भारतीय सूचना प्रौद्योगिकी संस्थान भागलपुर
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY BHAGALPUR
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Ref: IIITBH/REG/2021/662 **Date: 28/07/2021**

With reference to Advt. No.: IIITBH/Advt/2021/03/M.Tech & IIITBH/Advt/2021/04/PhD, dated 02-06-2021, regarding admission in M.Tech & PhD programmes for year 2021-22, the instructions for admission test are as follows:

1. The admission test will be conducted in **online mode** in two phases. Phase-I: General Aptitude, and Phase-II: Departmental Core Subjects.
2. The admission test will be conducted for the Phase-I starting from 11:00 AM to 12:00 Noon and Phase-II from 12:30 PM to 01:30 PM on 2nd August, 2021.
3. The successful candidates in the admission test will be called for an interview. The list of successful candidates in the admission test will be published in the Institute website on 2nd August, 2021.
4. The syllabus for admission test of Phase-I (General Aptitude) will be as per GATE syllabus for admission in M.Tech and PhD applicants for all the departments.
5. The syllabus for admission test of Phase-II (Departmental Core Subjects) will be as per respective departmental GATE syllabus for admission in M.Tech and PhD applicants for Dept. of Computer Science and Engineering, Dept. of Electronics and Communication Engineering, and Dept. of BSH (Mathematics). The Phase-II syllabus for the Dept. of Mechatronics Engineering is enclosed in Annexure-I.
6. The link for admission test for Phase-I and Phase-II will be provided in your email at the time of examination.
7. You are instructed to be ready 10 minutes before the examination time as mentioned above with Laptop/Desktop having high-speed internet connection.
8. IIIT Bhagalpur will not be responsible for any technical issues related to internet, laptop/desktop etc.
9. In case of any other issues during the admission test, you may contact the following persons:
   a. **Dept. of Computer Science and Engineering**
      Dr. Dilip Kr. Choubey, Assistant Professor, Dept. of CSE
      Mob: +91-7903300713
   b. **Dept. of Electronics and Communication Engineering**
      Dr. Suraj, Assistant Professor, Dept. of ECE
      Mob: +91-9727320796
   c. **Dept. of Mechatronics Engineering**
      Dr. Abhinav Gautam, Assistant Professor, Dept. of MEA
      Mob: +91-9162645874
   d. **Dept. of BSH (Mathematics)**
      Dr. Pankaj Kr. Tiwari, Assistant Professor, Dept. of BSH
      Mob: +91-9830724874

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Annexure-I

The topics for admission test (Phase-II) in Mechatronics Engineering department is as follows: (Section 1 to 3 from GATE-Mechanical Engineering Syllabus and Section 4 to 6 from GATE- Electrical Engineering Syllabus)

Section 1: Engineering Mathematics

Linear Algebra: Matrix algebra, systems of linear equations, eigenvalues and eigenvectors. Calculus: Functions of single variable, limit, continuity and differentiability, mean value theorems, indeterminate forms; evaluation of definite and improper integrals; double and triple integrals; partial derivatives, total derivative, Taylor series (in one and two variables), maxima and minima, Fourier series; gradient, divergence and curl, vector identities, directional derivatives, line, surface and volume integrals, applications of Gauss, Stokes and Green's theorems.

Differential equations: First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; Laplace transforms; solutions of heat, wave and Laplace's equations.

Complex variables: Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series.

Probability and Statistics: Definitions of probability, sampling theorems, conditional probability; mean, median, mode and standard deviation; random variables, binomial, Poisson and normal distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations; integration by trapezoidal and Simpson's rules; single and multi-step methods for differential equations.

Section 2: 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.

Vibrations: Free and forced vibration of single degree of freedom systems, effect of damping; vibration isolation; resonance; critical speeds of shafts.

Machine Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N 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.

Section 3: 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;

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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.

Section 4: Electrical Machine

Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three-phase transformers: connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines.

Section 5: Signals and Systems

Representation of continuous and discrete time signals, shifting and scaling properties, linear time invariant and causal systems, Fourier series representation of continuous and discrete time periodic signals, sampling theorem, Applications of Fourier Transform for continuous and discrete time signals, Laplace Transform and Z transform.

Section 6: Control Systems

Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems, R.M.S. value, average value calculation for any general periodic waveform.

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