SYLLABUS FOR DIRECT RECRUITMENT OF SR. INSTRUCTOR ITI, (ENGINEERING TRADE), GROUP-'C' , NON-GAZETTED UNDER THE DEPARTMENT OF INDUSTRIES AND COMMERCE, GOVT. OF TRIPURA

The Examination will comprise of Two successive stages viz. (i) Written Examination (Multiple Choice Type Test) carrying 170 marks and (ii) An Interview cum Personality Test carrying 30 marks.

(A) Scheme of the Written Examination: The Written Examination will consist of one paper viz. a paper on "General Studies and "Engineering Aptitude". The paper will be of an Objective Type consisting of 170 Multiple- Choice Question. The paper will carry 170 marks and will be of Two and a half (2½) hours duration. The paper consist of Two Parts, namely 1) Part-A General Studies (50 questions of 01 marks each) ii) Part-B "Engineering Aptitude" (120 questions of 01 marks each). There will be Negative marks for MCQ. For each question for which a wrong answer has been given by the candidate, **one-fourth** of the marks assigned to that question will be deducted as penalty.

(B) Details Syllabus for the written Examination:

PART-A: GENERAL STUDIES
(COMPULSORY FOR ALL ENGINEERING GROUP)

English Composition:- English Composition will cover Synonyms, Antonyms, Use of Common Phrase & Idioms, Use of appropriate Preposition & Articles, Spotting Errors etc.

General knowledge : Question will include knowledge of Indian History , Geography & Constitution of India of such a nature which the candidate shall able to answer without any special study. Question on Tripura and North Eastern States, its historian Topography will also be included.

Knowledge of Current Affairs :-Question will include the knowledge of current events of Local, National & International important and of such matters of everyday observation and experiences in their scientific aspect as may be expected of an educated person who has not made a special study of any scientific subjects.

Numerical Ability:- Question on Numerical Ability will be similar to that of the compulsory Mathematics based on 10th standard.

General Mental Ability:-Question will be set on logical perception, understanding and natural conclusion etc.

PART-B: ENGINEERING APTITUDE

SYLLABUS OF SR. INSTRUCTOR(MECHANICAL)

1. THERMODYNAMICS

Cycles and IC engines, basic concepts, open and closed systems.heat and work. Zeroth, first and second law, application to non-flow and flow processes. Entropy, availability. Properties of ideal gases and vapours. Standard vapour, gas power and refrigeration cycles. Two stage compressor. CI and SI engines. Pre-ignition, detonation and diesel-knock, fuel injection and carburation, supercharging. Engine cooling, emission & control. Measurement of calorific values.

2. REFRIGERATION AND AIRCONDITIONING

Heat pump and refrigeration cycles and systems, refrigerants. Condensers, evaporates and expansion devices, psychrometry, charts and application to air conditioning, sensible heating and cooling, effective temperature, comfort indices, load calculations, solar refrigeration, controls, duct design.

3. BASIC KNOWLEDGE ON WORKSHOP SCIENCE

Measuring instruments & gauges, introduction to manufacturing processes, basic terminology used economical and technological considerations. **Materials properties and their application:** different engineering materials, properties, nomenclature, basics of heat treatment. **Fitting:** introduction, tools used in fitting, measuring and marking tools, the process of making sawing, filling, tapping and die,

introduction to drills. **Welding:** introduction, various welding processes with brief introduction, electric arc welding, arc welding procedure, list of equipment for electric arc welding, gas welding process and equipment, soldering and brazing process. **Sheet metal working:** introduction, types of sheets (ferrous/non-ferrous), standard sheet sizes and their measurement, tools used in sheet metal. **Metal cutting:** introduction, classification of machine tools and cutting tolls, basic operations on lathe, drilling, shaper, milling, cutting tool material, work-holding devices, cutting parameters i.e. Speed, feed and depth of cut.

4. AUTOMOBILE ENGINEERING

Constructional features fuel supply system , cooling system ,lubrication system ,intake & exhaust system fuels, combustion in engine ,automobile emission & its control ,electrical system chassis & body ,transmission system ,gear box, propeller shaft & final drive ,suspension system ,steering system ,braking system ,wheel & tyre.

5. STRENGTH OF MATERIALS

Stress and strain in two dimensions, principal stresses and strains, mohr's construction, linear elastic materials, isotropy and anisotropy, stress-strain relations, uniaxial loading, thermal stresses. Beams: bending moment and shear force diagram, bending stresses and deflection of beams. Shear stress distribution.
Torsion of shafts, helical springs. Combined stresses, thick-and thin-walled pressure vessels. Struts and columns. Strain energy concepts and theories of failure.

6. FLUID MECHANICS

Properties and classification of fluids, manometer, forces on immersed surfaces, center of pressure, buoyancy, elements of stability of floating bodies. Kinematics and dynamics. Irrotational and incompressible. Inviscid flow. Velocity potential, pressure field and forces on immersed bodies. Bernoulli's equation, fully developed flow through pipes, pressure drop calculations, measurement of flow rate and pressure drop. Integral approach, laminar and turbulent flows, separations. Flow over weirs and notches. Open channel flow, hydraulic jump. Dimensionless numbers, similitude and modelling. One-dimensional isentropic flow, normal shock wave, flow through convergent - divergent ducts, oblique shock-wave.

7. THEORY OF MACHINES

Cotters, keys, splines, welded joints, threaded fasteners, joints formed by interference fits. Cams. Gears and gear trains. Flywheels. Governors, shaft and axle, wire ropes, hydrodynamics bearings and rolling element bearings. Balancing of rigid rotors and field balancing. Balancing of single and multicylinder engines. Critical speeds and whirling of shafts automatic controls

SYLLABUS OF SR. INSTRUCTOR (ELECTRICAL)

1. EM THEORY

Electric and magnetic fields. Gauss's Law and Amperes Law. Fields in dielectrics, conductors and magnetic materials. Time varying fields. Plane-Wave propagating in dielectric and conducting media. Transmission lines.

2. ELECTRICAL MATERIALS
Conductors, Semi-conductors and Insulators. Super-conductivity. Insulators for electrical and electronic applications. Magnetic materials. Ferro and ferri magnetism. Ceramics, Properties and applications. Hall effect and its applications. Special semi conductors.

3. ELECTRONIC DEVICES AND CIRCUITS

Analog Devices and circuits: Physics of Semiconductor Materials & Components, Energy band diagram, Fermi level, Hall effects, Effects of Temperature on Semiconductor. **Devices :** Diodes, Rectfiers & its Efficiency,Zener Diode, BJTs, FETs, Thyristors, Tunnel diodes, Basics of IC,s and operational amplifiers ,IC fabrication technique ,Different OP-AMP Application etc. **AC Fundamentals:** Introduction, Characteristics of Sine Wave- Audio and Radio Frequencies- Different values , Sinusoidal

Voltage & Current-Phase of an AC- Phase Difference. RLC Circuit-Q Factor of a coil- Skin Effect, Resonance in an RLC circuit, Bandwidth of a Tuned circuit , Time Constant of an RL , RC Circuit-Charging and Discharging of a Capacitor etc. **Biasing Circuits** : Biasing circuits of transistors and its characteristics, Voltage Regulator Circuits, Power amplifiers, feedback amplifiers, Oscillators, Multi vibrators. Regulated Power supply. Time base circuit ,Saw-tooth voltage and current generators, transistor switches, wave shaping circuit(diode and transistors) Electro-static and magnetic deflection methods, low frequency h-parameter of transistor & FET models, Pi models. **Digital Devices and Circuits :** Number systems, logic gates-Boolean Algebra-Transistor as a switch-logic families Arithmetic and logic circuits-Counters and shift registers-A /D and D /A converters, Multiplexer, De-multiplexer,Encoder,Decoderetc.

5. MICROPROCESSORS

Microprocessor architecture-Instruction set and simple assembly language programming. Interfacing for memory and I/O. Applications of Micro-processors in power system.

6.ELECTRICAL MACHINES AND POWER TRANSFORMERS

Magnetic Circuits . Construction and testing. Equivalent circuits. Losses and efficiency. Regulation. Auto-transformer, 3-phase transformer. Parallel operation. Basic concepts in rotating machines. EMF, torque, basic machine types. Construction and operation, leakage losses and efficiency. D.C. Machines. Construction, Excitation methods. Circuit models. Armature reaction and commutation. Generators and motors. Starting and speed control. Testing, Losses and efficiency. Synchronous Machines. Construction. Circuit model. Operating characteristics.Synchronous reactance. Efficiency. Voltage regulation. Salient-pole machine, Parallel operation.Hunting. Short circuit transients. Induction Machines. Construction. Principle of operation. Rotating fields. Characteristics and performance analysis. Determination of circuit model. Circle diagram. Starting and speed control. Fractional KW motors. Single-phase synchronous and induction motors.

7. MEASUREMENTS AND INSTRUMENTATION

Units and Standards. Measurement of current, Voltage, power, Power-factor and energy. Indicating instruments. Measurement of resistance, inductance, Capacitance and frequency. Bridge measurements. Electronic measuring instruments. Digital Voltmeter and frequency counter. Transducers and their applications to the measurement of non-electrical quantities like temperature, pressure, flow-rate displacement, acceleration, noise level etc. Data acquisition systems. A/D and D/A converters.

5. COMMUNICATION SYSTEMS

Types of modulation; AM, FM and PM. Demodulators. Noise and bandwidth considerations. Digital communication systems. Pulse code modulation and demodulation. Elements of sound and vision broadcasting. Carrier communication. Frequency division and time division multiplexing, Telemetry system in power engineering.

6. POWER ELECTRONICS

Power Semiconductor devices. Thyristor. Power transistor, GTOs and MOSFETS. Characteristics and operation. AC to DC Converters; 1-phase and 3-phase DC to DC Converters; AC regulators. Thyristor controlled reactors; switched capacitor networks. Inverters; single-phase and 3-phase. Pulse width modulation. Sinusoidal modulation with uniform sampling. Switched mode power supplies.

SYLLABUS OF SR. INSTRUCTOR (ELECTRONICS)

1. ELECTRONIC DEVICES AND CIRCUITS

Analog Devices and circuits: Physics of Semiconductor Materials & Components, Energy band diagram, Fermi level, Hall effects, Effects of Temperature on Semiconductor. **Devices :** Diodes, Rectfiers & its Efficiency,Zener Diode, BJTs, FETs, Thyristors, Tunnel diodes, Basics of IC,s and operational amplifiers ,IC fabrication technique ,Different OP-AMP Application etc. **AC Fundamentals:** Introduction, Characteristics of Sine Wave- Audio and Radio Frequencies- Different values , Sinusoidal Voltage & Current-Phase of an AC- Phase Difference. RLC Circuit-Q Factor of a coil- Skin Effect, Resonance in an RLC circuit, Bandwidth of a Tuned circuit , Time Constant of an RL , RC Circuit-Charging and Discharging of a Capacitor etc. **Biasing Circuits** : Biasing circuits of transistors and its characteristics, Voltage Regulator Circuits, Power amplifiers, feedback amplifiers, Oscillators, Multi vibrators. Regulated Power supply. Time base circuit ,Saw-tooth voltage and current generators, transistor switches, wave shaping circuit(diode and transistors) Electro-static and magnetic deflection methods, low frequency h-parameter of transistor & FET models, Pi models. **Digital Devices and Circuits :** Number systems, logic gates-Boolean Algebra-Transistor as a switch-logic families Arithmetic and logic circuits-Counters and shift registers-A /D and D /A converters, Multiplexer, De-multiplexer,Encoder,Decoderetc.

2. MICROPROCESSORS

Microprocessor architecture-Instruction set and simple assembly language programming. Interfacing for memory and I/O. Applications of Micro-processors in power system.

3. ELECTRONIC INSTRUMENTATION AND MEASUREMENTS

Systems, units and standards of Measurement, AC and DC indicating instruments, AC and DC bridge circuits, Error Analysis of generalized measurement systems, transducers (Strain gauge, LVDT. Thermistor, Thermocouple etc.) Electronic Measuring Instruments, CRO, Digital Ammeter, Millimetre, Voltmeter, Time and Frequency measurements, Signal Generators, Q-meter,Wattmeter,Energymeteretc.

4. NETWORKS-FILTERS AND MICROWAVE ENGINEERING

Network theorems, Single and Two port networks, T-type, ll-type ladder type networks. Transmission lines : Characteristics impedances, Losses in transmission lines, Standing Waves, Quarter and half wavelength lines, Attenuators, Equalizers, Basics of Wave guides- Resonators and Components, Transmission line charts, The double Stub, Directional Couplers etc. Basic principles of wave propagation, Propagation of EM waves-sky waves- sky wave, ground wave, space wave, skip distance, maximum usable frequency, Basic of Microwaves ,Different Microwave Tubes, Circuits and its application and EM Spectrum Principles of microwaves devices and circuits. Antenna:-Basics of Electromagnetic theory, Maxwell's equations. Fundamentals of Antennas and Radar, Antenna gain, Antenna Resistance, Bandwidth, Beam width and Polarization, Antenna Couplers, Different types of antenna and its application.

5. ANALOG AND DIGITAL COMMUNICATION ENGINEERING

Introduction of AM,FM PM , : Amplitude limiting in FM, Pre-emphasis, De-emphasis; Noise in AM and FM: Multiplexing-FDM, TDM; ASK, FSK, Block schematic of different transmitters for AM, FM,SSB, ISB systems; receivers, Mixers, AGC, AFC, spectrum of EM waves; Principles of telegraphy, telephony and television broadcasting , Basics of satellite and optical fibre communications: Fundamentals of telematics. Signal analysis-Fourier series and Fourier transform. Sampling theorem, Parseval's theorem, convolution, Pulse modulation; PCM, PAM, PWM, DM, Multiplexing-FDM, TDM; ASK, FSK etc.

6. ELECTRICAL MACHINES

SINGLE-PHASE TRANSFORMER: Construction and basic principle of operation, Core type and shell type. Materials used for core. Winding and insulation,(E.M.F. equivalent circuit;) Equivalent circuit referred to primary -- phasor diagram, Polarity test, O.C and S.C. test Regulation. Efficiency. All day efficiency, Parallel operation. INDUCTION MOTOR: Three phase balanced excitation system. Development of

rotating magnetic field. Frequency of the induced emf and relationship to number of poles. Construction and basic principle of operation of 3 phase induction motor, Slip, Slip speed and slip frequency, Per-phase equivalent circuit, Phasor diagram, Types of windings, Squirrel cage and slip-ring motor construction, Equations for torque, Torque speed characteristics, Effect of change in rotor resistance in slip-ring machine, Methods of starting and speed control. **D.C. MACHINES:** Construction and operating principle, Function of commutator and brush system, Armature reaction and their effects, MMF distribution, Commutation, Interlopes. D.C. GENERATORS: EMF equation characteristics with different excitation systems, Voltage relation. Parallel operation. D.C. MOTORS: Equation for torque, characteristics with different excitation systems, method of starting. Speed control, Speed-torque characteristics.

SYLLABUS OF SR. INSTRUCTOR (IT&ESM)

1. BASICS OF INFORMATION TECHNOLOGY

Introduction to Computers: Generation of computers, Characteristic and classifications of computers. Components of Computer: CPU, Various I/O Devices, Memory & its types , (Memory Hierarchy, Storage Media), Computer Software and their types, Operating System. Algorithm and flowchart: Algorithm and flow chart characteristics, Sketching Flowcharts of various problems. Basics of C Programming Introduction to programming paradigms, Structure of C program, C programming: Data Types, Storage classes, Constants, Enumeration Constants, Keywords, Operators: Precedence and Associativity, Expressions, Input/Output statements, Assignment statements, Decision making statements, Switch statement, Looping statements, Pre-processor directives, Compilation process.

2. ELECTRONIC DEVICES AND CIRCUITS

Analog Devices and circuits: Physics of Semiconductor Materials & Components, Energy band diagram, Fermi level, Hall effects, Effects of Temperature on Semiconductor. **Devices :** Diodes, Rectfiers & its Efficiency,Zener Diode, BJTs, FETs, Thyristors, Tunnel diodes, Basics of IC,s and operational amplifiers ,IC fabrication technique ,Different OP-AMP Application etc. **AC Fundamentals:** Introduction, Characteristics of Sine Wave- Audio and Radio Frequencies- Different values , Sinusoidal Voltage & Current-Phase of an AC- Phase Difference. RLC Circuit-Q Factor of a coil- Skin Effect, Resonance in an RLC circuit, Bandwidth of a Tuned circuit , Time Constant of an RL , RC Circuit-Charging and Discharging of a Capacitor etc. **Biasing Circuits** : Biasing circuits of transistors and its characteristics, Voltage Regulator Circuits, Power amplifiers, feedback amplifiers, Oscillators, Multi vibrators. Regulated Power supply. Time base circuit ,Saw-tooth voltage and current generators, transistor switches, wave shaping circuit(diode and transistors) Electro-static and magnetic deflection methods, low frequency h-parameter of transistor & FET models, Pi models. **Digital Devices and Circuits** : Number systems, logic gates-Boolean Algebra-Transistor as a switch-logic families Arithmetic and logic circuits-Counters and shift registers-A /D and D /A converters, Multiplexer, De-multiplexer,Encoder,Decoderetc.

3. MICROPROCESSORS

Microprocessor architecture-Instruction set and simple assembly language programming. Interfacing for memory and I/O. Applications of Micro-processors in power system.

4. ELECTRONIC INSTRUMENTATION AND MEASUREMENTS

Systems, units and standards of Measurement, AC and DC indicating instruments, AC and DC bridge circuits, Error Analysis of generalized measurement systems, transducers (Strain gauge, LVDT. Thermistor, Thermocouple etc.) Electronic Measuring Instruments, CRO, Digital Ammeter, Millimetre, Voltmeter, Time and Frequency measurements, Signal Generators,Q-meter,Wattmeter,Energymeteretc.

5. DATA COMMUNICATION & NETWORKING

Communication Basics- Need for modulation in communication systems. Concept of AM,FM, PM, PAM, FSK,PSK and PCM , Communication model, Data communication networking. 2. **Networking Basics-** What is network, Models of networking computing, Networking models, Peerto-peer Network, Server Client Network, LAN, MAN, and WAN, Network Services, Topologies, Switching Techniques. **Data Transmission-** Analog and digital transmission, Transmission impairments (delay distortion, Noise, Bandwidth, channel capacity), Transmission medias: Wired (Twisted Pair, Coaxial cable, Optical fiber) and wireless (Radio wave, Microwave, Infrared, Light wave) and their characteristics.

6. WEB TECHNOLOGY

Basics of Internet:- Concept of Internet, Working of Internet, Specification and technical details for establishing Internet, Types and function of Modem, Internet connectivity methods (Terminal emulation, Dial up, dedicated, Broadband, RF Link, VSAT, ISDN etc) **Tools and Services on internet-** Email, Usenet, FTP, Telnet, IRC, Video conferencing. Search Engines, Proxy Server ,Networking Devices (NIC, bridges, Routers, Repeaters, Hubs/Switch, Gateways etc. ,Web Browsers (Netscape and Internet Explorer to surf Internet) **IP Addressing** Internet domains, domain name server (DNS), TCP/IP protocols, Internet service providers, Intranets, IP Addressing, IP Header, Subnetting, DNS

SYLLABUS OF SR. INSTRUCTOR(CIVIL)

1. BUILDING MATERIALS

Bricks: Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength on masonry strength. Cement: Compounds of, different types, setting times, strength. Cement Mortar: Ingredients, proportions, water demand, mortars for plastering and masonry. Concrete: Importance of W/C Ratio, Strength, ingredients including admixtures, workability, testing for strength, elasticity, non-destructive testing, mix design methods.

2. STRENGTH OF MATERIAL

Bending moment & share force in beams , Bending stress in beams ,Shearing stresses in beams Columns & struts , Combined bending & direct stress , Compound & complex stress , Strain energy & impact loading.

3. THEORY OF STRUCTURE

Definitions & general principles , Primary stress analysis for statically determinate pin jointed structures , Fixed & continuous beams, propped cantilever moment distribution method ,Retaining walls (earth retaining structures)

4. THEORY OF CONCRETE AND MASONRY STRUCTURES

Limit state design for bending, shear, axial compression and combined forces. Codal provisions for slabs, beams, walls and footings. Working stress method of design of R.C. members. Principles of prestressed concrete design, materials, methods of prestressing, losses. Design of simple members and determinate structures. Introductions to prestressing of indeterminate structures.
Design of brick masonry as per I.S. Codes.

5. SOIL MECHANICS

Properties of soils, classification and interrelationship; Compaction behavior, methods of compaction and their choice; Permeability and seepage, flow nets, Inverted filters; Compressibility and consolidation; Shearing resistance, stresses and failure; soil testing in laboratory and in-situ; Stress path and applications; Earth pressure theories, stress distribution in soil; soil exploration, samplers, load tests, penetration tests.

6.FOUNDATION ENGINEERING

Types of foundations, Selection criteria, bearing capacity, settlement, laboratory and field tests; Types of piles and their design and layout, Foundations on expansive soils, swelling and its prevention, foundation on swelling soils.

7. SURVEYING

Classification of surveys, scales, accuracy; Measurement of distances - direct and indirect methods; optical and electronic devices; Measurement of directions, prismatic compass, local attraction; Theodolites - types; Measurement of elevations - Spirit and trigonometric leveling; Relief representation; Contours; Digital elevation modeling concept; Establishment of control by triangulations and traversing - measurements and adjustment of observations, computation of coordinates; Field astronomy, Concept of global positioning system; Map preparation by plane tabling and by photogrammetry; Remote sensing concepts, map substitutes.

8. TRANSPORTATION ENGINEERING

Planning of highway systems, alignment and geometric design, horizontal and vertical curves, grade separation; Materials and construction methods for different surfaces and maintenance: Principles of pavement design; Drainage.

SYLLABUS OF SR. INSTRUCTOR (WC & ED)

1. BASIC KNOWLEDGE ON ENGINEERING MECHANICS

System of forces, coplanar concurrent force system, composition and resolution of force, equilibrium of rigid bodies, free body diagram, Lami's theorem. **Analysis of framed structure:** Reaction in beam with different end conditions, determination of reactions in members of trusses: a) Analytical methods b) Graphical method , **Centre of gravity and moment of inertia:** Concept of C.G and centroid, position of centroid, theorem of parallel and perpendicular axes, moment of inertia of simple geometrical figures. **Stress and strain:** Concept of stress and strain, simple stresses, tensile, compressive, shear, bending and torsion, stress- strain curves, elongation of bars, composite bars, thermal stresses, elastic constants. **Friction:** Introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry fiction belt friction. **Levers and Simple Machines:** Simple machines, Effort and load, mechanical advantage, velocity ratio, efficiency of machine, relation between efficiency, velocity ratio and mechanical advantage , Lever and its types.

2. BASIC KNOWLEDGE ON ENGINEERING DRAWING

Definition of projection, Principle of projection, Methods of projections,Orthographic projection, plane of projection, First and third angle of projection. Different methods of dimensioning. Isometric scale, Isometric axes, Isometric projection, Preparation of working drawing from models and isometric views. Concept of sectioning; Revolved and oblique section. Sectional drawing of simple machine parts. Types of rivet heads and riveted joints, Symbols for different types of welded joints; Processes for producing leak proof joints. Nomenclature, thread profiles, multi-start threads, left and right hand thread; Square headed and hexagonal nuts and bolts; Conventional representation of threads; Different types of lock nuts, studs, machine screws, cap screws and wood screws; Foundation bolts; Nomenclature, thread profiles, multi-start threads, left and right hand thread; Square headed and hexagonal nuts and bolts; Conventional representation of threads; Different types of lock nuts, studs, machine screws, cap screws and wood screws; Foundation bolts.

3. BASIC KNOWLEDGE ON WORKSHOP SCIENCE

Measuring Instruments & gauges, Introduction to manufacturing processes, Basic terminology used Economical and technological considerations. **Materials properties and their application:** Different engineering materials, Properties, Nomenclature, Basics of heat treatment process Hardening, Tempering, Annealing, Normalising, Case Hardening. **Fitting:** Introduction, Tools used in fitting, measuring and marking tools, the process of making sawing, Filling, Tapping and die, Introduction to drills. **Welding:** Introduction, Various welding processes with brief introduction, Electric Arc welding, Arc welding procedure, List of equipment for electric arc welding, Gas welding process and equipment, Soldering and Brazing process. **Sheet metal working:** Introduction, Types of sheets (ferrous/non-ferrous), Standard sheet sizes and their measurement, Tools used in sheet metal. Machinery: **Introduction to various workshop machines**: Lathe, power hacksaw, Shaper and planner, Drilling, and Grinder. **Safety measures in workshop**: Indian Factory Acts on safety.

4. BASIC KNOWLEDGE ON ELECTRICAL & ELECTRONICS ELEMENTS

Introduction of Voltage Source, Current Source, A.C & D.C Signal, Kirchoff's voltage and current laws, Star-delta transformations. A. C. FUNDAMENTALS & A. C. SERIES CIRCUIT- Concept & significance of R.M.S. value, peak value, average value, and form factor of sinusoidal, voltage/current – Equation of instantaneous value of sinusoidal voltage/current, power . Basic Principle of: Storage cell, D.C. motors, Transformer, A.C. generators & motors. Familiarity with the following components: — RESISTORS, CAPACITORS, INDUCTOR. Features and specifications of AF, RF transformer, Relays, Switches, Cables & Connectors. Operational characteristics of PN-JUNCTION DIODE, ZENER DIODE , BIPOLAR TRANSISTOR, & FIELD EFFECT TRANSISTOR , UJT & THYRISTER

SYLLABUS OF SR. INSTRUCTOR (MATH)

1. BASIC CONCEPTS OF ALGEBRA

Quadratic Equations – Quadratic expressions – Analysing the discriminant & nature of roots – Relation between roots & coefficients – Conjugate roots – Applications & problems **Binomial Theorem** – Definition & meaning of nPr & nCr – statement of Binomial Theorem (no proof) – General Term – Middle Term – Application & problems **Concept of vector** - Addition and subtraction of vectors – Multiplication of a vector by a scalar – Position vector of a point – Ratio formula – Rectangular resolution of a vector – Dot and cross product – Geometrical interpretation – Distributive law – Applications. **Complex Numbers** – Definition Geometric Representation – Modulus – Amplitude – Polar form – Rationalization – Addition & multiplication – Conjugate complex number – Cube roots of unity- simple problems. **Variation**, A.P, G.P – formula & simple problems.

2. BASIC CONCEPTS OF TRIGONOMETRY

Trigonometric- Ratios of associated angles, compound angles, multiple & sub multiple angles **Inverse circular function** – Definition – Formulae & problems Solution of Trigonometric equations between 0 & 2π only (no deduction) **Properties of Triangle** – Formulae & Problems

3. BASIC CONCEPTS OF CO-ORDINATE GEOMETRY OF TWO DIMENSION

Co-ordinate system – Cartesian & polar – Distance between two points – Area of a triangle. **Straight line** - Different forms of equations of a straight line – Angle between two straight lines – Parallelism & perpendicularity – Equation of bisectors of the angles between two straight lines , **Circle** - Different forms of equation – Common chord – Problems **Conic section** - Different forms of equation of parabola & their components – Standard equation of an Ellipse – Different components of an ellipse – Focal distance of a point

4. BASIC CONCEPTS OF DIFFERENTIAL CALCULUS

Function – Even – Odd – Periodic – Limit – Theorems on limit – Important limits – Evaluation of limits – Definition of Continuity – Theorems of continuity – Testing of Continuity Problems **Differentiation** - Definition – Derivative of standard functions – Rules for differentiation of function – Logarithmic differentiation – Differentiation of I.C.F. – Differentiation of parametric & implicit function , Successive differentiation up to second order – Problems

5. BASIC CONCEPTS OF INTEGRAL CALCULUS

Integration as the inverse process of differentiation – List of formulae for integration –Method of substitution – Integration by parts – Integration by partial fraction – Evaluation of integrals by each of the above methods Definite integral – Rules & properties of definite integral (statement only) – Evaluation of definite integrals

6. BASIC CONCEPTS OF MATRIX & DETERMINANT

Matrix – Definition – Order of a matrix – Leading element – Principal diagonal. Types of matrices – Null matrix – Square matrix – Identity matrix – Upper and lower triangular matrix – Symmetric matrix. Determinant of a square matrix – Minors and cofactors – Procedures for evaluation –Properties of determinants (no deduction) – Evaluation of determinant by Chio's method (4th order).

7. BASIC CONCEPTS OF DIFFERENTIAL EQUATIONS

Definition – Order and degree of a differential equation – Differential equations of 1st order and 1st degree – Separation of variables ,Homogeneous differential equations – Equations reducible to the homogeneous form Exact differential equations – equations reducible to the exact form – problems. Linear equations – Bernoulli's equations. Differential equations of 2nd order with constant co-efficients Complementary function and particular integral . Applications of differential & integral calculus – Physical meaning of derivative – Rate measurement- Maxima, Minima (one variable) – Area under plane curve- volume and surface revolution.

8. BASIC CONCEPTS OF PROBABILITY

Introduction – Random experiment – Sample space – Events. Classical and axiomatic definition of probability. Addition and multiplication theorem.

(C) Interview cum Personality Test: A limited no. of candidates, maximum 5(five) times of total posts (in category wise) will be selected merit wise on the basis of the result of the Written Examination, subject to securing minimum qualifying marks (50% for UR candidates, 45% for Scheduled Castes candidates and 40% for Scheduled Tribes category candidates) or otherwise as fixed by the Departmental Selection Committee. **The total marks for the Personality Test will be 30.** If a candidate remains absent in the personality Test, his/her candidature will be treated as cancelled. Final Merit List will be prepared on the basis of the total marks obtained in the Written Examination and marks obtained in the Personality Test.

Signature of the Committee Members

(Debashish Barman)
Member
Principal, WITI, Indranagar

(Sri Anumoy Debbarma)
Member
Principal, ITI, Indranagar

(Sri Siddhartha Das)
Member
Asst. Professor, TIT Narsingarh

Representative of NIT, Agartala
Member

(Sri Tapan Das)
Member
Manager (Credit), Directorate of (I&C)

(Sri Subash Ch. Das)
Chairman
Addl. Directorate of (I&C)