

# 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, 2<sup>nd</sup> 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)  $-4\pi$  4)  $4\pi$

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)  $1 - \cos t$  3)  $\arctan t$  4)  $1 + \sin t$

\*\*\*\*

# 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.

**Unit-X: Properties of matter:** Define terms - elasticity, plasticity – stress and strain – units – Hooke's law – definition of surface tension, examples – angle of contact , capillarity and examples – formula for surface tension based on capillarity (no derivation) –viscosity and examples- Newton's formula for viscosity- Poiseuille's equation for co-efficient of viscosity- effect of temperature on viscosity of liquids and gases- problems.

**Unit-XI: Electricity and Magnetism:** Ohm's law –Specific resistance, Conductance and their units- statements and explanation of kirchoff's laws- expression for balancing condition of Wheatstone bridge- Working principle of meter bridge-coulomb's inverse square law in magnetism- magnetic field – magnetic lines of force- magnetic induction field strength and units – moment of couple acting on a bar magnet placed in a uniform magnetic field – problems.

\*\*\*\*\*

## TS ECET-2021

### MODEL QUESTIONS FOR PHYSICS

- 1) Dimension of mass in Universal gravitational constant  
1) 0                            2) 1                            3) -1                            4) 2
- 2) If  $\vec{F} = 2\hat{i} + 3\hat{j} - 4\hat{k}$  and  $\vec{S} = 4\hat{i} - 2\hat{j} + n\hat{k}$  then the work done is zero. The value of n is  
1) 0                            2)  $\frac{1}{2}$                             3)  $\frac{3}{2}$                             4) 1
- 3) The nature of velocity-time graph of a freely falling body is  
1) parabola                            2) ellipse  
3) **straight line passing through the origin**                            4) straight line with +ve y axis intercept
- 4) A particle is performing SHM with a time period T. Then the time taken by the particle to reach half the amplitude from its mean position is  
1)  $\frac{T}{12}$                             2)  $\frac{T}{3}$                             3)  $\frac{T}{6}$                             4)  $\frac{T}{2}$
- 5) A given mass of gas at  $27^\circ$  is heated in a glass flask at constant pressure so that its volume is doubled. Then the final temperature of the gas is  
1)  **$327^\circ\text{C}$**                             2)  $227^\circ\text{C}$                             3)  $430^\circ\text{C}$                             4)  $530^\circ\text{C}$

\*\*\*\*\*

# 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 - H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub> (Lewis dot model) - Characteristics of covalent compounds - Coordinate covalent bond – Definition and examples, [NH<sub>4</sub><sup>+</sup>], [NH<sub>3</sub>BF<sub>3</sub>].

**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  $\text{H}_2\text{O}$ .  
1)  $\text{H}_3\text{O}^+$       2)  $\text{H}^+$       3)  $\text{OH}^-$       4)  $\text{O}^{2-}$
- Which one of the following cause temporary hardness to water?  
1)  $\text{CaCl}_2$       2)  $\text{MgSO}_4$       3)  $\text{NaCl}$       4)  $\text{Ca}(\text{HCO}_3)_2$
- 0.4 grams of  $\text{NaOH}$  is added to 100 ml of 0.1 M  $\text{NaOH}$  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: MINING ENGINEERING

(100 Marks)

### UNIT I:

#### ELEMENTS OF MINING:

**Definitions** of Terms, Mineral based industries, Mining operations, modes of entry, shaft, incline, adit-applicable conditions, Mining Methods used in coal and Non coal mining, Classification of the mineral deposits based on various factors, classification of coal seams based on various factors. Classification of methods of working-U/G Coal, OC Mining,

**Bore (Drill) holes** uses, classification and various tools used in boring(Drilling), feed mechanism, core recovery, deviation of boreholes.

**Explosives-** Characteristics, classification, composition, properties, different explosives used in U/G, OCM, Metal and coal mines, selection of explosives and initiation of explosives, Detonators- types, Blasting practice in Mines- terms, tools, sequence of shot firing, drill patterns types, misfires, blown out shots, sockets, treatment of misfires dangers associated with underground blasting, precautions to be taken before and after blasting, simple problems on powder factor, yield/kg of explosives- drill bits-drill – Water conditioning – fuse – electric blasting.

**Mine Gases-** types, physical and chemical properties, physiological effects and occurrence, flame safety lamp-purpose, principle constructional details of bottom, top feed types-method of heat transfer, accumulation and percentage test, different detectors.

**Shaft sinking methods** – sinking through normal strata, Special methods of shaft sinking - pilling, drop shaft method, widening and deepening– modern trends, cementation, freezing method. Temporary, permanent lining of shafts.

### UNIT II:

#### MINING GEOLOGY:

**Definitions** of the term Geology, scope, uses of geology in Mining field, Branches of geology, Age of the earth, origin of the earth-Nebular hypothesis of Kant and Laplace,

**Physical Geology**, internal structure of earth, weathering, erosion, denudation, Attrition, Abrasion, Earthquakes, its propagation, intensity, causes and effects of earthquakes. Volcanoes and its classification,

**Mineralogy** - Physical characteristics of minerals, important mineral families, industrial uses of important minerals; Occurrence and distribution in Telangana and India.

**Petrology** - Classification of Rocks and its characteristics, structures and textures. Structural Geology, folds, faults, joints, unconformities. Geological time scale, major stratigraphical divisions of India, Physio-graphic divisions of India,

**Economic Geology-** Terms, processes of mineralization and important economic minerals



formed by these processes.

**Geological prospecting-** objectives, guidelines for location of mineral deposits in fields, methods of prospecting. GIS and Remote sensing concepts.

**Coal Geology** - Periods of coal formation, stages of coal formation, origin of coal seams, drift and insitu theories, structural features of coal seams, distribution of coal seam in India, and Telangana state.

**Petroleum Geology-**Origin, migrations, and accumulations, distribution of oil fields in world and India

### **UNIT III:**

#### **METHODS OF WORKING COAL:**

**Methods of working Bord and pillar-** applicability –merits – demerits – different terms – stages of development and de pillaring – panel system –types –applicability- factors influencing this size of panel – general considerations- number of opening of panel-merits, demerits – factors governing the selection of the development method -opening of districts, different methods of development systems, along dip along strike, cross cuts, steeply dipping seams loading machines and continuous miners, blasting of solids, different conveyers ,coal cutting machines LHD, SDL depillaring, terms – classification-planning preparation arrangements – sequence of operations – pillar extraction under weak roof mechanized method of pillar extractions by LHD , SDL – conveyor systems – size ,shape of pillar, ribs– local fall – main fall-air blast, dangers precautions- stowing- methods conditions for adoption of stowing - H/L ratio, preparatory arrangements for stowing- stowing panel- danger and precautions while working below goafed areas- contiguous seams extractions precautions against fire during and after depillaring

**Long wall mining** - drivage of road ways by drill blast by manual loading, by gathering arm loader, by road header, dint header, continuous miner, Long wall advancing- applicability, merits, demerits, limitations comparison between long wall retreating and advancing, machinery employed-continuous mining method – factors governing length of long wall face, layout conventional long wall face

,advancing with caving and stowing – layouts of mechanized long wall face advancing with caving and stowing comparison with bord and pillar- production calculation –long wall retreating method – applicability –layout of mechanized /conventional long wall with caving and stowing, layout of long wall face with shearer – methods of sumping – method of push- salvaging-productions calculations.

**Blasting gallery method** - applicability, merits, demerits, limitations – drilling – blasting pattern – loading operations – supporting – spacers - precautionary measures at goaf edge line development of BG panel - mechanized layout of BG panel-production calculations thick seam mining –

**Thick seam mining by slicing** – difficulties-methods- applicability inclined slicing, horizontal slicing, with caving and stowing- blasting gallery, sublevel caving with

mechanized long wall - horizon mining. Merits - demerits applicability, limitations- Hydraulic mining-applicability-merits and demerits - Hydraulic breaking of coal-transport-layout of Hydraulic mining in moderately thick and steep seams – Gasification of coal applicability – merits –demerits – principle of Gasification-opening of coal seams with gasification, linkages bore holes in gasification of coal, Stowing practice in mines, subsidence-subsidence survey, its effects and remedial measures-

#### **UNIT IV: SURFACE MINING**

Surface mining-definitions- different forms-geo mining situations, major coal and metal Opencast - limitations-merits and demerits- different terminology with sketches-stages of surface mining– Equipment-machinery for preparing ground, dozed scraper, ripper, road grader, road rollers-classifications of dozer, components - functions, operations-classification of rippers - road grader main components functions and operations classification of road roller, components functions and operations –

**Drilling and blasting in OC mines** – classification of drill host – vertical and inclined drilling – merits-demerits various parameters-drill parameters-application- estimation of charges for blasting round of holes, blasting tools-shot firing procedure-patterns-blasting techniques –transportation-storage –charging of bulk explosives- use of NONELS-electronic detonators, boosters firing procedure –use of bulk explosives.

–control blasting techniques –applicability-conditions for adopting sleeping hole – secondary blasting techniques – dangers due blasting in OC mines preventive measures-

**OC machinery** – selection-classification of HEMM - application –Excavators used in open cast mines –all types of excavators-shovel-dragline – BWE-surface miner applicability’s merits-demerits etc.-All types of transport system in opencast mines-dumpers, belt conveyors – rail-pipeline-high angle conveyor – types -merits-demerits-applicable condition of inpit crusher technology spreaders-working

**various layout of opencast mines** -design factors of layout- different combinations layout – shovel dumper, drag line, surface miner, bucket wheel excavator—

**impact on environmental and ecology in OC mines** – terms- various pollutions –causes-preventive measures-relationship between ecology and environment - BOD methods-calculations of BOD –EIA, EMP, land reclamation

#### **UNIT V: ROCK MECHANICS AND STRATA CONTROL**

**Introduction** Definition of rock mechanics - Scope of Rock mechanics in mining- Application of Rock mechanics to mining field Stress Strain-Modulus of elasticity-Relation between various Modulus of elasticity-Terms Insitu stress -Induced stress -simple numerical problems

**Stress Analysis, Stress distribution in underground** Various forces acting on block in Insitu condition -- Relation between vertical and lateral stresses -Induced stresses due to Mining - Principle plane- Major Principal Stress, Minor principle stress-Diagram normal and shear stresses in a 2D model stress distribution around a Mine workings , narrow and wider openings-Mohr's circle- simple numerical problems on lateral strain- Mohr's circle

**Geo Mechanical properties of Rocks and methods of determination Rock properties -** Physical Mechanical, properties of rocks uni-axial compressive strength - confined compressive Strength (Tri axial test) -Tensile strength shear strength - strength indices of rocks - point load strength index protodyakonov's strength index - porosity - Relation between them - methods determining shear strength. Definition of rock mass, classification of rock stability - Give the RQD (Rock Quality Designation) Classifies Rocks by Mohr's Hardness scale. ,Give the RMR (Rock mass rating), factors consider for estimation of RMR, Estimation of RMR, simple numerical problems for estimation of RQD, Classification of roof rock based on RMR-Tunnel Quality Index

**Theories of Rock failure, Rock Behaviour and stress measuring devices** Theories of failure of Rocks. the Confining Pressures the Effect of water, time and Temperature - instruments used for measurement of stress- Flat jack method - Remote convergence recorder-Magnetic ring multipoint extensometer Coal Bumps and Rock bursts-State the causes of Rock bursts and bumps.List the preventive measures against bumps and bursts.

**strata control Supports -** Necessity - Materials used - Classification of supporting Systems - Applicability of various types of supports - Size, Shape of supports - Principle of roof bolting, stitching Merits and demerits of bolting - Rigid and Yielding props constructional details of Friction, Hydraulic props - Method of setting Various supports at different situations - Fore poling. safari supporting- Junction Supports - Clearance of Heavy roof Collapse - Systematic Supporting - withdrawal of supports.

## **UNIT VI:**

### **MINE SURVEYING:**

**Preliminaries of Surveying** -Definition and objectives of surveying, primary divisions, classifications, and principle of surveying. To know the difference between plan and map, importance of scale and representative fraction, general requirements of mine plans, care and maintenance of plans and sections according to mining laws.

**Basics concepts linear measurements (chain and tape) -** Perform Different objectives of chain surveying, Ranging, Cross staff survey, Plotting the chain triangulations for measuring the areas, corrections in chain surveying and simple problems on it.

**Concepts of angular measurements (compass surveying)-**Introducing the concepts of angular measurements with the adoption of compass surveying, differences between angle and bearing, terminologies and parts of prismatic compass, solving the problems of bearings, angles and also introduced the concepts of traverse. Errors and its distribution of a closed traverse.

**Levelling-**Learning the concept of elevations and depressions of ground surface by introducing

the different methods of levelling, definition of different terms in levelling, and brief lines about dumpy level and inverted staff. Importance of reduced levels and problem on it by different methods, definitions of curvature and refraction, problem solving on reciprocal levelling, and importance of HFL and contouring

**Theodolite survey**-Introducing the concepts of angular measurements with the adoption of theodolite surveying, different terminologies used in theodolite and its parts, measurements of horizontal and vertical angles and introducing the concepts of repetition and reiteration methods.

Rectangular Co-ordinates- calculation of latitude and departure – problems on Rectangular Coordinates – calculation of Areas – Bowditch Rule

**Setting out Curves** Classification – Definitions – elements of simple curve – Method of setting out curves – by chord and offset – chord and angle – solves problem

**Correlation Survey** Purpose – methods of correlation – Direct Traversing – Co – planning – Weisbach Triangle

**Tacheometer** Purpose – methods of correlation – Direct Traversing – Co – planning – Weisbach Triangle–

**Dip, Strike, Fault problems** Definitions of Dip, Strike, Fault, True Dip, Apparent Dip-Relation among them- Solving the problems relating to them – determines the rate and direction of true dip or strike of a mineral bed- Solving the problems related to strike and fault – calculate the length of drift, passing through the fault-Bore hole problems- cross measure drift problems.

### **Modern Surveying Equipment's**

Modern surveying Equipment- Principle of working of - EDM – GPS –advantages of DGPS – Total station Instrument – applicability in Mines. –key components of GIS– Remote sensing- Applicability

## **UNIT VII:**

### **MINING MACHINERY :**

**Wire ropes**- usage, chemical composition, tests of wires, classification, applicability of different wire ropes, causes of deterioration and precautions, selection parameters-numerical problems on size-weight and strength,

**capping, recapping** methods and rope splicing, description Transportation in mines - classification different types of rope haulages, their applicability, merits and demerits limitations. Safety devices in different rope haulages, laying and maintenance of track-details of mine car, factors of section of rope haulage computation of problems for HP, rope size, breaking strength, tub capacity, number of tubs,

**conveyors** –classification different types of conveyors, construction safety devices merits-demerits limitations, solves numerical problems on size, output motor HP,

**Locomotive haulages**- types, applicability's, merits-demerits, classify aerial rope ways, applications, simple problems,

**pumps** –terms ,classification types of pumps, fittings, merits-demerits, limitations ,selection-

problem on head, quantity HP, frictional losses their applicability in mines, construction details merits, demerits and limitations.

**Coal face machinery**, different Drills, Power loaders, Long wall face machinery-AFC , lump breakers, stage loaders, power pack, SERDS, DERDS, safety devices, power support, , Flame proof apparatus and Intrinsically safe apparatus- field of applications, features, remote control principle,

**Signaling** methods used in mines, telephones,

**winding** -purpose, equipment, types of headgear frames, shaft fittings, guides, Pit top and pit bottom arrangements, keps, suspension gear, types of drums, drum and skip winding, Cage winding and Friction (Keope Winding) speed control and safety contrivances. Breaks, types, speed control methods, mining cables-classification, types, constructional details-cable jointing, care and maintenance.

## **UNIT VIII:**

### **MINE MANAGEMENT AND ENTREPRENURSHIP**

**Mine management** Entrepreneurship and organisational structure Role of mining Industry in country's economic development, ownerships of Industries, Management, organisation, in the context of mining Industry. Motivating factors, Risks and Rewards, requirements of entrepreneur, products selection. site solution, , setting of a Mine-Theory of motivation-Leadership-Decision making process-communication process- Market survey., Demand survey techno-economic-Break even analysis- Sellers and Buyers market- Feasibility study report

**Industrial Dispute Act-1947 and Total Quality Management** Industrial Dispute act-1947, causes of Industrial Dispute, adverse effects for Industrial Dispute various provisions of ID act works committee, conciliation officer, Bord of conciliation court of enquiry, industrial tribunal, voluntary organisation ,strike and lockout-Total Quality Management Definition of TQM-constituents of ISO 9000 series-Merits and drawbacks of ISO-Indian standards of Quality system

**Recruitments and training** Recruitment and training, Methods of recruitment - Essential Quality of person different category training as per VTC Rules - Training programmes

**Network analysis** Definition and Objectives of network analysis-construction of network diagrams-Definitions of various terms-Merits and demerits of CPM-Simple problems on CPM-PERT-Definition, methodology, time estimates -Simple problems on PERTCompression CPM Vs PERT

# TS ECET-2021

## MODEL QUESTIONS FOR MINING ENGINEERING

1 High explosives containing-----

- 1) **Nitroglycerine**
- 2) Sodium nitrate
- 3) Ammonium nitrate
- 4) Charcoal sulphur.

2. The drill holes which are driven vertically and make the sides of the excavation are described as -----

- 1) Easers
- 2) Simpers
- 3) **Dressers**
- 4) Hole directors

3. The mining terminology, exploitation or winning is-----

- 1) The process of blasting
- 2) **The process of extracting the ore or economic mineral from the earth**
- 3) The process of ventilation
- 4) The detailed mapping of the ore body

4. Long wall method is generally employed for:

- 1) Copper ore mining
- 2) Iron ore mining
- 3) **Coal mining**
- 4) Gypsum mining.

5. Horizon mining for coal winning is more suitable where:

- 1) The coal seams are horizontal.
- 2) The coal seams are highly disturbed.
- 3) The coal seams are slightly dipping.
- 4) **The coal seams are found above the earth's surface.**

\*\*\*