Syllabus for
Junior Grade of Mizoram Planning, Economic & Statistical Service
under Planning & Programme Implementation Department, 2019

The examination will comprise of the following papers:

Sl. No.	Subject	Time	Full Marks
1)	General English	3 hrs.	100
2)	Economics-I/ Statistics-I/ Mathematics-I/ Commerce-I	3 hrs.	100
3)	Economics-II/ Statistics-II/ Mathematics-II/ Commerce-II	3 hrs.	100
4)	General Knowledge	3 hrs.	100
5)	Viva Voce	3 hrs.	100
		Total :	**450**

DETAILS OF SYLLABUS :

GENERAL ENGLISH
100 Marks

GENERAL KNOWLEDGE
100 Marks

ECONOMICS – I
100 Marks

I. <u>Consumption and Demand</u>: The theory of consumer's choice; utility-cardinal and ordinal approaches: optimum of the consumer; Indifference Curve, Slutsky, Revealed Preference Theory; Consumer's Surplus; Constant Elasticity Model.

II. <u>Theory of Production and Costs</u>: The Production Function; Factor-Employment Decision; Shift in factor prices; substitution and scale effect. Derivation of short and long run cost curves; Laws of Returns and Returns to Scale. Input Demand Functions; Adding up Theorem.

III.   Theory of Firm: Long run and Short-run Supply; Determinants of the Industry's Supply Function. Firm Survival and the "Zero Profit Theorem"; Monopoly Profit Maximizing Optimum; Monopoly and Economic Efficiency, Monopolistic Price Discrimination; Controlled and Administered Prices; Oligopoly-non-collusive and Collusive Models.

IV.   National Income and Consumption Function: Concept, Measurement and Component Analysis of National Income; Theories of Consumption Function – Absolute, Relative, Permanent and Life-cycle Hypotheses.

V.   Output and Employment: Model of Income Determination; Say's Law of Markets; Keynes' Objection to Classical Theory; The Principle of Effective Demand; Income Multiplier; Classical-Keynesian Synthesis. Theory of Investment, Autonomous and Induced Investment, Marginal Efficiency of Capital; Saving-Investment Equality.

ECONOMICS – II
100 Marks

I.   Economic Growth and Development: Role of Government in Economic Development; Factors of Economic Growth; Capital, Labour & Technology; Classical and Neo-classical Growth Models: Harrod and Domar, Solow and Meads, Joan Robinson, Contribution of Smith, Ricardo, Malthus and J.S.Mill. Quality of Life and Holistic view of Development and civil Society.

II.   Sectoral View of Development : Role of Agriculture in Economic Development-Efficiency and Productivity in Agriculture, New Technology and Sustainable Agriculture; Globalisation and Agricultural Growth; Terms of Trade between Agriculture and Industry; The question of scale-economy; Development of Infrastructure; Labour Laws.

III.   Money: Concept of High-Powered Money; Components of Supply of Money; Theories of Demand for Money – Keynesian, Portfolio Balance Approach and Friedman's Restatement; The Process of Credit Creation; Functions of Central Bank; Instruments of Credit Control; Theory of Inflation Demand- Pull and Cost-push Inflation; Policies for Control.

IV.   Public Finance: Theory of Public Goods; Market Failure in Provision of Public Goods; Voluntary Exchange Models; Pure Theory of Public Expenditure, Social Choice Theory; Wagner's Law of Increasing State Activities; Criteria for Public Investment; Benefit-Cost Analysis.
        Benefit and Ability to Pay Approach; Welfare Cost of Taxation; Deficit Financing.

V.   International Trade and Indian Economy: Terms of Trade, concept, their uses and limitations, International Trade as an Engine of Growth; Static and Dynamic Gains from trade; Import-substituting Industrializations, Export-led Growth; Balance of Payments, Tariff and Effective Protection; Post-GATT International Economic order; WTO and Developing countries.
        Characteristics of under developed economy; Broad Demographic features of Indian population and Achievements and Goals of Population Policy; Rural-Urban Migration; Poverty and Inequality. Rationale of Internal and External Reforms; Privatisation and Disinvestments Debate; Issues in Labour Market Reforms.

STATISTICS – I
100 Marks

I. <u>Descriptive Statistics</u>: Collection of Data: Primary and Secondary Data; Designing a questionnaires; classification of data; Measures of Central Tendency; Arithmetic, Geometric and Harmonic Mean; Range; Mean Deviation; Standard Deviation; Moments; Skewness and Kurtosis; Lorenze Curve.

II. <u>Correlation and Regression Analysis</u>: Karl Pearson's Coefficient of Correlation; Correlation and Causation; Rank Correlation Coefficient; Method of Least Squares; Partial and Multiple Correlation Coefficients. Regression Equation of Y on X; Explained and Unexplained Variation; R^2, Regression in Grouped Frequency Distribution; Standard Error of Estimate and t-statistic.

III. <u>Index Numbers Vital Satisfies</u>: uses and problems in the construction of Index Numbers; Weighted and Un-weighted Index Numbers; Fisher's Ideal Index Numbers; Time Reversal Test; The Chain Index Numbers; Base shifting, splicing and deflating Index Numbers; Consumer Price Index Numbers and Index Numbers of Industrial Production; Crude Birth Rate; Infant Mortality Rate; Maternal Mortality Rate; Natural Growth Rates.

IV. <u>Business Forecasting and Time Series Analysis</u>: Method of forecasting; Business forecasting and Time Series Analysis; Components of Time Series; Methods of Measurement- Straight line trend, freehand method; Method of Semi-Averages; Method of Least Squares; Non-Linear Trend; Method of Moving Averages; Second Degree Parabola; Logarithmic Trends; Growth Curves – Logistic and Gompertz; measurement of seasonal variations, measurement of cyclical variations and irregular variations.

V. <u>Probability</u>: Axiomatic definition of probability; Probability Density Function; Conditional Probability; Additional Theorem; Multiplicative Theorem; Dependent and Independent Events; Baye's Theorem; Moments and Moment Generating Functions; Properties of Binomial, Poisson and Normal Distribution.

STATISTICS – II
100 Marks

I. Methods of Sampling and Estimation: Sampling methods – Random Sampling methods, Stratified Sampling, Purposive Sampling, Cluster Sampling and Proportional Sampling; Parameter and Statistic; Sampling Distribution. Statistical Estimation; Properties of Good Estimators; Method of Maximum Likelihood; Point Estimation; Interval Estimation; Confidence Limit for Population Means, Proportion and Difference of Two Means.

II. Sampling Distributions: Properties of t-distribution; critical values; t-test for single means; t-test for difference of means; F-statistic; F-test for equality of population variances. Chi-square test; Yate's Correction for continuity; test of hypothesis concerning variance; Test of Independence; Test of Goodness of Fit; Test of Homogeneity.

III. Test of Hypothesis: Statistical Hypothesis- Simple and Composite; Type I and Type II Errors; Test of Hypothesis About Population means; Test of the difference between two means, Population Proportions; Power of Test. Steps in Solving Testing of Hypothesis Problems. Non – parametric Test: Test for Randomness; Median Test; Sign Test; Mann-Whitney-Wilcoxtion U-Test.

IV. Statistical Decision Theory: Decision Making Under Risk; Decision making under certainty; Decision making under uncertainty; Theory of Games; Two Persons zero-sum Game; A game with a pure Strategy; A game with a Mixed Strategy: Dominance Principal, Analysis of Variance: One-way classification model and two-way classification model.

V. Regression Model; Deterministic and undeterministic Relationship; Ordinary Least Squares (OLS) Method, Basic Assumption of OLS Estimation; Best Linear Unbiased Estimator (BLUE); Distribution of a and b; Covariance of a and b; Estimation of Var(a) and Var (b); Violation of Basic Assumption: Heteroskedasticity: Auto-regressive Disturbances.

MATHEMATICS – I
100 Marks

1. **Real Analysis:**
   Limit of functions, continuous functions, continuity and compactness, uniform continuity, continuity and connectedness, intermediate value theorem; discontinuous and their classification, monotonic function, infinite limits and limits at infinity. Differentiation of real-valued functions and its elementary properties; mean value theorem; Taylor's theorem; differentiation of vector-valued functions; elementary properties of Reimann Integral.
   Sequences of functions, pointwise and uniform convergence; uniform convergence and continuity, completeness of C(X); uniform convergence and integration; uniform convergency and differentiation; nowhere differentiable functions; Stone-Weierstrass theorem for complex valued functions on an interval.
   Directional derivatives; derivatives of several variables and their interrelationship; chain rule; mean value theorem; higher order partial derivatives; equality of mixed partial derivatives, Schwarz lemma; Taylor's theorem.

2. **Function Analysis :**
   Normed linear spaces; equivalent norms; bounded linear operators and funtional; Banach spaces. Hahn Banach Theorem; Uniform boundedness theorem, Open mapping theorem; Closed graph theorem. hilbert spaces; palarization identity and parallelogram law; orthogonality; Reisz representation theorem; orthonormal systems; Bessel's inequality; Parsevals identity. Adjoint operators, normal and self adjoint operators; unitary operators; isometry; orthogonal projection; spectrum of an operator and it's non emtiness.

3. **Algebra :**
   Groups, Subgroups, Homomorphisms, Group actions, Free Groups. Sylow theorems and applications, Normal series, Solvable and Nilpotent groups. Rings, Ideals and Quotient rings, Maximal, Prime and Principal ideals, Euclidean and Polynomial rings. modules, sub-modules, quotient modules and modules homomorphism, generation of modules, direct sums and free modules, Fields, characteristics and prime subfields, Field extension, finite algebraic and finitely generated field extension.

4. **Topology :**
   Arbitrary Cartesian products, finite sets, countable and uncountable sets, infinite sets. Topological spaces, Basis and Sub-basis for a topology. Dictionary order, Order topology, the subspace topology, Product Topology, metric topology. The closed set and the closure Interior and limit points. Hausdorff spaces, continous functions, Connectedness, path connectedness, Local connectedness. Compactness, Local Compactness, The countability Axioms, 1st countability and 2nd countability, seperability.

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5. **Mechnics:**
   Generalized coordinates, holonomic and non-holonomic systems; D'Alembert's principle; Lagrange's equations; calculus of variations Halmilton's principle, Lagrange's equations from Hamilton's principle, extension of Hamilton's principle to non-conservative and non-holonomic systems. Halmilton's equations of motion, conservation theorems and physical significance of Hamiltonian, Hamilton's equations from variational principle, principle of least action. Equation of canonical invariants, equations of motion in Poisson bracket notation; infinitesimal contact transformations. Transformation; integral inrainants of Poicane; Lagrange and Poisson brakets as canonical.

MATHEMATICS – II
100 Marks

1. **Ordinary Differential Equations:**
   Linear equations with variable coefficients - introduction, initial value problems for the homogeneous equations; solutions of homogeneous equations; Wronskian and linear independence; non-homogeneous equations: homogeneous equations with analytic coefficients; Euler equation; second order equations with regular singular points-example and the general case, convergence proof, exception cases; Existence and uniqueness of solution - introduction; equations with variable separated; exact equations, Lipschitz condition; non-local existence of solutions; uniqueness of solutions; existence and uniqueness theorem for the solutions of ordinary differential equation of order n. Existence and uniqueness of solutions of system; central forces planetary motion; some special equations.

2. **Partial Differential Equations:**
   Definition of PDE, origin of first-order PDE : determination of integral surfaces of linear first order partial differential equations passing through a given curve; surfaces orthogonal to given system of surfaces; non-linear PDE of first order, Cauchy's method of characteristic. Compatible system of first order PDE; charpit's method of solution, solutions satisfying given conditions, Jocobi's method of solution. Origin of second order PDE, linear second order PDE with constant coefficients, linear second order PDE with variable coefficients. Characteristic curves of the second order PDE; Monge's method of solution of non-linear PDE of second order, Separation of variables in a PDE; Laplace's equation, elementary solutions of Laplace's equations: families of equipotential surfaces.

3. **Complex Analysis:**
   Introduction to Complex variable, extended plane and stereographic projection, power series, radius of convergence of power series, exponential, cosine and sine, logarithm functions introduced as power series, their elementary properties, Analytic functions and their basic properties. Integration of complex-valued functions, simply connected domains, index of a closed path, Cauchy's theorem and its corollaries, Cauchy's integral formula. Tylor's expansion of holomorphic functions, Cauchy's estimate; Liouville's theorem; fundamental theorem of algebra; zeros of and analytic function and related results; maximum modulus theorem Laurent's expansion of a holomorphic function in an annulus, singularities of a function, removable singularities, poles and essential singularities; residues calculus of residues; evaluation of definite integrals; argument principle; Rouche's Theorem.

4. **Numerical Analysis:**
   Interpolation and approximation : Lagrange and Newton interpolations, finite difference operators, interpolating polynomials using finite differences, Differentiation and Integration: Introduction, numerical differentiation, numerical integration, method b ased

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on interpolation, methods based on undetermined coefficients. Ordinary differential equations, initial value problems: Introduction. Numerical methods, single step methods, stability analysis of single step methods, multistep methods. Predictor-corrector methods, Milne-Simpson method.

5.   **Linear Programming:**
     Linear Programming, Simplex method, Theory of Simplex method. Duality and Economic interpretation of Dual Variables, Dual Simplex method. Parametric Linear Programming, Upper bound technique. Transportation and Assignment Problems. Integer Programming, Branch bound technique, All integer Programming Problems and mixed integer Programming Problem.

COMMERCE – I
100 Marks

1.   School of Management thought; Managerial functions;
2.   Organizational Behaviour; theories of Motivation; Group dynamics and Team development; Leadership; Organizational conflict; Organizational Communication; Organization Development.
3.   Business Environment; Techniques of Environment Scanning; Economic, Political and Legal, Social-cultural and International and Technological Environment- Recent Trends.
4.   Management Accounting: Accounting Plans; Responsibility Centres; Budgeting; Types of Budgeting; Budgetary Control; Standard Costing and Variance Analysis: Marginal Costing and Break-Even Analysis; Analysis of Financial Statement; Reporting to Management.
5.   Business Statistics: L Trivariate Analysis; Probability theory; Probability Distributions; Statistical Decision Theory; Sampling and Data-Collection; Data Sources; Statistical Estimation and Testing; Correlation and Regression Analysis; Index Numbers; Statistical Quality Control.
6.   Entrepreneurship; Theories; Public Policies and Programmes for Entrepreneurship Development; Promotion of a Venture.
7.   Marketing Management; Market Analysis and Selection; Consumer behaviour; Product decision; Pricing decision; Distribution channels and Physical distribution decisions; Promotion Decision; Marketing Research; Marketing Organization and control; Recent Development in Marketing.
8.   Financial Management; Capital Budgeting; Cost of Capital; Operating and Financial Leverage; Capital Structure Theories; Dividend Policies; Management of Working Capital.

COMMERCE – II
100 Marks

1.   Computer Application in Business; Fundamentals; Local Area of Networks (LAN) Networking Topologies; Wide Area of Network & (WAN); Multimedia; Operating systems; DOS and Windows;
2.   Word Processing; Working with MS-Word in MS-Office; formatting; Working with graphics; Spreadsheets; Working with EXCEL; Working with graphics in EXCEL; Using worksheet as database in accounting marketing, finance and personal areas ; Power-Point presentation; Accounting Packages Tally; Statistical packages; Excel and SPSS;
3.   E-Commerce: Internet Technology Concept and; Business Models of E-Commerce and Infrastructure; Business to Consumer E-Commerce; Web Page Design, Business to

Business E-Commerce; E-business; Security issues in E-Commerce; Regulatory and Legal Framework of E-Commerce; Multi-Media and E-Commerce

4. Corporate legal Framework: The Companies Act, 1956 (With Amendment Act 2002) The Negotiable Instruments Act 1881; Legal Environment for Security Markets: SEBI Act, 1992; Consumer Protection Act, 1986; regulatory Environment for International Business: FEMA Act, 1999; Regulatory framework of WTO.

5. Financial Institution and Markets: Indian Financial System; Financial Markets; Role of SEE I; Recent Developments; Reserve Bank of India; Commercial Bank; Development Bank; Insurance Sector; Insurance Regulatory and Development Authority; Unit Trust of India; Non-Banking Financial Institutions; Mutual Funds; Merchant Banking; Interest Rates Structure; Foreign Investments,

6. Project Planning and Control: Identification of Investment Opportunities; Market and Demand Analysis; Technical Analysis; Cost of Project and Means of Financing; Profitability, Financial Projections and Tax Consideration; appraisal Criteria and Appraisal Process; Social Cost Benefit Analysis; Network Techniques for Project Implementation, Monitoring and Control.