

TS ECET-2021

SYLLABUS: MATHEMATICS

(50 Marks)

Unit-I: Matrices

Matrices: Definition of Matrix, Types of matrices-Algebra of matrices-Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Properties-Laplace's expansion-singular and nonsingular matrices-Adjoint and multiplicative inverse of a square matrix-System of linear equations in 3 variables-Solutions by Cramer's rule, Matrix inversion method-Gauss-Jordan method.-Partial Fractions: Resolving a given rational function into partial fractions.Logarithms: Definition of logarithm and its properties, meaning of 'e' exponential function and logarithmic function.

Unit-II: Trigonometry

Properties of Trigonometric functions– Ratios of Compound angles, multiple angles, sub multiple angles – Transformations of Products into sum or difference and vice versa.Properties of triangles: sine rule, cosine rule, tangent rule and projection rule. Solving a triangle when (i) three sides (SSS), (ii) two sides and an included angle(SAS), (iii) one side and two angles are given(SAA).Inverse Trigonometric functions, Hyperbolic functions.

Complex Numbers: Properties of Modulus, amplitude and conjugate of complex numbers, arithmetic operations on complex numbers—Modulus-Amplitude form (Polar form) - Euler form (exponential form)-Properties.

Unit-III: Analytical Geometry

Straight Lines—different forms of Straight Lines, distance of a point from a line, angle between two lines, intersection of two non-parallel lines and distance between two parallel lines. Circles-Equation of circle given center and radius, given ends of diameter-General equation-finding center and radius, center and a point on the circumference, 3 non-collinear points, center and tangent, equation of tangent and normal at a point on the circle.

Unit-IV: Differentiation and its Applications

Functions and limits – Standard limits – Differentiation from the First Principle – Differentiation of sum, product, quotient of functions, function of function, trigonometric, inverse trigonometric, exponential, logarithmic, Hyperbolic functions, implicit, explicit and parametric functions—Derivative of a function with respect to another function-Second order derivatives – Geometrical applications of the derivative(angle between curves, tangent and normal)—Increasing and decreasing functions—Maxima and Minima(single variable functions) using second order derivative only - Partial Differentiation—Partial derivatives up to second order—Euler's theorem.

Unit-V: Integration and its Applications

Indefinite Integral – Standard forms – Integration by decomposition of the integrand, integration of trigonometric, algebraic, exponential, logarithmic and Hyperbolic functions—Integration by substitution –Integration of reducible and irreducible quadratic factors – Integration by parts— Definite Integrals and properties, Definite Integral as the limit of a sum – Application of Integration to find areas under plane curves and volumes of Solids of revolution—Mean and RMS values, Trapezoidal rule and Simpson's 1/3 Rule for approximation integrals

Unit–VI: Differential Equations

Definition of a differential equation-order and degree of a differential equation-formation of differential equations-solution of differential equation of the type first order, first degree, variable-separable, homogeneous equations, exact, linear differential equation of the form $dy/dx+Py=Q$, Bernoulli's equation, 2nd order linear differential equation with constant coefficients both homogeneous and non-homogeneous and finding the Particular Integrals for the functions e^{ax} , $\sin ax$, $\cos ax$, ax^2+bx+c (a,b,c are real numbers)

Unit–VII: Laplace Transforms

Laplace Transforms (LT) of elementary functions-Linearity property, first shifting property, change of scale property multiplication and division by t - LT of derivatives and integrals, Unit step function, LT of unit step function, second shifting property, evaluation of improper integrals, Inverse Laplace transform (I LT)-shifting theorem, change of scale property, multiplication and division by s , ILT by using partial fractions and convolution theorem. Applications of LT to solve linear ordinary differential equations up to second order only.

Unit–VIII: Fourier series

Define Fourier series, Euler's formulae over the interval $(C, C+2\pi)$ for determining the Fourier coefficients. Fourier series of simple functions in $(0, 2\pi)$ and $(-\pi, \pi)$. Fourier series for even and odd functions in the interval $(-\pi, \pi)$.

TS ECET-2021

MODEL QUESTIONS FOR MATHEMATICS

1. If the determinant of the transpose of the matrix $\begin{bmatrix} 2 & 2 & 2 \\ 2 & 2+x & 2 \\ 2 & 2 & 2+y \end{bmatrix}$ is positive, then the point (x,y) lies in

- 1) I and II quadrants 2) **I and III quadrants** 3) II and IV quadrants 4) III and IV quadrants

2. If $f(x)=x^2$ in $(-\pi,\pi)$ and $f(x) = \sum_{n=0}^{\infty}(a_n \cos nx + b_n \sin nx)$, then $a_1 =$

- 1) 4 2) **-4** 3) -4π 4) 4π

3. If $\frac{1}{x^2(x+1)} = \frac{A}{x+1} + \frac{B}{(x)^2} + \frac{C}{x}$ then $A+B+C =$

- 1) 0 2) 3 3) 2 4) **1**

4. The general solution of the corresponding Homogeneous differential equation of $(D^2 + 9)y = \cos 3x$ is

- 1) **A cos 3x + B sin 3x** 2) A cos 3x + B x sin 3x 3) $\frac{x \cos 3x}{3}$ 4) $\frac{x \sin 3x}{6}$

5. If $L^{-1} \left\{ \frac{1}{s(s^2+1)} \right\} = \int_0^t f(t) dt$, then $f(t) =$

- 1) **sint** 2) 1-cost 3) arc Tan t 4) 1+sint

TS ECET-2021

SYLLABUS: PHYSICS

(25Marks)

Unit-I: Units and dimensions: Physical quantity-fundamental and derived physical quantities-units-fundamental and derived units-SI units-advantages of SI units-dimensions and dimensional formulae for physical quantities -principle of homogeneity in dimensions

Unit-II: Modern physics: Photo electric effect–explanation and its laws-applications of photo electric effect (photocell)-Einstein’s photoelectric equation–critical angle and total internal reflection– optical fibers - principle, working- Basic concept of super conductivity , examples of super conducting materials and their applications.

Unit-III: Heat and Thermodynamics: Boyle’s law-Absolute scale of temperature-Charles laws-Ideal gas equation-Universal gas constant and its value-SI Units-problems - isothermal process-adiabatic process- statements of first law and second law of thermodynamics - two specific heats of a gas-relation between C_p and C_v -problems.

Unit-IV: Elements of vectors: Scalar and vector quantities-examples-types of vectors-triangle law-parallelogram law- expression for magnitude and direction of resultant of two vectors using parallelogram law -resolution of a vector-unit vectors (i,j,k)-dot product and cross product of two vectors- properties of dot and cross products-examples- problems.

Unit-V: Kinematics: Projectile motion-examples-horizontal and oblique projections- expression for path of projectile in case of oblique projection - expressions for maximum height, time of ascent, time of flight, horizontal range in case of oblique projection - problems.

Unit-VI: Friction: Friction- causes and types of friction-normal reaction-laws of friction-coefficients of friction-methods to reduce friction-advantages and disadvantages of friction-expression for acceleration of a body over a rough horizontal surface – expressions for displacement and time taken by a body to come to rest over a rough horizontal surface - problems.

Unit-VII: Work and Energy: Work and energy-definitions and units-potential and kinetic energies-examples and expressions-Work-Energy theorem – law of conservation of energy in the case of freely falling body -problems.

Unit-VIII: Simple harmonic motion: Definition-conditions of Simple Harmonic Motion (SHM) - examples of SHM - expressions for displacement, velocity, acceleration, time period, frequency and phase of SHM- expression for time period of a simple pendulum- laws of simple pendulum -seconds pendulum-problems.

Unit-IX: Sound: Sound- longitudinal wave and transverse wave - noise pollution-Effects and methods to control Noise Pollution-Beats and echo and their applications -Doppler effect - statement– Physical explanation and applications –Reverberation time -Sabine’s formula-characteristics/conditions of a good auditorium - problems.

TS ECET-2021

SYLLABUS: CHEMISTRY

(25 Marks)

Unit I: Fundamentals of Chemistry: Atomic structure: Introduction- Atomic number – atomic mass number – Bohr's theory – Aufbau's principle – Hund's rule – Pauli's exclusion principle- Electronic configurations of elements up to atomic number 30, Differences between orbit and orbital - shapes of **s, p, d** orbitals.

Chemical Bonding: Introduction – Electronic theory of valency - Types of chemical bonds – Ionic bond - NaCl and MgO – Characteristics of ionic compounds - Covalent bond - H₂, O₂, N₂ (Lewis dot model) - Characteristics of covalent compounds - Coordinate covalent bond – Definition and examples, [NH₄⁺], [NH₃BF₃].

Oxidation-Reductions: Electronic concept of Oxidation and Reduction - Oxidation number and its calculations - Differences between oxidation number and valency.

Unit-II: Solutions: Introduction – Definition of solution, solute and solvent - Classification of solutions based on physical state - Mole concept - Molecular weight, equivalent weight of acids, bases and salts - Molarity, Normality and numerical problems.

Unit-III: Acids and Bases: Introduction – Theories of acids and bases – Arrhenius theory - Bronsted – Lowry theory – Lewis theory – Ionic product of water - pH and related numerical problems pertaining to strong acids and bases – Definition of buffer – Types of buffer – Acidic buffer (Acetate buffer) – Basic buffer (Ammonia buffer) without buffer action – Applications without explanation.

Unit – IV: Principles of Metallurgy: Characteristics of metals and distinction between metals and non-metals. Definitions of metallurgy, ore, gangue, flux, slag – Concentration of ore by froth floatation process – Roasting, calcination, smelting – Alloys – Composition and uses of brass, German silver and nichrome.

Unit-V: Electrochemistry: Conductors - Metallic and electrolytic conductors- Insulators, electrolytes (strong and weak) - Arrhenius theory of electrolytic dissociation – Electrolysis of fused NaCl –Electrolytic refining of copper - Faraday's laws of electrolysis- Numerical problems – Galvanic cell – Electrode potential - Standard electrode potential – Electro chemical series – Significance of electro chemical series without explanation - emf and numerical problems on emf of a cell (based on $EMF = E_R - E_L$ formula).

Unit –VI: Corrosion: Introduction – Definition of corrosion - Factors influencing rate of corrosion - Electrochemical theory of corrosion- Composition cell, stress cell and concentration cell - Rusting of iron and its mechanism – Prevention of corrosion by (a) protective coatings - Metallic (anodic and cathodic coatings), Inorganic and Organic coatings (only examples) (b) cathodic protection (sacrificial anode method and impressed voltage method).

Unit-VII: Water Technology: Introduction – Soft and hard water – Causes of hardness – Types of hardness – Disadvantages of hard water in industries – Degree of hardness, units (ppm and mg/litre) and Numerical problems on hardness of water – Softening methods – Permutit process – Ion exchange process – Characteristics of drinking water – Municipal treatment of water for drinking purpose - Osmosis and reverse Osmosis - Advantages of Reverse Osmosis.

Unit-VIII: Polymers: Introduction – Polymerization – Types of polymerization – Addition, condensation polymerization with examples – Plastics – Types of plastics – Advantages of plastics over traditional materials – Disadvantages of using plastics - Thermo plastics and thermo setting plastics– Differences between thermo plastics and thermo setting plastics - Preparation and uses of the following plastics: 1. Polythene, 2. PVC, 3. Teflon, 4. Polystyrene, 5. Urea formaldehyde 6. Bakelite. – Rubber – Natural rubber – Processing of rubber from latex – Vulcanization – Elastomers – Butyl rubber, Buna-s, Neoprene rubber and their uses.

Unit-IX: Fuels: Definition and classification of fuels based on physical state and occurrence – Characteristics of good fuel - Composition and uses of gaseous fuels. (a) Water gas, (b) producer gas, (c) natural gas, (d) coal gas, (e) bio gas, (f) acetylene.

Unit-X: Environmental Chemistry: Introduction – Environment – Lithosphere, hydrosphere, atmosphere, biosphere, biotic component – Definitions of pollutant, contaminant- receptor, sink, particulate with examples, Definition and significance (without explanation) of DO, BOD, Threshold limit value, COD - Forest resources, uses and over exploitation - Deforestation - Air pollution - Causes-Effects- - Acid rain - Green house effect – Ozone depletion – Control of Air pollution (Basic level only) – Water pollution – Causes – Effects – Control measures of water pollution (Basic level only) - Renewable and Non Renewable energy sources with examples – Concept of ecosystem – Producers, consumers and decomposers – Biodiversity, threats to Biodiversity.

TS ECET-2021

MODEL QUESTIONS FOR CHEMISTRY

- The number of unpaired electrons present in sulphur.
1) 3 2) 2 3) 1 4) 4
- What is the conjugate base of H_2O .
1) H_3O^+ 2) H^+ 3) OH^- 4) O^{2-}
- Which one of the following cause temporary hardness to water?
1) CaCl_2 2) MgSO_4 3) NaCl 4) $\text{Ca}(\text{HCO}_3)_2$
- 0.4 grams of NaOH is added to 100 ml of 0.1 M NaOH solution and the volume of solution is made to 200ml by adding water. Calculate the molarity of the resulting solution?
1) **0.1M** 2) 0.2M 3) 0.3M 4) 0.4M
- Monomers used for the preparation of Bakelite
1) Urea and formaldehyde 2) aniline and formaldehyde
3) **Phenol and formaldehyde** 4) Phenol and urea

TS ECET-2021

SYLLABUS: ELECTRONICS AND COMMUNICATION ENGINEERING (100 Marks)

UNIT I: ELECTRONIC DEVICES AND CIRCUITS:

Semiconductor diodes – varactor diode – zener diode – Clippers and clampers-Transistors– FETs – UJT (characteristics only) – Power supplies – Rectifiers and Filters – HW, FW and Bridge type – RC , LC and CLC filters – Series and Shunt regulators, IC regulators – Transistor amplifiers – CE, CC and CB configurations – Biasing techniques-RC coupled – amplifiers, Differential amplifiers – Feedback, Power and Tuned amplifiers - RC, LC and Crystal oscillators – Operational amplifiers – characteristics and applications – Astable and Monostable Multivibrators using 555 timers- Schmitt Trigger – Sweep circuits – Miller and Bootstrap circuits, VCO, PLL- Fabrication of ICs.

UNIT II: CIRCUIT THEORY:

Ohms' Law, KCL & KVL-Mesh current and Node voltage analysis – Cramer's Rule – Concept of Graph-nodes, junctions, loops, Co-tree, tree, twig - tie set - cut set - Network theorems – Thevenin's, Norton's, Maximum Power transfer, Superposition and Reciprocity theorems– Star to Delta and Delta to Star transformations. Series and Parallel Resonance – Q - factor – Selectivity – Bandwidth- Transient analysis-RC and RL, Linear wave shaping circuits. Transmission Lines – Characteristic Impedance – Reflection Coefficient – SWR – Transmission Line losses and Impedance matching.

UNIT III : INDUSTRIAL ELECTRONICS:

Thyristor family – SCR, TRIAC– Off Line and On Line UPS –Working & Applications SMPS – Working Servo stabilizer - Opto electronic devices – LDR (characteristics and applications) – Transducers – LVDT – Strain Gauge, Thermocouple - Ultrasonic - Pulse echo flaw detector – Classify Industrial heating methods-induction and dielectric heating- Types of electrical welding-resistive welding- applications- Architecture of PLCs - ladder symbols - diagram – working-List PLCs types - features of Siemen's, Allenbradly-applications of PLCs- Block diagram of Open and Closed loop Control system-merits and demerits of open loop system.

UNIT IV:COMMUNICATION SYSTEMS:

Analog – Need for modulation – Types of modulation – AM, FM , PM – Modulation Index – Bandwidth — Transmitters – Low level and High level types – Receivers– Block diagram of TRF and its limitations-Super heterodyne – Need for AVC-Fading-AM and FM receivers - choice of IF – Wave Propagation – Ground, Sky and Space waves – Properties. Digital – Pulse modulation – PCM, Delta modulation – RZ and NRZ line coding – error detection and correction - digital modulation – ASK, FSK, PSK and QAM – generation and detection – Multiplexing – TDM , FDM- Multiple access – TDMA, FDMA – Internet Telephony.- Antennas– radiation resistance – beam width – polarization – directivity – efficiency – bandwidth – gain – front to back ratio – folded dipole – arrays – broadside – end fire – Yagi Uda antenna-Turnstile antennas-loop antenna-horn-helical-Binomial antenna – Parabolic

reflectors – beam width, gain and applications. Wave Guides – Rectangular – Dominant mode – Phase and Group velocity – Cut off wavelength - working principle and applications of Magnetron, Klystron, TWT– Radar – range equation – Pulsed radars – indicators – duplexers – CW radars and MTI radars – ILS– Satellite communication – UP link and DOWN link frequencies – types of satellites – satellite on board –earth station systems .

UNIT V : DIGITAL ELECTRONICS:

Number systems – Logic gates – Boolean algebra – Adders and Subtractors, Multiplexers, De multiplexers-Encoders-decoders, Comparators – Flip-flops– Registers and Counters – Memories – RAM, ROM, Flash ROM – D/A converters – binary weighted – R-2R Ladder, A/D Converter - Counter and Successive approximation types.

UNIT VI: MICROCONTROLLERS, PROGRAMMING, INTERFACING & APPLICATIONS –

Block diagram 8085 - 8051 Architecture – Instruction Set – subroutines – use of input and output machine related statements – time delay program – peripheral ICs – 8255 use of ADC 0808/ADC0809 and DAC0808 / DAC0809 – Interfacing of RTC.-Interfacing & Segment display –LCD 4X 4 matrix –Key board matrix –RS-232 - DB25 & DB9 connector –MAX 232 233 - 8051 Programming in C-I/O Programming bit wise, byte wise .

UNIT VII: CONSUMER ELECTRONICS:

Television Picture elements – scanning and synchronization – blanking and interlacing – composite video signal, flicker, CCIR standards – Color TV – Additive and subtractive mixing – types of color TV systems – NTSC, PAL and SECAM – PAL system processing – DTH system –.features of HDTV and Smart TV.

UNIT VIII : DATA COMMUNICATIONS AND COMPUTER NETWORKS:

Transmission Media – Twisted pair – UTP – STP – Coaxial cable – Optical fiber – comparison – Shannon Capacity theorem – Network Topologies – BUS, STAR, RING – switching – Packet and Circuit switching – OSI 7- layer model and functions – CSMA and token ring – properties and operations – Wireless LAN – Bluetooth technology – WAN architecture – Packet transmission – ARPA Net – ISP and ISDN architectures – WAN Protocols – TCP / IP features and comparison – Ports and Sockets – Domain Name System – Email – File transfer protocol – Proxy server and Web server architecture-list HTTP commands – security services-message confidentiality-message integrity – message authentication – entity authentication – Web Browser Architecture-key management-digital signature – firewalls in securing networks

TS ECET-2021
MODEL QUESTIONS FOR
ELECTRONICS AND COMMUNICATION ENGINEERING

1. The following parameter of varacter diode varying with respect to

- | | |
|---------------|-----------------------|
| 1) Inductance | 2) Capacitance |
| 3) Frequency | 4) Resistance |

2. The Maximum Power transferred when the impedance $Z+jX$ matches to

- 1) Bandwidth
- 2) (Z^2+X^2)
- 3) $Z-jX$**
- 4) X^2

3. The dominant mode in Rectangular Wave Guide is

- | | |
|---------------------------|---------------------|
| 1) TE₁₀ | 2) TE ₁₁ |
| 3) TM ₁₁ | 4) TE ₂₀ |

4. Which of the following microwave tube works based on the cross field?

- | | |
|---------------------|-----------------------|
| 1) Magnetron | 2) Klystron Amplifier |
| 3) Gunn Oscillator | 4) TWT |

5. Convert 25 into Binary

- | | |
|----------|----------------|
| 1. 11011 | 2.11001 |
| 3. 1111 | 4.10011 |
