

## SCREENING TEST FOR THE POSTS OF ITI SUPERINTENDENT

### SYLLABUS FOR THE SCREENING TEST FOR THE POST OF SUPERINTENDENT ITI IN TECHNICAL EDUCATION DEPARTMENT

#### MATHEMATICS MARKS : 25

**MAXIMUM**

#### **Chapter 1: Matrices and Determination**

Concept of a matrix, types of matrices. Determinants of a square matrix, Applications of determinants in finding area of a triangle.

#### **Chapter 2: Boolean Algebra**

Boolean algebra as an algebraic structure.

#### **Chapter 3: Functions, Limits and Continuity**

Concept of a real function, limit of a function

$$\lim_{x \rightarrow 0} \frac{x^n - a^n}{x - a} = na^{n-1} \quad (a > 0), \quad \lim_{x \rightarrow 0} \frac{\sin X}{x} = 1$$

Limits at infinity.

#### **Chapter 4: Differentiation**

Derivative of a function, its geometrical and physical significance, Derivative of some simple functions from first principle. Logarithmic differentiation.

#### **Chapter 5: Vectors (continued)**

Scalar (or dot) product of vectors, vector (or cross) product of two vectors. Coplanarity of three vectors or four points using scalar triple product.

#### **Chapter 6: Three Dimensional Geometry**

Cartesian and vector equation of a line through (i) a point and parallel to a given vector, (ii) through two points. Angle between (i) two lines, (ii) two planes; (iii) a line and a plane.

#### **Chapter 7: Linear Programming**

Introduction, definition of related terminology such as constraints, Graphical

methods of solution for problems in two variables.

### **Chapter 8: Applications of Derivatives**

- Rate of change of quantities, Tangents and normals, Rolle's theorem and Mean value theorem (without proof).

### **Chapter 9: Indefinite Integrals**

Integration as inverse of differentiation. Integration by substitutions.

### **Chapter 10: Differential Equations**

Definition; Order and degree, General and particular solution of a differential equation. Solution of linear differential equation of the type:

$$\frac{dx}{dy} + P(x)y = Q(x)$$

, where P(x) and Q(x) are functions

f(x), Solution of second order differential equations:  $\frac{d^2y}{dx^2} = f(x)$

### **Chapter 11: Elementary Statics**

Introduction, Basic concepts and basic Laws of mechanics, Triangle law of forces and its converse, Lami's theorem and its converse, Two parallel forces, Like and Unlike parallel forces.

### **Chapter 12: Elementary Dynamics**

- Speed and velocity, Motion of a particle along a line when moving with constant acceleration, Projectile motion- the path of a projectile

### **Chapter 13: Probability**

Conditional probability, Recall of concept of random variables and its probability distribution, Binomial and Poisson's distributions, their mean, variance and applications of these distributions in commerce and industry.

## **CHEMISTRY**

**Maximum Marks :**

**25**

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### **Unit I: Atomic Structure and Chemical Bonding**

Dual nature of matter and radiation, de-Broglie relation, Uncertainty Principle, Wave functions and quantum numbers, Atomic Orbitals and their shapes, Spin Quantum Number, Electronic configuration and atoms, Molecular orbital method (homonuclear diatomic molecules only) Concept of bond order, Hybridization involving s, p, and d- orbitals.

**Unit II: The Solid State**

Space lattice, Unit cells, cubic crystal system, close packing in crystals, X-ray studies of crystals, Structure of simple ionic compounds (AB and  $AB_2$  type only). Imperfection in solids, Properties of solids, (electrical, magnetic and dielectric). Amorphous solids (elementary idea only)

**Unit III: Solutions**

Units of concentration, Vapour pressure of a solution, colligative properties (relative lowering of vapour pressure, elevation of boiling point, depression in freezing point and osmotic pressure) Determination of molecular mass, abnormal molecular mass.

**Unit IV : Thermodynamics**

First law (brief) Second law of thermodynamics; Entropy (criterion of spontaneous and non-spontaneous processes). Gibbs's free energy (criterion for spontaneity of a process), Standard entropies and free energy of formation. Free energy change and Chemical Equilibrium, Free energy change and non-mechanical work.

**Unit V: Electrochemistry**

Electrolytic and Galvanic cells, Electrolysis and laws of electrolysis, Electrolytic conduction- conductance, conductivity, molar conductivity, Kohlrausch's law and its applications, Galvanic cells- electrode potential, Electromotive force, Nernst's equations, electrode potential and electrolysis Primary and secondary cells including fuel cells.

**Unit VI: d and f -Block Elements**

Photography (Chemistry of developing, fixing and printing)

**Unit VII: Polymers**

Classification of polymers, General methods of polymerization- addition and condensation. Copolymerisation, natural rubber, synthetic rubbers.

Condensation polymers

Some commercially important polymers.

**Unit VIII: Chemistry in Every day Life**

Dyes-classification with examples – indigo, methyl orange, aniline yellow, alizarin, malachite green

Detergents-Classification, some important examples.

rocket propellants- characteristics, chemicals used.

## **PHYSICS**

**25**

**MAXIMUM MARKS :**

### **Unit I: Electrostatics**

Coulomb's law-forces between two point electric charges, forces between multiple electric charges; superposition principle and continuous charge distribution;

Electric field and its physical significance.

Equipotential surfaces, electric dipoles in an electrostatic field.

Energy stored in a capacitor, Van de Graff generator.

### **Unit – II: Current Electricity**

Drift velocity and mobility and their relation with electric current; Ohm's law.

Temperature dependence of resistance.

Kirchoff's laws-illustration by simple applications.

Potentiometer-principle and its application.

Thermoelectricity- origin, elementary ideas of seeback, Thomson and Peltier effects; thermocouple.

Thermo emf, neutral and inversion temperatures.

### **Unit – III: Magnetic Effects of Current and Magnetism**

Biot-Savart law, Force on a moving charge in uniform magnetic and electric fields, Cyclotron; moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter.

Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; Magnetic field lines: earth's magnetic field and magnetic elements.

### **Unit – IV: Electromagnetic Induction and Alternating Current**

Faraday's law, induced emf and current, Lenz's law. Eddy currents, self and mutual inductance.

Peak and rms value of alternating current voltage, reactance and impedance;

LC oscillations, LCR series circuit (phasor diagram)-Resonant circuits and Q-factor; Power in circuits, Wattless Current, AC generator and Transformer.

### **Unit – V: Optics**

Refraction of light, total internal reflection and its applications, lens maker's formula; determination of refractive index of the material of prism.

Compound microscope, Astronomical telescope.

Reflection and refraction of plane wave at a plane surface using wave fronts (qualitative idea); Interference -Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light.

### **Unit VI: Atoms and Nuclei**

Composition and size of a nucleus, atomic masses, isotopes, isobars; mass-energy relation. Mass defect binding energy per nucleon and its variation with mass number; Nature of the nuclear forces.

Nuclear fission and fusion; Energy source of stars (concept only).

### **Unit VII: Dual Nature of Radiation and Matter**

Photo-electric effect, Einstein's Photo-electric equation, Particle nature of light, photo cells and their applications.

### **Unit VIII: Semi-conductor Devices**

Energy bands in solids (qualitative ideas only), difference between metals, insulators and semi conductors using band theory.

### **Unit IX: Communicating Systems**

Space communication: Sky and space wave propagation; Satellite communication; Application in Remote Sensing.

Line Communication: 2 wire lines, cables, telephone links; optical communication (optical fibre, use of Laser), elementary principle of light modulation.

## **INFORMATION TECHNOLOGY**

**MAXIMUM MARKS :**

**25**

### **Chapter 1: The Computer as a Tool**

After Completing this Chapter a student is expected to:

1. Explain how computers are used as a tool that help people write, learn, create art and music.
2. Explain how calculations are performed in the operation of computer programs such as Spread sheets (MS Excel) and Photo Deluxe.
  - 2.1 Explain the role of calculation in rotating, shrinking, expanding and modifying images in Photo Deluxe.
  - 2.2 Define pixels.
3. Identify how computers can be used for the Physically Disabled.
  - 3.1. Explain how computers have been adapted to assist physically disabled people.
4. Identify how computer can be used for information Management.
  - 4.1. illustrate with an example how people are finding it harder to perform their jobs due to information overload.
    - 4.1.1 explain how a garment manufacturer can use the internet for his/her job.
    - 4.1.2 explain how computers can be used as a storage device.
      - 4.1.2.1 name some computer equipment that can be used as storage devices.
5. Define a wizard.

## **Chapter 2: Computer Sense and Safety**

1. Define copyright laws.
2. Explain the meaning of software piracy.
3. Identify the importance of using original software.
  - 3.1. list reasons to purchase and use only original software.
4. Define a computer virus.
5. Define an anti-virus software.
6. Explain how an anti-virus software works.
7. Reason why people create viruses.
8. Give some examples of viruses.

9. State the worst virus problem that ever hit India and describe what it did.

### **Chapter 3: Word Processing Wizard**

Students can ....

1. Define word processing.
2. Edit a document.
  - 2.1. explain what editing means.
  - 2.2. use the short cuts of copy and paste.
  - 2.3. use the "Undo" and "Redo" features.
  - 2.4. apply the "Find" and "Replace" feature.
3. Format a document.
  - 3.1. list a few formatting feature such as bold, underline, italics, font size and alignment.
  - 3.2. create a bullet list.
4. Create a table.

### **Chapter 1: The Information Superhighway**

Students can.....

1. Define a LAN.
2. Define the Internet.
3. Explain how computers are used for accessing information.
  - 3.1. define the World Wide Web (WWW).
  - 3.2. Find information on the Internet.
    - 3.2.1 Describe how a person can find information in a directory.
4. Explain how computers are used for displaying information.
  - 4.1. name two programs that help create web pages.
5. Explain how computers are used for communication.

5.1. define e-mail.

5.2. define the term "ISP".

## **Chapter 2: Multimedia in Action**

Students can

1. Define multimedia.
2. Identify a need for multimedia.
3. Define following term: Processor, RAM and Byte.
  - 3.1. Reason why a faster processor is better with respect to multimedia.
4. Identify terms such as kilobyte, megabyte gigabyte.

## **ENGLISH**

**MAXIMUM MARKS : 20**

### **A. Communication Skills**

Comprehension questions, Composition, Paragraph Writing, Grammar, Pronunciation and usage aimed at improving the language skills of students of technology.

### **B. Writing Skills**

#### **Technical/Project Report Writing**

- (i) Meaning & Importance
- (ii) Aspects of Technical Report Writing/Project report Writing

### **C. Oral Presentation**

- (i) Importance of Oral Presentation
- (ii) Preparing for Oral Presentation
- (iii) Elements of Oral Presentation
- (iv) Effective Delivery of Oral Presentation
  - a. Role and effective use of voice
  - b. Use of body language
  - c. Art of summing up