Statistics, Mathematics and Economics (Degree Standard)

Code: 504

Unit I: Algebra and Differential Calculus (20 Questions)
Theory of Equations: Relations between roots and Coefficients – Complex roots – Irrational roots – Related roots – Transformations of equations – Reciprocal equations.
Matrix Theory: Symmetric – Skew Symmetric – Hermitian – Skew Hermitian – Orthogonal and Unitary Matrices – Rank of a matrix – Consistency and solutions of Linear Equations – Cayley Hamilton Theorem – Eigen values and Eigen Vectors.
Differential Calculus: n^{th} derivative – Leibnitz's theorem and its applications – Partial differentiation – Maxima and Minima of functions of two independent variables.

Unit II: Integral Calculus and Differential Equations (20 Questions)
Integral Calculus: Methods of integration – Properties of definite integrals – Reduction formulae – Double Integrals –triple integrals – Applications to area, surface and volume – simple problems.
First order but of higher degree equations – solvable for p, solvable for x, solvable for y – simple problems. Second order differential equations with constant coefficients with particular integrals for $e^{ax}, x^m, cosmx, sinmx, e^{ax}cosmx, e^{ax}sinmx$ – simple problems.
Partial Differential equations: Formation of Partial Differential equations by eliminating arbitrary constants and arbitrary functions – First order P.D.E. – complete integral – Singular integral – general integral – standard types $f(p,q) = 0, f(z,p,q) = 0, f(x,y,p,q) = 0$, Clairaut's form and Lagrange's equations – simple problems.

Unit III: Vector Calculus and Operations Research (25 Questions)
Vector Differentiation: Gradient, divergence, curl, directional derivative, unit normal to a surface.
Vector Integration: line, surface and volume integrals – Applications of Gauss, Stokes and Green's Theorems – simple problems.
Linear programming: Formulation – graphical solution – simplex method – Big-M method – Transportation problem – Assignment problem.
PERT and CPM: project network diagram – Critical path – PERT computations.
Inventory models: Basic concepts – EOQ models (i) Uniform demand rate infinite production rate with no shortages models (ii) Uniform demand rate with finite production rate with no shortages models.

Unit IV: Descriptive Statistics and Fitting of Simple equations (20 questions)
Introduction to Statistics, Uses, scope and limitations - Collection, Classification and Tabulation of data - Diagrammatic and Graphical representations of Data – Measures of location, dispersion, skewness and kurtosis – Bivariate data- Scatter diagram – Correlation, Partial correlation and regression – Fitting of Linear and quadratic equations by the method of least squares.

Unit V: Probability and Statistical Inference (25 questions)
Introduction to Probability - Addition, Multiplication and Baye's Theorems and simple applications. Random variables and Expectation– Univariate Probability distributions – Binomial, Poisson, Geometric, exponential and normal distributions (Mean & Variance). Sampling Techniques – Simple Random Sampling – Stratified and Cluster (Single Stage) - Estimation – Properties, Point Estimation by the method MLE. Tests of Hypothesis – Important terminology – Test procedures for large and small samples (z, t, Chi-square, F).

Unit VI: Time Series, Index Numbers and Statistical computing using MS-Excel (20 Questions)
Time series – Components – Determination of Trend (Moving Average, Linear Trend by LSE) - Index Numbers – Construction of Simple, weighted Cost of living index numbers.
Statistical Computing using MS-Excel: Introduction to MS-Excel – MS-Excel Options using Excel Shortcuts – Link the Data in Rows, Columns and Sheet - Functions: Logical Functions -Math and Statistical Functions – Regular Charts-Plotting Density Function and Distribution Function.

Unit VII: Micro Economics (15 Questions)
(a) Definition, Scope and Importance of Micro Economics – Law of Demand – Elasticity of Demand – Utility Analysis – Consumer Surplus.

(b) Production Function – Factors of Production – Producer's Surplus – Economies of scale – Cost and Revenue curves in the Short-run and Long-run – Welfare Criteria – Adam Smith, Bentham, Marshall, Pigou and Kaldor.

Unit VIII: Macro Economics (15 Questions)
Definition, Nature and Scope of Macro Economics – Circular flow of Income in an Open Economy – National Income Accounting – Definition – Concepts: GNP, NNP, GDP, NDP, Personal Income, Per Disposable Income & Personal Savings, Per Capita Income – Keynesian Psychological Law of Consumption – Investment function – Marginal Efficiency of Capital – Multiplier – Accelerator.
Inflation – Deflation – CPI – WPI – Phases of Trade cycle.

Unit IX: Stabilisation Policies (20 Questions)
(a) Monetary Policy: Barter System – Demand for and supply of money – Functions of money, Functions of Central and Commercial Banks – Money Multiplier – Monetary Policy Instruments – SLR, CRR, OMO & LAF – Functions of Money Market – Capital Market.
(b) Fiscal Policy: Taxation – Types of Taxes – Canons of Taxation – Public Expenditure – Causes and Growth – Types of Public Expenditure – Public Debt – Internal and External Public Debt - Budget – Deficit and deficit financing – FRBM (Fiscal Regulation and Budgetary Management) – Fiscal Federalism.

Unit X: Indian Economy: (20 Questions)
(a) Agriculture: Contribution of the Agriculture sector to National Income and Employment – Agriculture Price Policies – Agriculture Statistics – Modern Technology in Agriculture Statistics – Agriculture Finance and Marketing.
(b) Industry: Contribution of the Industrial Sector to National Income and Employment – MSME and Large Scale Industries – Industrial Policy Resolutions – Industrial finance.
(c) Service Sector: Contribution of the Services Sector to National Income and Employment –Transport, Communication and IT Sectors.
(d) Economics of Planning: Five Year Plans – Planning Commission – Finance Commission – NITI Aayog – Government Welfare and Employment Generation Programmes.
(e) Population: Demographic transition and Demographic Statistics – Poverty Alleviation Programmes.

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