RAJIV GANDHI INSTITUTE OF PETROLEUM TECHNOLOGY, JAIS, AMETHI

(An Institution of National Importance Established under the Act of Parliament)

List of short-listed candidates for Interview and/or written test for possible admission in PhD. Programme of **Department of Mathematical Science** in Odd Semester, Academic Session 2021-22.

Full Time Regular Registration Category

Sr. No.	RGIPT Reg. No.	Name of Candidates
1	2117336	Dibjyoti Mondal
2	2116566	Dolagobinda Das
3	2116798	Gautam Kaushik
4	2117822	Neeraj Kumar
5	2115974	Poulami Paul
6	2117854	Preeti Saini
7	2117269	Rajesh Yadav
8	2116098	Shashank Kumar Shukla
9	2116194	Vaibhav Agrawal

The above short listing has been done on the basis of information provided by the applicant. If at any stage the information provided by the applicant is found incorrect, the application is liable to rejection.

Applicants who have qualifying degree from CFI/CFTI with CPI of 8.00 or above (on a 10.0 point scale) (supernumerary candidates), possessing external fellowship such as CSIR JRF, UGC JRF, DST INSPIRE etc., in part time and full time external category will be interviewed on 22nd July, 2021 for possible selection into the PhD programme.

The candidates in supernumerary category if fail to get selected in the interview will be evaluated under regular procedure by appearing for written test on 22nd July, 2021.

Other regular shortlisted candidates will appear for written test on 22nd July, 2021. The Candidates those will qualify the written test will appear in the interview on 23rd July, 2021 for possible selection to PhD programme. The final selection will be subjected to performances in GATE Score, written test & interview.

The time schedule of the written test and viva-voce will be communicated later.

Syllabus for written test and interview

Mathematics

Calculus: Finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property; Sequences and series, convergence; Limits, continuity, uniform continuity, differentiability, mean value theorems; Riemann integration, Improper integrals; Functions of two or three variables, continuity, directional derivatives, partial derivatives, total derivative, maxima and minima, saddle point, method of Lagrange's multipliers; Double and Triple integrals and their applications; Line integrals and Surface integrals, Green's theorem, Stokes' theorem, and Gauss divergence theorem.

Linear Algebra: Finite dimensional vector spaces over real or complex fields; Linear transformations and their matrix representations, rank and nullity; systems of linear equations, eigenvalues and eigenvectors, minimal polynomial, Cayley-Hamilton Theorem, diagonalization, Jordan canonical form, symmetric, skew-symmetric, Hermitian, skew-Hermitian, orthogonal and unitary matrices; Finite dimensional inner product spaces, Gram-Schmidt orthonormalization process, definite forms.

Real Analysis: Metric spaces, connectednes , compactness, completeness; Sequences and series of functions, uniform convergence; Weierstrass approximation theorem; Power series; Functions of several variables: Differentiation, contraction mapping principle, Inverse and Implicit function theorems; Lebesgue measure, measurable functions; Lebesgue integral, Fatou's lemma, monotone convergence theorem, dominated convergence theorem.

Complex Analysis: Analytic functions, harmonic functions; Complex integration: Cauchy's integral theorem and formula; Liouville's theorem, maximum modulus principle, Morera's theorem; zeros and singularities; Power series, radius of convergence, Taylor's theorem and Laurent's theorem; residue theorem and applications for evaluating real integrals; Rouche's theorem, Argument principle, Schwarz lemma; conformal mappings, bilinear transformations.

Ordinary Differential equations: First order ordinary differential equations, existence and uniqueness theorems for initial value problems, linear ordinary differential equations of higher order with constant coefficients; Second order linear ordinary differential equations with variable coefficients; Cauchy-Euler equation; method of Laplace transforms for solving ordinary differential equations, series solutions (power series, Frobenius method); Legendre and Bessel functions and their orthogonal properties; Systems of linear first order ordinary differential equations.

Algebra: Groups, subgroups, normal subgroups, quotient groups, homomorphisms, automorphisms; cyclic groups, permutation groups, Sylow's theorems and their applications; Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domains, Principle ideal domains; Euclidean domains, polynomial rings and irreducibility criteria; Fields, finite fields, field extensions.

Functional Analysis: Normed linear spaces, Banach spaces, Hahn-Banach theorem, open mapping and closed graph theorems, principle of uniform boundedness; Inner-product spaces, Hilbert spaces, orthonormal bases, Riesz representation theorem.

Numerical Analysis: Numerical solutions of algebraic and transcendental equations: bisection, secant method, Newton-Raphson method, fixed point iteration; Interpolation: error of polynomial interpolation, Lagrange and Newton interpolations; Numerical differentiation; Numerical integration: Trapezoidal and Simpson's rules; Numerical solution of a system of linear equations: direct methods (Gauss elimination, LU decomposition), iterative methods (Jacobi and Gauss-Seidel); Numerical solution of initial value problems of ODEs: Euler's method, Runge-Kutta methods of order 2.

Partial Differential Equations: Linear and quasi-linear first order partial differential equations, method of characteristics; Second order linear equations in two variables and their classification; Cauchy, Dirichlet and Neumann problems; Solutions of Laplace and wave equations in two dimensional Cartesian coordinates, interior and exterior Dirichlet problems in polar coordinates; Separation of variables method for solving wave and diffusion equations in one space variable; Fourier series and Fourier transform and Laplace transform methods of solutions for the equations mentioned above.

Topology: Basic concepts of topology, bases, subbases, subspace topology, order topology, product topology, metric topology, connectedness, compactness, countability and separation axioms, Urysohn's Lemma.

Probability and Statics: Random variables, Distributions (discrete & continuous), Characteristics of Data, Probability laws. Estimation & Hypothesis testing.