं सम्बन्धित उपश्रेणी	40%	45%
2	अन्य पिछड़ा वर्ग श्रेणी एवं सम्बन्धित उपश्रेणी	35%	40%
3	अनुसूचित जाति श्रेणी/अनुसूचित जनजाति श्रेणी एवं सम्बन्धित उपश्रेणी	30%	35%

नोट— सम्बन्धित श्रेणी/उपश्रेणी के अभ्यर्थियों को उक्तानुसार न्यूनतम अर्हकारी अंक (प्रतिशत में) प्राप्त करने पर ही प्रवीणता सूची हेतु विचारित किया जायेगा।