SYLLABUS AND MODEL QUESTIONS FOR DIFFERENT PROGRAMMES UNDER SCHOOL OF ENGINEERING

(These questions are representative samples only, not complete question set. Candidates are requested to see the 'Syllabus' for reference)

Syllabus for Tezpur University Entrance Examinations (TUEE) 2020

Ph.D. in Civil Engineering

Soil formation, Soil structure, Soil properties, Permeability and seepage, Stress distribution in soils, Compaction, Consolidation, Shear strength, Soil exploration & site investigation, Shallow foundations, Deep Foundations, Ground improvement techniques, Lateral earth pressure, Stability of slope, Introduction to soil dynamics & machine foundation, Liquefaction of soils, Pavement material.
Water and Wastewater Quantity Estimation, Water Quality, Microbiology, Environmental Chemistry, Dissolved oxygen Model, Sewer Design, Type I and II suspensions, Sedimentation Tanks, Coagulation and Flocculation, Hydraulics of Filtration, Disinfection Methods, Ion exchange and Adsorption, Water Softening, Manganese and Iron Removal, Waste water treatment, Septic tank, wastewater stabilization ponds, aerated ponds and oxidation ditches.

Model Questions

1. Atterberg limts are applicable for
(A) Gravels
(B) Clayey soils
(C) Sand
(D) Boulders

2. In Indian standard plasticity chart, group symbol CI denotes
(A) Inorganic clay of high plasticity
(B) Inorganic silt of low plasticity
(C) Organic clay of medium plasticity
(D) Inorganic clay of medium plasticity

3. Which of the following soil groups possesses the lowest permeability?
(A) Gravel
(B) Sand
(C) Clay
(D) Silt

4. Increase in compactive effort in standard Proctor test results in
(A) Increase in both MDD and OMC
(B) Increase in OMC and decrease in MDD
(C) Decrease in both MDD and OMC
(D) Increase in MDD and decrease in OMC

5. Which of the following is the quickest among all types of triaxial tests?
(A) CD test
(B) CU test
(C) UU test
(D) PU test

Syllabus for Tezpur University Entrance Examinations (TUEE) 2020

M.Tech. in Civil Engineering

Geotechnical Engineering : Soil Mechanics: Origin of soils, soil structure and fabric; Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Permeability - one dimensional flow, Darcy's law; Seepage through soils - two-dimensional flow, flow nets, uplift pressure, piping; Principle of effective stress, capillarity, seepage force and quicksand condition; Compaction in laboratory and field conditions; One-dimensional consolidation, time rate of consolidation; Mohr's circle, stress paths, effective and total shear strength parameters, characteristics of clays and sand.

Foundation Engineering: Sub-surface investigations - scope, drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests; Earth pressure theories - Rankine and Coulomb; Stability of slopes - finite and infinite slopes, method of slices and Bishop's method; Stress distribution in soils - Boussinesq's and Westergaard's theories, pressure bulbs; Shallow foundations - Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays; Deep foundations – types of piles, dynamic and static formulae, load capacity of piles in sands and clays, pile load test, negative skin friction.

Environmental Engineering: Water and Waste Water: Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater.

Engineering Mechanics: System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Friction and its applications; Kinematics of point mass and rigid body; Centre of mass; Euler's equations of motion; Impulse-momentum; Energy methods; Principles of virtual work.

Solid Mechanics: Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Theories of failures; Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, buckling of column, combined and direct bending stresses.

Construction Materials: Concrete - constituents, mix design, short-term and long-term properties; Bricks and mortar; Bitumen.

Water Resources Engineering : Properties of fluids, fluid statics; Continuity, momentum, energy and corresponding equations; Potential flow, applications of momentum and energy equations; Laminar and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth.

Transportation Engineering: Geometric design of highways - cross-sectional elements, sight distances, horizontal and vertical alignments; Highway Pavements: Highway materials - desirable properties

Surveying : Principles of surveying; Errors and their adjustment; Maps - scale, coordinate system; Distance and angle measurement - Levelling and trigonometric levelling; Traversing and triangulation survey;

Model Questions

1. As per Indian standard plasticity chart, the group symbol ‘CI’ denotes

(A) Inorganic clay of intermediate plasticity

(B) Organic clay of intermediate plasticity

(C) Inorganic clay of high plasticity

(D) Inorganic silt of intermediate plasticity

2. The maximum value of degree of saturation (Sr) of soil is

(A) 95%

(B) 100%

(C) 80%

(D) 0%

3. Which of the following soil groups possesses the lowest permeability?

(A) Gravel

(B) Sand

(C) Clay

(D) Silt

4. Which of the followings is the quickest among all types of Tri-axial tests?

(A) CD test

(B) CU test

(C) UU test

(D) PU test

5. Which of the following tests is performed for laboratory determination of permeability of finegrained soils?

(A) Constant head test

(B) Falling head test

(C) Field pumping test

(D) Vane shear test

Syllabus for Tezpur University Entrance Examinations (TUEE) 2020

Ph.D. in Computer Science and Engineering

Basics of programming in C, elementary data structures such as - arrays, lists, stacks, queues, trees, recursion; Discrete mathematics, Design and analysis of algorithms, Digital Logic, Computer organization and architecture, Operating systems, Theory of computation, Database management systems, Computer networks and Compiler Design.

Model Questions

1. What is the octal equivalent of the hexadecimal number (7B43.52)16
(A) (75003.234)8
(B) (75503.244)8
(C)(70503.224)8
(D) (75500.244)8

2. For the following Boolean expressions, which of the statements is true?
F1 = wy +w $\bar{x}y$ +w yz
F2 = wx$y$ +$\bar{x}y$ +w yz
F3 = wy +$\bar{x}y$ $\bar{z}$+w $\bar{x}$z+w y z
F4 = w xy +wy+y$\bar{z}$
(A) F1=F3 and F2=F4
(B) F1= F2
(C) F1=F2=F3
(D) F3=F4

3. If the hit ratio to a TLB is 80%, and it takes 15 nanoseconds to search the TLB, and150 nanoseconds to access the main memory, then what must be the effective memory access time in nanoseconds?
(A) 185
(B) 203
(C) 205
(D) 195

4. The number of negative roots of the equation $x^5 - 2x^3 + 3x^2 - 3x + 1 = 0$ is
(A) 0
(B) 1
(C) 2
(D) cannot determine

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M.Tech. in Information Technology/ Computer Science & Engineering

Programming in C, Computer Organization, Algorithm and Data Structure, System Programming, Operating Systems, Computer Networks, DBMS, Theory of Computation.

Model Questions

1. An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be
(A) 255.255.0.0
(B) 255.255.64.0
(C) 255.255.128.0
(D) 255.255.252.0

2. Which data structure a compiler uses for managing information about variables and their attributes?
(A) Abstract syntax tree
(B) Symbol table
(C) Semantic stack
(D) Parse table

3. Banker's algorithm for resource allocation deals with
(A) deadlock prevention
(B) deadlock avoidance
(C) deadlock recovery
(D) mutual exclusion

4. Which one of the following in place sorting algorithms needs the minimum number of swaps?
(A) Quick sort
(B) Insertion sort
(C) Selection sort
(D) Heap sort

5. Consider the regular expression (a|b)(a|b). The given regular expression denotes which of the following sets?
(A) {a, b, ab, aa}
(B) {a, b, ba, bb}
(C) {a, b}
(D) {aa, ab, ba, bb}

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

Master of Computer Application (MCA)

Logical Reasoning, Basic Mathematical Ability, Mathematics (10+2 Level), Fundamentals of Computer Science, English Vocabulary and composition.

Model Questions

1. ENTRY: GPVTA :: ____: CFOKP
(A) ADMIN
(B) EHQMR
(C) DANIM
(D) BENJO

2. DOG : BARK :: COW : ____
(A) BOO
(B) FOO
(C) MOO
(D) COO

3. If 78 is mapped to 15, 59 is mapped to 14, 47 is mapped to 11 then 56 will be mapped to _
(A) 11
(B) 12
(C) 13
(D) 10

4. Find the odd one among the following.
(A) (8, 3, 2)
(B) (63, 4, 3)
(C) (14, 6, 2)
(D) (24, 5, 2)

5. Find the missing number of the series 2, 5, 10, __, 26, 37
(A) 17
(B) 20
(C) 15
(D) 16

Syllabus for Tezpur University Entrance Examinations (TUEE) 2020

Ph. D. in Electronics and Communication Engineering

Standard P.G. /U.G. courses in Electronics and Communication (ECE) and ECE related PG courses

Model Questions

1. Which neurotransmitter(s) make membrane potential less negative?
(A) Excitatory only
(B) Inhibitory only
(C) Both Excitatory and Inhibitory
(D) Neither Excitatory nor Inhibitory

2. Action potential is generated due to change in membrane potential in nerve cells due to
(A) large amount of positively charged protein flow out of the cel
(B) B. large amount of negatively charged protein flow out of the cells.
(C) large amount of Na+ ions flow inside the cells.
(D) large amount of glucose flow inside the cells.

3. The condition that decides the oscillator's output frequency is
(A) loop gain should at least be unity.
(B) loop phase shift should be zero or integral multiple of 2p radians.
(C) loop gain should be precisely unity.
(D) loop phase shift should be precisely zero radian.

4. Most popular oscillator configuration for audio applications is
(A) Hartley oscillator.
(B) Colpitt's oscillator.
(C) Wein bridge oscillator.
(D) RC phase shift oscillator.

5. The output voltage at no load in an unregulated power supply is the same as its output voltage at rated load current. Its internal resistance therefore
(A) extremely small .
(B) zero
(C) infinite.
(D) extremely large.

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M.Tech. in Bioelectronics

B.E/B.Tech. level courses in Electronics Engineering, Electrical Engineering, Instrumentation Engineering, Communication Engineering, Biomedical Engineering, Chemical Engineering, Bioengineering, Computer Science and Engineering, Biotechnology.

M.Sc. level courses on Chemistry, Biophysics, Molecular Biology, Cell Biology and Molecular Biology and Biotechnology.

Model Questions

1. A load cell is a
(A) Strain gauge
(B) Photovoltaic cell
(C) Thermistor
(D) Pressure pick up

2. Which of the following is acceptor impurity element?
(A) Antimony
(B) Gallium
(C) Arsenic
(D) Phosphorus

3. Depletion region in a pn diode is due to
(A) Reverse biasing
(B) Forward biasing
(C) An area created by crystal doping
(D) An area void of current carriers

4 Which of the following is used in pencils?
(A) Graphite
(B) Charcoal
(C) Silicon
(D) Phosphorous

5. The gas usually filled in the electric bulb is
(A) Nitrogen `
(B) Hydrogen
(C) Carbon dioxide
(D) Oxygen

Syllabus for Tezpur University Entrance Examinations (TUEE) 2020

M.Tech. in Electronics Design and Technology

B.E. or equivalent level courses on Electronics and Communication Engineering, Electrical Engineering/ AMIE level courses in Electronics/Instrumentation Engineering

Model Questions

1. A battery is connected to a resistance causing a current of 0.5 A in the circuit. The current drops to 0.4 A when an additional resistance of 5 is connected in series. The current will drop to 0.2 A when the resistance is further increased by
(A) 30 Ω
(B) 25 Ω
(C) 12 Ω
(D) 40 Ω

2. A 10 μF capacitor is connected across a 10 V source. The steady state value of current is
(A) 10 μA
(B) 106 A
(C) 1 A
(D) zero A

3. A 10 μF capacitor is connected across a 10 V source. The steady state value of current is
(A) 10 μA
(B) 106 A
(C) 1 A
(D) zero A

4. A 150 V dc motor of armature resistance 0.4 Ω has back emf of 142V. The armature current is
(A) 10 A
(B) 20 A
(C) 150 A
(D) 100 A

5. A good voltage regulation of a transformer means
(A) difference between primary and secondary voltage is maximum
(B) difference between primary and secondary voltage is least
(C) difference between no load output voltage to full load output voltage is maximum
(D) difference between no load output voltage to full load output voltage is least

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

Ph.D in Energy

Energy conversion and Energy systems, Energy-Environment interaction.

Model Questions

1. Which of the following is the least combustible?
(A) CO_2
(B) H_2
(C) CO
(D) CH4

2. North-Eastern region of India has no
(A) Nuclear Power Plant
(B) Hydro-Electric Power Plant
(C) Coal Power Plant
(D) Gas Power Plant

3. The value of 1eV is
(A) 1.6×10^{-17} joule.
(B) 1.6×10^{-18} joule.
(C) 1.6×10^{-19} joule.
(D) 1.6×10^{-20} joule.

4. The example of external combustion engine is
(A) Diesel Engine.
(B) Steam Engine.
(C) Petrol Engine.
(D) Jet Engine.

5. A major disadvantage of using wind to produce electricity is
(A) The amount of emission it produces.
(B) Its lower level of energy efficiency compared to conventional power sources.
(C) The noise created during operation.
(D) The initial start-up cost

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M. Tech. in Energy Technology

Energy sources and Energy conservation, Graduate level courses in Science and Engineering

Model Questions

1. Largest hydropower project in the world is being constructed in
(A) USA
(B) China
(C) Australia
(D) UK

2. The agency to look after the climate changes and for action to cut GHG is
(A) UNFCCC
(B) WHO
(C) DOE
(D) GOI

3. Energy supplied by combustion of fuel is equal to
(A) mass of fuel consumed x its calorific value
(B) mass of fuel consumed x its density
(C) mass of fuel consumed x its specific heat
(D) mass of fuel consumed x its heat capacity

4. The simultaneous production of heat and electricity is called
(A) Rankine cycle
(B) Brayton cycle
(C) Carnot cycle
(D) Cogeneration

5. Energy consumption per unit of GDP is called as:
(A) Energy Ratio
(B) Energy intensity
(C) Per capita consumption
(D) None of the above

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

PhD in Electrical Engineering (*New Programme*)

Electric Circuits

Network graph, KCL, KVL, Node and Mesh analysis, Transient response of dc and ac networks, Sinusoidal steady□state analysis, Resonance, Passive filters, Ideal current and voltage sources, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Two□port networks, Three phase circuits, Power and power factor in ac circuits.

Electromagnetic Fields

Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot□Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits,Self and Mutual inductance of simple configurations.

Signals and Systems

Representation of continuous and discrete□time signals, Shifting and scaling operations, Linear Time Invariant and Causal systems, Fourier series representation of continuous periodic signals, Sampling theorem, Applications of Fourier Transform, Laplace Transform and z-Transform.

Electrical Machines

Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three phase transformers: connections, parallel operation; Auto□ transformer, Electromechanical energy conversion principles, DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Three phase induction motors: 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, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiency calculations of electric machines.

Power Systems

Power generation concepts, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per□unit quantities, Bus admittance matrix, GaussSeidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over□current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

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, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and Lead□Lag compensators; P, PI and PID controllers; State space model, State transition matrix.

Electrical and Electronic Measurements

Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

Analog and Digital Electronics
Characteristics of diodes, BJT, MOSFET; Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: Biasing, Equivalent circuit and Frequency response; Oscillators and Feedback amplifiers; Operational amplifiers: Characteristics and applications; Simple active filters, VCOs and Timers, Combinational and Sequential logic circuits, Multiplexer, Demultiplexer, Schmitt trigger, Sample and hold circuits, A/D and D/A converters, 8085Microprocessor: Architecture, Programming and Interfacing.

Power Electronics
Characteristics of semiconductor power devices: Diode, Thyristor, Triac, GTO, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost converters; Single and three phase configuration of uncontrolled rectifiers, Line commutated thyristor based converters, Bidirectional ac to dc voltage source converters, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters, Single phase and three phase inverters, Sinusoidal pulse width modulation

Engineering Mathematics
Linear Algebra: Matrix Algebra, Systems of linear equations, Eigenvalues, Eigenvectors.

Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Multiple integrals, Fourier series, Vector identities, Directional derivatives, Line integral, Surface integral, Volume integral, Stokes's theorem, Gauss's theorem, Green's theorem.

Differential equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's equation, Euler's equation, Initial and boundary value problems, Partial Differential Equations, Method of separation of variables.

Complex variables: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, Taylor series, Laurent series, Residue theorem, Solution integrals.

Probability and Statistics: Sampling theorems, Conditional probability, Mean, Median, Mode, Standard Deviation, Random variables, Discrete and Continuous distributions, Poisson distribution, Normal distribution, Binomial distribution, Correlation analysis, Regression analysis.

Numerical Methods: Solutions of nonlinear algebraic equations, Single and Multi□step methods for differential equations.

Transform Theory: Fourier Transform, Laplace Transform, z□Transform.

Model Questions

(*Not Available*)

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

B.Tech in Electrical Engineering (*Lateral Entry*)

CORE- ELECTRICAL

DC Circuit Analysis: Electric Circuits Laws: Basic electric circuit terminology, Ohm's law, Kirchhoff's current law (KCL) and Kirchhoff's Voltage law (KVL), circuit parameters (resistance, Inductance and capacitance), series and parallel combinations of resistance, Inductance and capacitance , Nodal analysis. Energy Source, Ideal and Practical voltage and current sources and their transformation, Dependent voltage sources and dependent current sources, D.C. Circuit Analysis, Power and energy relations, Analysis of series and parallel DC circuits, Loop and Nodal methods of circuit analysis, Superposition theorem, Thevenin's and Norton's theorems, maximum Power theorem, Delta - star (Y) Transformation

A.C. Circuit Analysis: Basic terminology and definitions, Phasor and complex number representation, solutions of sinusoidally excited RLC circuits, Power and energy relations in A.C. circuits, Applications of network theorems to A.C. circuits, Resonance in series and parallel circuits, Concepts of active & reactive powers.

Steady State A.C three phases Circuits:, Concept of a 3-phase voltage, wye (Y) circuits. Delta (Δ) circuits, Current and voltage relations in Y and Δ Circuits, Characteristics of a 3 -phase system, Magnetically Coupled circuits, Mutual inductance

Single Phase Transformers: Introduction, classification, construction, electromotive force (e. m. f.) equation, Equivalent circuit model, Phasor diagrams, Losses and efficiency, Voltage regulation, Transformer tests (polarity test, open circuit test and short circuit test), Auto-transformers

Direct current Generators: General introduction, principles of operation of D.C Generators, construction of D.C Generators, Types of DC Generators, e.m.f equation, Types of windings, power stages and efficiency, commutation and armature reaction, characteristics of D.C Generators.

Direct current Motors: Principles of operation of D.C Motors, construction of D.C Motors, Types of DC Motors, Back e.m.f and Torque equation, torque and speed of D.C Motors, characteristics of various types of D.C motors, speed control of D.C motors.

Induction Motors: Construction and working principle of 3 phase Induction motors, types of rotors, rotating magnetic field, slip, effect of slip on rotor parameters, torque equation, torque-speed characteristics, effect of rotor resistance on torque-speed characteristics, Single phase induction motors, staring and applications

PHYSICS

Vector Analysis, Collision of particles, Vibration and acoustics, Electromagnetic Theory, Maxwell's equations, Quantum mechanics, Solid state physics, Superconductivity, Diffraction, Special Theory of Relativity

MATHEMATICS

Differential Calculus, ordinary, linear and non-linear differential equations, Partial Differential Equations, Fourier series, Matrices

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

Ph.D. in Food Engineering and Technology

Food Engineering; Food Chemistry and Nutrition; Food Microbiology; Food Products Technology (as per the outline of GATE syllabus for Food Technology).

Model Questions

1. Among the following, the product, which is rich in protein?
(A) Atta
(B) Maida
(C) Suji (Semolina)
(D) Dalia (Porridge)

2. Unit of viscosity is
(A) Pascal.
(B) Pascal second.
(C) Pascal meter.
(D) Pascal kilogram.

3. Reynold's number is defined as the ratio of
(A) internal force and viscous force.
(B) viscous force and inertial force.
(C) inertial force and pressure.
(D) viscous force and pressure difference.

4. Drying rate drops sharply in the
(A) constant rate phase of drying.
(B) rising phase of drying.
(C) falling rate phase of drying.
(D) falling rate and rising phase of drying.

5. In certain thermal processing operation carried out in a hydrostatic cooker, it is required to maintain a pressure 99.5 kPa (gauge). What is the height of water column in the hydrostatic cooker to retain the pressure?
(A) 760 mm
(B) 760 cm
(C) 1014 cm
(D) 1032 cm

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M. Tech. in Food Engineering & Technology

Part-I: Mathematics and General Engineering

Part-II: Food Engineering; Food Chemistry and Nutrition; Food Microbiology; Food Products Technology (as per the outline of GATE syllabus for Food Technology).

Model Questions

1. Five horses are in a race. Mr. A selects two of the horses at random and bets on them. The probability that Mr. A selected the winning horse is
(A) 4/5
(B) 3/5
(C) 1/5
(D) 2/5

2. The area of the region bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$ is
(A) 2 sq units
(B) 3 sq units
(C) 4 sq units
(D) 6 sq units

3. A bucket of water is hanging from a spring balance. An iron piece is suspended into water without touching any of the sides of bucket from another support. The spring balance reading will
(A) increase
(B) decrease
(C) remain the same
(D) depend on the depth of immersion

4. Flow commences between two parallel plates with the upper plate moving in the direction of flow, while the other plate is stationary. The resulting flow between the plates is called
(A) creep flow
(B) couette flow
(C) plug flow
(D) stokes flow

5. A mass M is suspended from a spring of negligible mass. The spring is pulled a little and then released so that the mass executes SHM of time period T. If the mass is increased by m, the time period becomes 5T/3. then the ratio of m/M is
(A) 3/5
(B) 25/9
(C) 16/9
(D) 5/3

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

B. Tech. in Food Engineering & Technology (*Lateral Entry*)

General Awareness and English (10)+ Engineering Mathematics (15)+ General Engineering(15)+Core(20)*

As per syllabus of First year B.Tech followed at TU.
*As per AICTE approved diploma level syllabi for Food Technology/Food Engineering and Technology.

CORE- FET

1. **Engineering Thermodynamics:** Zeroth law, first law, second law. Concepts of enthalpy, internal energy, entropy and absolute temperature. Properties of pure substances and mixtures, reversibility and irreversibility. Thermodynamics cycles. Refrigeration and air conditioning: Refrigeration cycles, heat pump. Application of refrigeration in food processing and preservation. Food freezing systems. Steam: steam generation, steam properties and application. Psychrometrics: properties of air water vapour mixer; psychrometric properties, charts and relations and psychro metric calculations.

2. **Heat and Mass Transfer:** Principles of heat and mass transfer to heat, different methods of heat transfer, Fourier's Law, Steady state heat transfer through plain and composite slabs, cylindrical and spherical surfaces. Natural and forced convection, concept of overall heat transfer coefficient, LMTD, heat exchangers in food processing, effectiveness of heat exchanger. Fick's Law of diffusion and basic concepts of convective mass transfer.

3. **Basic Fluid Mechanics :** Physical properties of fluids, classification of fluid flow, continuity equations, Bernoulli's equation and its application, steady state flow equation, concept of viscosity, Newtonian and non-Newtonian fluids. Poiseuille's equation. Navier Stoke's equation, flow through parallel plates and circular pipes. Concept of Reynold's number and its application. Pipe and pipe flow, fittings. Pumps, types of pumps and their application and selection.

4. **Food Engineering Operations:** Materials and introduction energy balance for food engineering processes. Size eduction, mechanical expression, mechanical separation, mixing and agitation, emulsification and homogenization. Filtration, membrane separation, sedimentation, centrifugation, crystallization, extraction, distillation, absorption, humidification and dehumidification. Thermal processing of foods, Food concentration: Evaporation, equipments, their selection and calculation. Freeze concentration. Drying and dehydration methods, different kinds of dryers, their selection and design.

5. **Food Microbiology:** Microbiology and reproduction of bacteria. Pure culture technique: serial dilution, pour plate, streak plate, spread plate, slant, broth and enrichment culture, lyophilization. Microbial Growth: Definition, Growth curve, account of different phases, synchronous growth, doubling/ generation time. Relationship between number of generations and total number of microbes. Disinfecting agents and its dynamics. Enzymes, specificity of enzymes, coenzymes, cofactors, Enzymes inhibitors and activators. Applications of enzymes in food industry, immobilized enzymes. Definition, scope and present status of Biotechnology and its applications, Microbial propagation and production of SCP, Fermentation: Fermented and non Fermented food, cereal fermentation.

6. **Food Chemistry:** Importance of different food constituent, Carbohydrate and its classification and functions. Proteins, classification and properties of amino acids. Lipids structure, physical and chemical properties. Vitamins and minerals in food. Food spoilage: Types and factors, Food enzymes,

7. **Food preservation techniques:** Addition of salt, sugar, oil, spices, preservative, drying, evaporation, heat treatment, irradiation, refrigeration, freezing, plant physiology: Transpiration, Ripening, Senescence, Post-Harvest technology and its importance, Climacteric and non-climacteric fruits.

8. **Food Product technology:** Parboiling, Milling of rice, wheat, malting, storage atmospheres: Quality control and quality assurance, different quality attributes: qualitative, hidden and sensory, HACCP and its application, Food adulteration: types, Estimation of moisture, crude, fat, proteins, crude fibre, ash, sampling and its types, BIS, AGMARK, FPA, PFA, FAO

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

Ph.D. in Mechanical Engineering

Engineering Mathematics, Solid Mechanics, Theory of Machines, Machine Design, Engineering Materials, Manufacturing Science, Manufacturing Management, Applied Thermodynamics, Fluid Mechanics, Internal Combustion Engine, Heat Transfer, Power Plant Engineering, Renewable Energy System, Automobile Engineering.

Model Questions

1. Consider the following statement: For a two dimensional potential flow
1. Laplace equation for stream function must be satisfied.
2. Laplace equation for velocity potential must be satisfied.
3. Streamline and equipotential lines are mutually perpendicular.
4. Stream function and potential function are not interchangeable.
(A) 1 & 4 are correct
(B) 2 & 4 are correct
(C) 1, 2 & 3 are correct
(D) 2, 3 & 4 are correct

2. The Euler equation of fluid motion is derived considering the principle of conversation of
(A) mass and the fluid as incompressible and inviscid.
(B) momentum and the fluid as incompressible and viscous.
(C) momentum and the fluid as incompressible and inviscid.
(D) energy and the fluid as incompressible and inviscid.

3. For a Newtonian fluid
(A) the relation between stress and strain is nonlinear.
(B) the relation between stress and strain is linear.
(C) the relation between stress and strain rate is linear.
(D) the relation between stress and strain rate is nonlinear.

4. The Blasius equation with respect to laminar boundary layer flow over a flat plate is a
(A) third order linear ordinary differential equation.
(B) third order linear partial differential equation
(C) third Order nonlinear partial differential equation.
(D) third Order nonlinear ordinary differential equation.

5. Which of the following numerical methods give more accurate results in solving first order ordinary differential equations?
(A) Euler method
(B) Predictor corrector method
(C) Second order Runge Kutta method
(D) Fourth order Runge Kutta method

Syllabus for Tezpur University Entrance Examination (TUEE) 2020

M.Tech. in Mechanical Engineering

Engineering Mathematics, Solid Mechanics, Theory of Machines, Machine Design, Engineering

Materials, Manufacturing Science, Manufacturing Management, Thermodynamics, Fluid

Mechanics, IC Engine, Heat Transfer, Power Plant.

Model Questions

1. An ideal flow of any fluid must fulfil the following
(A) Newton law of motion
(B) Newton's law of viscosity
(C) Pascal's law
(D) Continuity equation

2. Two important forces for a floating body are
(A) Buoyancy, gravity
(B) Buoyancy, pressure
(C) Buoyancy, inertial
(D) Inertial, gravity

3. Cavitation is caused by
(A) High velocity
(B) High pressure
(C) Weak material
(D) Low pressure

4. In tensile test, the phenomenon of slow extension of material at constant load is
(A) Creeping
(B) Yielding
(C) Breaking
(D) Plasticity

5. Flow stress corresponds to
(A) Fluid in motion
(B) Breaking point
(C) Plastic deformation of solid
(D) Rupture stress