



Instructions:

1. Entrance test question paper consists of multiple choice questions for 100 Marks and it is Classified as Part-A, Part-B & Part- C
2. Entrance Test Duration shall be 3 hours
3. Part-A shall be Subject specific for 50 Marks.
Part – B shall be General Aptitude for 30 Marks
Part – C shall be Mathematics for 20 Marks

Part – A
Subject Specific (Engineering Discipline)
Mechanical Engineering - 50 Marks

1. Metallurgy and Materials Engineering

Crystal structures, defects in crystals structure, Diffusion, elastic and plastic deformation, generalized Hooke's law, phase diagrams, Gibbs phase rule, lever rule, Iron carbon diagram, heat treatment of steels and aluminium alloys, TTT diagrams, CCT diagrams, formation of austenite, martensite transformation, austenite transformation, corrosion and corrosion prevention by alloying, coating, creep, fatigue, fracture, engineering alloys, ferrous and non-ferrous alloys, advanced materials, nano materials, composite materials, smart materials and shape memory alloys.

2. Design Engineering

Engineering Mechanics: Free body diagrams and equilibrium, trusses and frames, virtual work, kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations.

Strength of Materials: Stress and strain, stress-strain diagrams and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders and thick cylinders, shear force and bending moment diagrams, bending and shear stresses, columns.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; whitworth quick return mechanisms, links, three bar and four bar mechanisms, gear trains, flywheels, governors.

3. Thermal Engineering

Fluid Mechanics: Fluid properties; fluid statics, manometer, buoyancy; control-volume analysis

of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, heat exchanger performance, LMTD and NTU methods.

Thermodynamics: Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. Irreversibility and availability; behavior of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle

4. Manufacturing Engineering

Metal Casting, forming and joining: Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, and drawing) and sheet (shearing, deep drawing, and bending) metal forming processes; principles of powder metallurgy. Welding, brazing, soldering and adhesive bonding.

Machining and Machine Tool Operations: Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, jigs and fixtures. Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; gauge design interferometry; form and finish measurement; alignment and testing methods tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools. Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning. Inventory Control: Deterministic and probabilistic models; safety stock inventory control systems.

References:

1. Engineering Mechanics, S SBhavikatti, K. G. Rajashekarappa, New Age international (P)

Ltd.,Publisher

2. Engineering Mechanics Statics and Dynamics, N H Dubey Tata McGraw-Hill Education, 2013 -Dynamics
3. Strength of Materials S SBhavikatti,Vikas Publishing House -1 Pvt Ltd,2nd Edition2006
4. Theory of Machine – S S Rattan 3rd Edition, Tata McGraw-Hill Education,2013.
5. Theory of Machine – Dr.Sadhu Singh 2rd Edition, PearsonPublication.
6. Mechanical Vibrations, S SRao, Pearson Education Inc., 4th edition,2003.
7. Mechanical Vibrations, G K Grover, Nem Chand and Bros, 6th edition,1996.
8. Design of Machine Elements, V B Bhandari, Tata McGraw Hill Publishing Company Ltd., NewDelhi.
9. Fluid Mechanics , Dr. Bansal R K ,Lakshmi Publications, 2004
10. Heat and Mass Transfer , Mahesh M Rathore, Laxmi Publications
11. Basic and Applied Thermodynamics,Nag P K, Tata McGraw HillPub.Co,2002
12. Fluid Mechanics and Machinery, Dr. Bansal R K ,Lakshmi Publications,2004.
13. MaterialScience&Engineering,WillamDCallisterJr,JohanWiley&Sons.,Iic,5th Edition 2001.
14. WorkshopTechnology A K HazaraChowdray& S K HazaraChowdray , Media promoters and Publishers pvt. Limited,2007
15. Manufacturing Technology-1 Dr. K Radhakrishna ,Sapna Book House, 5th Edition2009.
16. Engineering Metrology , R K Jain ,KhannaPublishers,1994.
17. Automation, Production Systems and Computer Integrated Manufacturing, M PGroover ,Pearson Education ,Third Edition, 2008.
18. SamueEilon “Elements of Production, Planning and Control, 1st Edition, Universal Publishing Corp.,1999.

Part - B

General Aptitude Test Syllabus (Weightage 30%)

Common to all branches

1. Arithmetical Ability,
2. Data Interpretation,
3. Verbal Ability,
4. Numerical Analysis Quantitative ability,
5. Reading Comprehension data Sufficiency
6. Logical Reasoning, computer awareness.

Reference Books:

1. Quantitative Aptitude by R S Agarwal
2. Fast Track Objective Arithmetic by Rajesh Verma

Part –C

Mathematics Entrance Test Syllabus for Ph.D - 20 marks Common to all branches

Linear Transformations: The algebra of Linear Transformation, singular and non-singular transformations, characteristic polynomials, minimal polynomials, Rank and Nullity, Eigen values and Eigen vectors.

Solutions of Linear System of Equations : Introduction to Direct Methods via., Gauss Elimination method, Gauss-Jordan method. Iteration Methods: Gauss Jordan methods, Gauss-Seidel method, Successive Over relaxation method and problems on each method.

Fourier Series : Dirichlet's conditions, Expansions of Periodic functions into Fourier series, Half range Fourier series.

Laplace Transforms: Properties of Laplace transformation, Unit step function, Convolution theorem, Solution of differential equation using Laplace transformation.

Statistical method : Curve fitting by the method of least squares – Fitting the curve of the form $y = ax + b$, $y = ax^2 + bx + c$ and $y = ax^b$. Correlation and regression.

Differential Calculus: polar curves, angle between polar curves, Curvature and radius of curvature, Taylor's and Maclaurin's expansion for a function of single variable.

Differential Equations: Ordinary Differential Equations (ODEs): Existence and Uniqueness of Solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs.

Numerical methods : Solution of ODE of first order : Taylor's series method , Modified Euler's method, RK - 4th method, Milne's method , Newton forward- backward method, interpolation method.

References:

1. B. S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2018
2. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed. (Reprint), 2016.
3. H.K.Dass and Er. Rajnish Verma: "Higher Engineering Mathematics" S.Chand Publication (2014).
4. N.P Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, Latest edition.