Entrance Exam Test Pattern & Syllabus for M Tech Programs

Pattern of Exam

- The entrance examination shall consist of 60 questions to be answered in 90 mins duration.
- Each question shall carry 4 marks for the correct answer.
- **THERE WILL NOT BE ANY NEGATIVE MARKING.**
- The candidate has to indicate the option which in his/her opinion is correct.

- The PG CET for M Tech Programs is proposed to be an Online CBT consisting of Two Sections consisting of 60 Questions to be solved in 90 Mins time.
- Section A (40 % Weightage) (24 Questions)
  o Consisting of General Aptitude and Mathematics
- Section B (60% Weightage) (36 Questions)
  o Consist of 3 Parts. Candidates will be required to take any one part.
  o Each part will cover questions based on the specialization
    - Part 1: Computer Science & Engineering
    - Part 2: Electronics & Communication Engineering
    - Part 3: Mechanical Engineering

Syllabus for M Tech Programs

Section A: General Aptitude and Mathematics

- Reasoning:

  Analytical Reasoning, Syllogisms, Analogies, Directions, Coding-Decoding, Classification, Alphabet Series, Symbols and Notations, Similarities and Differences, Number Series, Blood Relationships, Arrangements, Statements, Data Sufficiency, Non-verbal Reasoning, Visual Ability, Graphical Analysis, Data Analysis

- Quantitative Aptitude/ Numerical Ability

  Simplifications, Number System, Average, Algebra, Percentage, Time & Work, Simple & Compound Interest, Time & Speed, HCF, LCM Problems, Area, Profit Loss, Bar Graph, Pictorial Graph, Pie Chart, Ratio; Proportion, Permutation Combination.

- Data Interpretation and Graphical Analysis

  Mean, Median, Mode, Measures of Dispersion, Graphical Analysis: Bar Graph, Line Graph, Pie-Chart and Tabulation.

- English

  Vocabulary Usage, Synonyms, Antonyms, Homophones, English Grammar, Comprehension Ability, Selecting Words/Phrases, Sentence completion, Error Detection, Rearrangement of sentences, Reconstruction of sentences.

- Mathematics:

  Linear Algebra: Matrices, algebra of Matrices, determinants, rank, system of linear equations, eigen values and eigen vectors, Cayley- Hamilton Theorem.

  Differential Equations: First order (linear & non-linear) ordinary differential equations, higher order linear differential equations with constant coefficients; Cauchy's and Euler's equations, partial differential equations, variable separable method, Laplace Transforms, solution of ODE using Laplace transform.

  Calculus: Limits, continuity and differentiability, partial derivatives, Euler's theorem, Extreme values of functions of several variables (maxima, minima, saddle points)

  Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Vector identities, line, surface and volume integrals, Gauss's Green's and Stoke's theorems.

  Probability and Statistics: Random Variables, Binomial, Poisson, Uniform, exponential and normal distributions. Mean, Median, mode and standard deviation. Conditional Probability and Bayes Theorem.

Section B: Part 1 (Computer Science & Engineering)

- Digital Logic

  Boolean algebra, Combinational and sequential circuits, Minimization, Number representations and computer arithmetic (fixed and floating point).

- Computer Organization and Architecture

  Machine instructions and addressing modes, ALU, data-path and control unit, Instruction pipelining, pipeline hazards, Memory hierarchy: cache, main memory and secondary storage, I/O interface (interrupt and DMA mode).

- Programming and Data Structures

  Programming in C/python/C++/Java. Recursion, Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

- Algorithms

Searching, sorting, hashing, Asymptotic notations, time and space complexity, Algorithm design techniques: greedy, dynamic programming and divide-and-conquer, Graph traversals, minimum spanning trees, shortest paths.

- Theory of Computation

  Regular expressions and finite automata, Context-free grammars and push-down automata, Regular and context-free languages, pumping lemma, Turing machines and undecidability.

- Compiler Design

  Lexical analysis, parsing, syntax-directed translation, Runtime environments, Intermediate code generation, Local optimisation, Data flow analyses: constant propagation, liveness analysis, common subexpression elimination.

- Operating System

  System calls, processes, threads, inter-process communication, concurrency and synchronization, Deadlock. CPU and I/O scheduling, Memory management and virtual memory, File systems.

- Databases

  ER-model, Relational model: relational algebra, tuple calculus, SQL, Integrity constraints, normal forms, File organization, indexing (e.g., B and B+ trees), Transactions and concurrency control.

- Computer Networks

  Concept of layering: OSI and TCP/IP Protocol Stacks, Basics of packet, circuit and virtual circuit switching, Data link layer: framing, error detection, Medium Access Control, Ethernet bridging, Routing protocols: shortest path, flooding, distance vector and link state routing, Fragmentation and IP addressing, IPv4, CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT), Transport layer: flow control and congestion control, UDP, TCP, sockets, Application layer protocols: DNS, SMTP, HTTP, FTP, Email.

- Software Engineering

  Software process models, Software design, Software Testing and Quality Assurance, Project Planning, Current Trends in Software Engineering (Web Engineering, Agile Technologies)

Section B: Part 2 (Electronics & Communication Engineering)

- Circuits, Signals and Systems

Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, reciprocity, maximum power transfer, Linear 2-port network parameters, wye-delta transformation, Continuous-time signals: Fourier transform, sampling theorem and applications, Classification of Signals & Systems, z-transform, LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, group delay, phase delay.

- Semiconductor Devices

  Energy bands in intrinsic and extrinsic semiconductors, Carrier transport: diffusion current, drift current, continuity equations, P-N junction, Zener diode, BJT, MOSFET, LED, photo diode

- Analog Circuits

  Diode circuits: clipping, clamping and rectifiers, BJT and MOSFET amplifiers: biasing, small signal analysis, Feedback concept, Classification of Feedback amplifiers, Op-amp circuits: Amplifiers, summers, differentiators, integrators, oscillators.

- Digital Electronics

  Number representations: Boolean algebra, arithmetic circuits, code converters, multiplexers, Demultiplexers, Encoders, decoders, Sequential circuits: flip-flops, counters, shift-registers, ADCs and DACs, Semiconductor memories: ROM, RAM, Cache memory, Virtual memory, Computer organization: addressing modes, instruction pipelining

- Control Systems

  Transfer function; Block diagram representation, Signal flow graph, Routh-Hurwitz and Nyquist stability criteria, Bode and root-locus plots

- Communications

  Random processes: autocorrelation and power spectral density, properties of white noise, Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, Information theory: entropy, channel capacity theorem, Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference

- Electromagnetics

  Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector, Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth, Transmission lines: equations, characteristic impedance, impedance matching, Smith chart.

Section B: Part 3 (Mechanical Engineering)

- Applied Mechanics and Design

  Engineering Mechanics: Free-body diagrams and equilibrium; friction and its applications including rolling friction, belt-pulley, brakes, clutches, screw jack, wedge, vehicles, etc.; trusses and frames; virtual work; kinematics and dynamics of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations; Lagrange's equation.

  Mechanics of Materials: Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; concept of shear centre; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.

  Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope.

  Machine Design: Design for static and dynamic loading; failure theories; fatigue strength and the SN diagram; principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

- Fluid Mechanics and Thermal Sciences

  Fluid Mechanics: Fluid properties; fluid statics, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings; basics of compressible fluid flow.

  Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, Heisler's charts; thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes, effect of turbulence; heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan- Boltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis

  Thermodynamics: Thermodynamic systems and processes; properties of pure substances, behaviour of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work

and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.

- Materials, Manufacturing and Industrial Engineering

  Engineering Materials: Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.

  Casting, Forming and Joining Processes: Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.

  Machining and Machine Tool Operations: Mechanics of machining; basic machine tools; 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; abrasive machining processes; NC/CNC machines and CNC programming.

  Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly; concepts of coordinate-measuring machine (CMM).

  Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools; additive manufacturing.