

Question Type for M.Tech Admission Test (MTAT) : 2019

Question setting type will be uniform for all the departments as follows :

- i. Qs 1 to Qs 40 (MCQ type), carrying 1 mark each with 25% negative mark for each wrong answer.
- ii. Qs 41 to Qs 50 (MCQ type) carrying 2 marks each with 25% negative mark for each wrong answer.
- iii. Qs 51 to Qs 60 (Fill up the blanks), carrying 2 marks each.
- iv. Qs 61 to Qs 65 (Subjective), carrying 4 marks each.

Syllabus for M.Tech Admission Test (MTAT) : 2019

CIVIL ENGINEERING

DESIGN OF CIVIL ENGINEERING STRUCTURES

1. Fluid Mechanics, Open Channel Flow and Hydrology, Water Resources and Engineering:

1.1 Fluid Mechanics: Fluid properties and their role in fluid motion, fluid statics including forces acting on plane and curved surfaces. Kinematics and Dynamics of Fluid flow: Velocity and accelerations, stream lines, equation of continuity, irrotational and rotational flow, velocity potential and stream functions. Continuity, momentum and energy equation, Navier-Stokes equation, Euler's equation of motion, application to fluid flow problems, pipe flow, sluice gates, weirs. Dimensional Analysis, Laminar flow between parallel, stationary and moving plates, flow through tube. Boundary layer: Laminar and turbulent boundary layer on a flat plate, laminar sub layer, smooth and rough boundaries, drag and lift. Turbulent flow through pipes: velocity distribution and variation of pipe friction factor, hydraulic grade line and total energy line

1.2 Open channel flow: Uniform and non-uniform flows, momentum and energy correction factors, specific energy and specific force, critical depth, rapidly varied flow, hydraulic jump, gradually varied flow, classification of surface profiles,

1.3 Hydrology: Hydrological cycle, precipitation, evaporation, transpiration, infiltration, overland flow, hydrograph, flood frequency analysis, flood routing

1.4 Irrigation Engineering: Water requirements of crops: consumptive use, duty and delta, irrigation methods and their efficiencies. (ii) Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most

efficient section, lined canals, their design, regime theory, critical shear stress, cross drainage works

2. **Geotechnical Engineering:** Soil Type and structure - gradation and particle size distribution - consistency limits. Water in soil - capillary and structural - effective stress and pore water pressure - permeability concept - field and laboratory determination of permeability - Seepage pressure - quick sand conditions - Shear strength determination - Mohr Coulomb concept. Compaction of soil - Laboratory and field tests. Compressibility and consolidation concept - consolidation theory - consolidation settlement analysis. Earth pressure theory and analysis for retaining walls, Application for sheet piles and Braced excavation. Bearing capacity of soil - approaches for analysis - Field tests - settlement analysis - stability of slope of earth walk. Subsurface exploration of soils - methods Foundation - Type and finding safe bearing capacity. Pile and well foundation.
3. **Structural Analysis, Design of structures:**
 - 3.1. **Structural Analysis:** Castigliano's theorems I and II, unit load, Method of consistent deformation applied to beams and pin jointed trusses, Rolling loads and Influences lines: Influences lines for Shear Force and Bending moment at a section of beam. Criteria for maximum shear force and bending Moment in beams traversed by a system of moving loads. Influences lines for simply supported plane pin jointed trusses. Slope deflection, moment distribution,
 - 3.2 **Structural Steel Design: Structural Steel:** Bolted and welded joints and connections. Design of tension and compression member,
 - 3.3 **Design of Concrete Structures:** Concept of mix design. Reinforced Concrete: Working stress and Limit State method of design-Recommendations of I.S. codes Design of one way and two way slabs, stair-case slabs, simple and continuous beams of rectangular, T and L sections. Compression members under direct load with or without eccentricity, Pre-stressed concrete.
4. **Building Materials :**

Basic Physical Properties. types, classification and various Physical laboratory tests of Cement, Bricks, Stone aggregate, Timber and steel.

Electrical Engineering

INSTRUMENTATION & CONTROL ENGG

1. **Electrical Science:** Network Theorems, D.C. networks, A.C. network fundamentals & phasor concepts, Series-Parallel A.C. networks, Energy & Power in electric circuits.
2. **Electrical Circuit Analysis/Signals & Systems:** Transients, Resonance, Transforms & properties: Laplace, Fourier, Z-transform, Discrete-time Fourier Transform, Discrete Fourier Transform, Fast Fourier Transform, Electrical Circuit Analysis using Laplace & Fourier Transforms, Properties of networks in terms of poles and zeros, Transfer function, Resonant circuits, Three-phase circuits, Two-port networks.

3. (A) Basic Electronics/Analog Electronics: Physics of Semiconductors, Diodes &

circuits, BJ Transistors and their CB, CE & CC configurations, h-parameter models, emitter-resistor model, FETs and circuit models, Feedback amplifiers, Power amplifiers: Class A, B, AB, C amplifiers. (B) Advance Electronics/Linear Electronics: Op Amp fundamentals and circuits, Oscillators, Filters, ADC, DAC, Pulse shaping circuits & waveform generators, Rectifiers & Regulated power supplies.

4. Digital Electronics & Logic Design: IC logic families : DTL, TTL, ECL, NMOS, PMOS & CMOS gates and their comparison, Logic gate circuits, Combinatorial Logic design using K-map, Multiplexer, Demultiplexer, Decoder, Encoder, Adder, Subtractor, Comparator, Multiplier, Divider, Latch, Sequential logic circuits: Flip-flops, Registers, Counters & Waveform generators, ROMs & Semiconductor Memories.

5. (A) Electrical Machines: Theory, construction, losses & efficiency, operation of Transformer, D.C. Machines, Synchronous Machines, Single Phase Induction motor, 3-phase Induction machines, Universal motor. (B) Power Electronics & Electric Drives: Power devices – Diode, Power transistor, Thyristor, Triac, Gate Turn-Off Thyristor (GTO), Power MOSFET, UJT; Diac & IGBT; Rectifier, Inverter, Chopper, Cycloconverter.

6. Fundamentals of Computing using C: Sorting: Sequential, Bubble, Selection, Insertion, Quicksort, Merge-sort, Binary Search, Arrays, Lists, Stacks, Queues, Trees, Graphs, Addition, Subtraction, Multiplication of Matrices & Sparse-matrices, Writing to Files & Computer monitor, Reading from keyboard & files.

7. 8085 Microprocessor & interfacing: Architecture, Assembly language programming, Memory interfacing – Address & Word expansion, IO interfacing - Memory map & IO map, Peripheral Interfacing Devices: 8255, 8156, 8259, 7-segment LED display.

8. (A) Electrical Measurements & Measuring Instruments: Potentiometers, Bridges, Digital meters, Digital Storage Oscilloscopes, Measurement of Current, Voltage, emf, Power, Frequency, Resistance, Inductance, Capacitance. (B) Transducers: Classification and Selection of Transducers, Construction principle and Applications of Diaphragms, Bellows, Bourden tubes, Springs, Capacitive, Piezoelectric and Photoelectric transducers.

9. Automatic Control Systems: Concept of automatic control systems; Classifications of Control systems; Block diagram and signal flow graphs; Mathematical modelling of physical systems: Potentiometer, Synchros, DC & AC Servomotors, Rotating Amplifier, Stepper Motor, Tachogenerators; Transient and steady state response of control systems; Effect of feedback on stability and sensitivity; Root locus techniques; Frequency response analysis: Bode plot, Concepts of gain and phase margins; Constant-M and Constant-N Nichol's Chart; Approximation of transient response from Constant-N Nichol's Chart; Approximation of transient response from closed loop frequency.