

## **Junior Research Fellowship in Quantitative Economics (2023)**

*Test Codes: QEA and QEB (Both are of 'Descriptive' type)*

The candidates for Junior Research Fellowship in Quantitative Economics are required to take two descriptive-type tests - QEA in the forenoon session and QEB in the afternoon session. While the questions in QEA are on Mathematics, those in QEB are on Economics.

### **Syllabus for QEA**

1. Permutations and combinations.
2. Theory of quadratic and cubic equations; elementary set theory.
3. Matrix algebra, rank and inverse of matrices, linear equations, determinants, and eigen values.
4. Functions of one and two variables: limits, continuity, differentiation, applications, integration of elementary functions, and definite integrals.
5. Constrained and unconstrained optimization, convexity of sets, and concavity and convexity of functions.
6. Elements of probability theory, discrete and continuous random variables, expectation and variance, joint conditional and marginal distributions, and distribution of function of a random variable.

### **Syllabus for QEB**

1. Theory of consumer behaviour; Theory of production; Market structure; General equilibrium and welfare economics; International trade and finance; Public economics.
2. Macroeconomic theories of income determination, rational expectations, Phillips Curve, neoclassical growth model, inequality.
3. Game Theory: Normal and extensive forms; Nash and sub-game perfect equilibrium.
4. Multiple Regression Model: Least squares and maximum likelihood methods of estimation, heteroscedasticity, autocorrelation, multicollinearity, specification bias, exogeneity, and instrumental variables.
5. Time Series Analysis: Stationarity, trend, seasonality, unit root tests, and ARMA model.