



PUBLIC SERVICE COMMISSION, WEST BENGAL
161-A, S. P. Mukherjee Road, Kolkata – 700 026

SCREENING TEST FOR RECRUITMENT TO THE POST OF DISTRICT OFFICER IN WEST BENGAL GENERAL SERVICE IN THE DIRECTORATE OF VOCATIONAL EDUCATION AND TRAINING UNDER THE DEPARTMENT OF TECHNICAL EDUCATION, TRAINING & SKILL DEVELOPMENT, GOVT. OF W.B. VIDE ADVT. NO. 04 / 2022.

SCHEME OF SCREENING TEST

Type of Exam. : MCQ type questions.

Full Marks : 100 marks, each question carrying 1 mark. There will be negative marking of $1/4^{\text{th}}$ mark for each wrong answer.

The Screening Test will be held in two parts –

Part I : English, Mathematics & General Awareness (30 marks)

&

Part II : Engineering Subjects (70 marks).

No. of questions : 100 Questions.

Duration : 1 hour 30 minutes.



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SYLLABUS OF SCREENING TEST FOR THE POST OF DISTRICT OFFICER
[ADVT. NO. – 04/2022]

Part I : a) English : Grammar & Construction of 12th Standard = 10 marks
b) Mathematics of 12th Standard = 10 marks
c) General Awareness = 10 marks } Total = 30 marks

Part II : Engineering Subjects – 1st year's syllabus of Graduate level Engg. subjects common to all disciplines.

The segregation in Engineering subjects is as follows :-

i) Basic Electrical Engineering	= 20 marks	} Total = 70 marks
ii) Basic Electronics Engineering	= 20 marks	
iii) Engineering Mechanics	= 20 marks	
iv) Basic Computation & Internet Application	= 10 marks	

NB: The above syllabus is indicative only. Candidates should be prepared to answer any question from essential Qualification / Degree mentioned in the advertisement for the relevant posts.

Basic Electrical Engineering – 20 Marks

DC Network Theorem.

Definition of electric circuit, network, linear circuit, non-linear circuit, bi-lateral circuit, unilateral circuit, Dependant source, Kirchhoff's law, Principle of superposition. Source equivalence and conversion, Thevenin's theorem, Norton Theorem, nodal analysis, mesh analysis, stardelta conversion. Maximum power transfer theorem with proof.

Electromagnetism:

Biot-savart law, Ampere's circuital law, field calculation using Biot-savart & Ampere's circuital law. Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faraday's law, Self and mutual inductance. Energy store in a magnetic field, B-H curve, Hysteretic and Eddy current losses, Lifting power of Electromagnet.

AC fundamental:

Production of alternative voltage, waveforms, average and RMS values, peak factors, form factor, phase and phase difference, phasor representation of alternating quantities, phasor diagram, behaviour of AC series, parallel and series parallel circuits, power factor, power in AC circuit, Effect of frequency variation in RLC series and parallel circuit, Resonance in RLC series and parallel circuit, Q factor, band width of resonant circuit.

Electrostatics:

Coulomb's law, Electric Field Intensity, Electric field due to a group of charges, continuous charge distribution, Electric flux, Flux density, Electric potential, potential difference, Gauss's law, proof of Gauss's law, its application to electric field and potential calculation, Capacitor, capacitance of parallel plate capacitor, spherical capacitor, isolated spheres, concentric conductors, parallel conductors, Energy stored in a capacitor.

DC Machines:

Construction, Basic concept of winding (Lap and wave). DC generator: Principle of operation, EMF equation, characteristics (open circuit, load) DC motors: Principle of operation, Speed torque Characteristics (shunt and series machine), starting (by 3 point starter), speed control (armature voltage and field control) Single phase transformer: Core and shell type construction, EMF equation, no load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit test, regulation and efficiency calculation.

3 phase induction motor:

Types, Construction, production of rotating field, principle of operation, equivalent circuit and phasor diagram, rating, torque-speed characteristics (qualitative only). Starter for squirrel cage and wound rotor induction motor. Brief introduction of speed control of 3 phase induction motor (voltage control, frequency control, resistance control).

Three phase system:

Voltages of three balanced phase system, delta and star connection, relationship between line and phase quantities, phasor diagram. Power measurement by two watt meters method. 3L General structure of electrical power system: Power generation to distribution through overhead lines and underground cables with single line diagram.

Basic Electronics Engineering – 20 Marks

Module – 1: Semiconductors:

Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Module-2: Diodes and Diode Circuits:

Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuit: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

Module-3: Bipolar Junction Transistors:

Formation of PNP / NPN junctions, energy band diagram; transistor mechanism and principle of transistors, CE, CB, CC configuration, Transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor;

Module-4: Field Effect Transistors:

Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles.

Module-5: Feed Back Amplifier, Oscillators and Operational Amplifiers:

Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feedback: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator.

Module-6: Digital Electronics:

Introduction to binary number; Basic Boolean algebra; Logic gates and function realization with OPAMPS.

Engineering Mechanics – 20 Marks

Module-I

Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector).

Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i , j , k . Cross product and Dot product and their applications.

Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces.

Module-II

Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium.

Concept of Friction; Laws of Coulomb's friction; Angle of Repose; Coefficient of friction.

Module-III

Distributed Force: Centroid and Centre of Gravity; Centroids of triangle, circular sector, quadrilaterals, composite areas consisting of above figures.

Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone.

Concept of simple stresses and strains; Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety.

Module-IV

Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of $x-t$, $v-t$ and $a-t$ graphs.

Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion).

Module-V

Kinetics of particles: Newton's second law; Equation of motion; D. Alembert's principle and free body diagram; Principle of work and energy; Principle of conservation of energy; Power and efficiency.

Basic Computation & Internet Application – 10 Marks

Fundamentals of Computer:

History of Computer, Generation of Computer, Classification of Computers.

Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices.

Binary & Allied number systems representation of signed and unsigned numbers. BCD, ASII. Binary Arithmetic & logic gates 6L Assembly language, high level language, compiler and assembler (basic concepts).

Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Algorithm & flow chart.

C Fundamentals:

The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements.

Operators & Expressions:

Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Input and output: Standard input and output, formatted output – printf, formatted input scanf.

Flow of Control:

Statement and blocks, if – else, switch, loops – while, for do while, break and continue, go to and labels.

Fundamentals and Program Structures:

Basic of functions, function types, functions returning values, functions not returning values, auto, external, static and register variables, scope rules, recursion, function prototypes, C pre-processor; command line arguments.

Arrays and pointers:

One dimensional arrays, pointers and functions, multidimensional arrays. 6L Structures Union and Files: Basic of structures, structures and functions, arrays of structures, bit field, formatted and unformatted files.

Internet application in modern office practice and management.