

Syllabus and Scheme of Combined Admission Test (CAT) **for Lateral Entry in B. Tech.**

For admission to the second year of B.Tech.(CSE & IT) program through Lateral Entry, Combined Admission Test (CAT) may be conducted (if required), of 3 papers: (1) Mathematics (2) Engineering Mechanics (3) Technical English, each containing 50 objective questions. The duration of examination will be of 2 hours 15 minutes. There will be no negative marking for the wrong answer.

Mathematics

1. **Solid Geometry** : Cartesian, cylindrical, Polar, Spherical Polar Co-ordinates, Direction ratios and direction cosines, equations of Planes and Straight lines shortest distance, Co-ordinate transformations Spheres, Cones Cylinders, Ellipoids, Paraboloids and Hyperboloid, Standard equations. With illustration, tangent, planes and normals.
2. **Differential Calculus** : Review of limit, Continuity and differentiability of functions of Single Variable with terminology, Properties of Continuous functions, geometrical illustrations, applications of differentiation to approximate computations, Successive differentiation, Leibnitz rule, Rolle's theorem, Cauchy's mean value theorem (Lagrange mean value theorem as a special case). Taylor and maclaurin expansions, L-Hospital rule, Review of maxima and minima of function of Single Variable, Concavity and convexity of a Curve, Points of inflexion, asymptotes and Curvature. Limit Continuity and differentiability of function, geometrical interpretations, differentials, derivatives of composite and implicit function, derivative of higher orders and their Commutativity, euler's theorem on homogeneous function. Taylor expansion of functions of several variables, maxima and minima of functions of several variables. Lagrange method of multipliers.
3. **Integral Calculus** : Riemann integrals (upper and lower sums), definite integral as the limit of a sum, fundamental theorem of integral calculus, mean value theorems, evaluation of definite integrals, reduction formula, convergence of improper integrals, tests of convergence, beta and gamma functions, elementary properties, differentiation under integral sign, differentiation of integrals with variable limits, Leibnitzrule, integrals dependent on a parameter applications, Rectification, double and triple integrals, computation of surfaces and volumes, change of variables in double integrals, Jacobean transformations, integrals dependent on parameters application.
4. **Differential Equations** : First order equation variable separable, exact, homogeneous, linear and bernoulli's form , second order equations with constant coefficients, Euler equations, methods of their solution, dependence and independence of Solutions, wronskian systems of first order equations (Simple type).
5. **Vector Calculus** : Scalar and vector fields, level surfaces, directional derivative, gradient, curl, divergence, laplacian, line and surface integrals, theorem of green, Gauss and stokes, Orthogonal Curvilinear coordinates, Infinite Series, Sequence and series their convergence and divergence, test of convergence, Power series – uniform and absolute convergence.
6. **Matrices** : Algebra of matrices, vector space, linear dependence of vectors, rank and inverse of a matrix, solutions of algebraic equations, consistency conditions, eigen value and eigen vectors, similarity transformation reduction to a diagonal matrix.
7. **Fourier series**: its convergence, Dirichlet conditions, half range series.

ENGINEERING MECHANICS:

1. **Introduction**: Idealization of Mechanics, concept of Rigid Body. External Forces [Body forces & Surface Forces], Laws of Mechanics.

2. **Various Methods** : Equality and Equivalence of vectors, Free and Bound Vectors, Principle of transmissibility of forces, Moment of force about a point and about a line couple and moment of a couple, couple moment as a free vector, Addition and subtraction of couples.
3. **Various Systems of Forces**: Statically Equivalent Force System, Simplest Equivalent of a system of forces.
4. **Equilibrium**: Force analysis, free Body Diagram, Equations of equilibrium and their applications to various system of forces, plane Trusses.
5. **Friction**: Friction on dry surfaces, static, kinetic and rolling friction, applications to inclined planes, wedge and blocks and belts and pulleys.
6. **Kinematics and Kinetics of particle**: Rectilinear and Curvilinear translations, Normal and tangential components of acceleration, projectile motion on a smooth vertical curve.
7. **Impulse and Momentum**: Linear Impulse and linear momentum, Central Impact of elastic, semi elastic & plastic bodies.
8. **Kinematics and Kinetic of Rigid Bodies** : angular velocity and angular acceleration, effective Forces on a rigid body, D'Alembert's principle Application to Highways and Railway tracks, Instantaneous centre of rotation, compound pendulum, centre of percussion Rotation of Rigid bodies, Rolling motion, plane motion of rigid bodies, simple application Four bar mechanism.
9. **Work Energy and Power**: work done by forces and couples, potential, Elastic and kinetic energy, work energy, conservation of energy, concept of power and efficiency.

TECHNICAL ENGLISH:

1. **Grammar and Comprehension**: (a) Subject – Verb concord (b) Tense (c) Voice (d) Synthesis (e) Common Errors (f) Vocabulary, Unseen passage will be set to test the language skills mentioned above.
2. **Business Correspondence**: (a) drafting Official and Business Letters (b) Drafting Circulars and Official Orders/Instructions (c) Drafting Minutes and Agenda of the Meeting.
3. **Elementary Spoken English**: Elementary theory of phonetics.
4. **Sentence and paragraph Writing.**
5. **Report Writing**: (i) Importance of Reports in the present day Industrial Set-up (ii) Classification of Reports (iii) Writing of Reports- (a) Format (b) Mechanics of language.
6. **Technical Description of things and Processes.**
7. **Precise Writing.**
