

SCHEDULE – I

Clause No

I GENERAL STUDIES (COMPULSORY FOR ALL GRADE/POSTS/BRANCHES)

TOTAL MARKS – 100
Duration of examination – 1 hour

The break up of marks on various topics will be as follows:-

<u>Topic</u>	<u>Marks</u>
i) Comprehension of a given passage	20
ii) Usage (corrections)	10
iii) Vocabulary (synonyms & antonyms, idioms & phrases)	10
iv) General knowledge	20
(Questions will include knowledge of Indian and geography of such a nature which the candidates should be able to answer without any special study. Questions on Tripura, its historian topography will also be included.)	
v) Current Affairs	20
(The questions will include knowledge of Indian current events and of such matters of every day observation and experience in their scientific aspects as may be expected of an educated person who has not made a special study of any scientific subject.)	
Vi) Mental Ability.	20
Total	100

II. ENGINEERINGS SUBJECT PAPER – I & II(OPTIONAL FOR ALL GRADES /RANCHES)

TOTAL MARKS – 200(each paper)
Duration of examination – 3 hour

The break up of marks will be as follows:

<u>Topic</u>	<u>Marks</u>
i) 15 questions of 6 marks each having answers restricted to 40 words	90
ii) 40 multiple choice type questions of 2 marks each	80
iii) 05 numerical questions of 6 marks each	30
Total	200

SCHEDULE - IV
SYLLABUS FOR GRADE V (B) JUNIOR ENGINEER(DIPLOMA HOLDER)

CIVIL ENGINEERING
PAPER – I

TOTAL MARKS – 200
Duration of Examination – 3 Hours

1. BUILDING MATERIALS & CONSTRUCTION:

BRICKS AND TILE
STONES, SAND
CEMENT
MORTAR
CONCRETE
TIMBER
METALS AND OTHER ENGINEERING MATERIALS
PAINTS AND VARNISHES
BUILDING CONSTRUCTION
CONSTRUCTION PLANNING AND STORAGE OF MATERIAL
FOUNDATION
BRICKS AND STONE MASONRY
DAMP PROOFING
LINTEL AND ARCHES
ROOFS AND ROOF COVERINGS
DOORS AND WINDOWS
SCAFFOLDING
STAIR AND STAIRCASES
FLOORING
WALL FINISH

2. STRENGTH OF MATERIALS & THEORY OF STRUCTURE:

STRENGTH OF MATERIALS
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

THEORY OF STRUCTURES

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)

3. FOUNDATION ENGINEERING:

GENERAL CONSIDERATIONS FOR DESIGN OF FOUNDATIONS
TYPES OF FOUNDATION
BEARING CAPACITY OF SOILS
SETTLEMENT OF FOUNDATION
PILE FOUNDATION
SOIL STABILISATION
SOIL EXPLORATION
STRESS DISTRIBUTION IN SOILS
EARTH PRESSURE

4. CONCRETE TECHNOLOGY:

MATERIALS FOR CEMENT CONCRETE
PREPARATION OF CONCRETE
CONCRETE MIX DESIGN
QUALITY CONTROL
SPECIAL CONCRETE
DETERIORATION AND RESTORATION OF CONCRETE

5. QUANTITY SURVEYING

DEFINITION OF AN ESTIMATE AND TYPES
SYMMETRICAL & UNSYMMETRICAL BOUNDARY WALL (USING MODULAR & TRADITIONAL BRICKS)
CENTRE LINE, LONG WALL & SHORT WALL METHOD WITH EXAMPLE
DEFINITION OF FLOOR AREA, CARPET AREA, PLINTH AREA, FAR
ESTIMATE OF DIFFERENT ITEMS OF WORKS INVOLVED IN A SINGLE STOREY RESIDENTIAL BUILDING
ESTIMATE OF R.C.C. BEAMS, CHUJIA, LINTEL AND SLAB (ONE WAY & TWO WAY REINFORCEMENT) SHOWING BAR BENDING SCHEDULE)
CALCULATION OF QUANTITY OF MATERIALS OF DIFFERENT ITEMS OF WORKS
CALCULATION OF VOLUME OF EARTH WORK OF DIFFERENT WORKS
QUANTITY & COST ESTIMATE
CONTRACTS
PWD ACCOUNTS
ARBITRATION
VALUATION

**CIVIL ENGINEERING
PAPER – II**

TOTAL MARKS – 200
Duration of Examination – 3 Hours

1. HYDRAULICS

INTRODUCTION
FLUID STATIC
FLUID FLOW
FLUID MEASUREMENT
FLOW THROUGH PIPES
OPEN CHANNEL FLOW

2. IRRIGATION

HYDROLOGY
WATER REQUIREMENT OF CROPS
CANAL IRRIGATION
WELL IRRIGATION
CANAL HEAD WORKS
FLOOD CONTROL
WATER LOGGING
LAND RECLAMATION
MAJOR IRRIGATION PROJECTS IN INDIA

3. ENVIRONMENTAL ENGINEERING

AIR POLLUTION
AIR POLLUTION CONTROL MEASURES & EQUIPMENT
METHODS & APPROACH OF AIR POLLUTION CONTROL
DIFFERENT SOURCES OF WATER POLLUTION
WATER POLLUTION & ITS CONTROL
SOLID WASTE DISPOSAL

4. SURVEYING

LINEAR MEASUREMENTS
CHAIN SURVEYING
COMPASS SURVEYING
LEVELLING
CONTOURING
THEODOLITE SURVEYING
EARTH WORK CALCULATION
PLANE TABLE SURVEYING
COMPUTATION OF AREAS
COMPUTATION OF VOLUME

5. TRANSPORTATION ENGINEERING

PROJECTS & PROFILES
PERMANENT WAY
TRACK GEOMETRICS
POINTS & CROSSINGS
STATIONS & YARDS
PERMANENT WAY MAINTENANCE
ROAD DRAINAGE
TRAFFIC ENGINEERING
HIGHWAY MAINTENANCE

**MECHANICAL ENGINEERING
PAPER – I**

**TOTAL MARKS - 200
Duration of Examination – 3 Hours**

1. ENVIRONMENTAL ENGINEERING:

AIR POLLUTION
ANALYSIS OF AIR POLLUTANTS
AIR POLLUTION CONTROL MEASURES & EQUIPMENT
METHODS & APPROACH OF AIR POLLUTION CONTROL

WATER & ENVIRONMENT

WATER SOURCES
DIFFERENT SOURCES OF WATER POLLUTION
WATER POLLUTION & ITS CONTROL
NOISE & ENVIRONMENTAL MANAGEMENT SYSTEM
NOISE POLLUTION & CONTROL
ENVIRONMENTAL LEGISLATIONS, AUTHORITIES & SYSTEMS

2. MECHANICS OF MATERIALS

Stress and strain
Thin cylinder and spherical shells
Deflections of beams
Torsion of solid and hollow circular shafts
Springs
Riveted joints

3. MACHINE TOOL

GENERAL INTRODUCTION
METAL CUTTING
LATHE AND LATHE WORKS
DRILLING MACHINE

BORING MACHINE SHAPER & PLANNER

MILLING MACHINE
GRINDING MACHINE

4. FLUID MECHANICS

PHYSICAL PROPERTIES OF FLUIDS
FLUID STATICS
FLUID KINEMATICS
FLUID MEASUREMENTS
IMPACT OF JET
PUMPS
HYDRAULIC TURBINE

MECHANICAL ENGINEERING

PAPER – II

TOTAL MARKS – 200

Duration of Examination – 3 Hours

1. 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
GARAGE AND SERVICE STATION

2. NON CONVENTIONAL ENERGY SOURCES

SOLAR POWER PLANTS
SOLAR ENERGY
SOLAR RADIATION
WIND POWER PLANTS
WIND ENERGY
ENERGY FROM BIO-MASS

3. REFRIGERATION & AIR-CONDITIONING

AIR REFRIGERATION SYSTEM
VAPOUR COMPRESSION REFRIGERATION SYSTEM
VAPOUR ABSORPTION SYSTEM
REFRIGERANTS
REFRIGERATION COMPONENTS, CONTROL AND SAFETY DEVICES
APPLICATION OF REFRIGERATION

**ELECTRICAL ENGINEERING
PAPER – I**

**TOTAL MARKS - 200
Duration of Examination – 3 Hours**

1. POWER PLANT ENGINEERING

Conventional sources of Energy – Fossil fuels, Hydroelectric and nuclear.
Thermal Power Station:
Hydro-electric Power Stations:
Nuclear Power Plants:
Diesel Power Plant & Gas-turbine Plants:
Elementary idea about Major Electrical Equipments used in Power Stations:
Combined working of power plants
Control of Active and Re-active power-Load-frequency control
Performance of power stations and Economic considerations:

2. ELECTRICAL DESIGN & ESTIMATING

Design and Specification:
Design of an electrical installation of machines in a workshop (Maximum 4 machines) [out of 4 machines at least 1 no. should be of 1-phase]
I.E. rules related to Power Sub-circuit.
Design of Electrical Machine:

Design of a 3-phase transformer up to 200 KVA: -

Estimation of a small residential complex.
Estimation of lighting scheme of a large Auditorium and Public Health Centre,
Estimation of electrical installation of machines (not more than four) in a workshop
Estimation for giving 3 – phase O.H. service connections to a residential building.

3. ELECTRICAL MACHINES

GENERAL INTRODUCTION OF ROTATING MACHINE

D.C Machines:
D.C. Generator
D.C. Motors:
TRANSFORMERS
1-phase Transformers:
Principles of 1-phase Autotransformer
Three-phase transformer
Alternator
3-Phase Induction Motor
Synchronous Motor:
Fractional H.P. Motors:

4. TRANSMISSION & DISTRIBUTION POWER

Transmission System

Constructional Features of Transmission & Distribution Lines

Mechanical Features of Overhead lines

Spacing of conductors, length of span, Relevant I.E. Rules

Electrical features of Overhead lines

Power Factor Improvement

Using Static condenser and Synchronous condenser – related problems

Distribution System

Sub-stations

Extra High Voltage DC System of Transmission

ELECTRICAL ENGINEERING PAPER – II

TOTAL MARKS - 200
Duration of Examination – 3 Hours

1. BASIC ELECTRONICS

Passive & Active Circuit Elements
Familiarity with the following components: —
RESISTORS, FUSES, CAPACITORS, INDUCTOR,
Voltage source and current source
AC and DC signals, Transformer

RELAYS, SWITCHES, CABLES AND CONNECTORS
ZENER DIODE
BIPOLAR TRANSISTOR
FIELD EFFECT TRANSISTOR
UNIJUNCTION TRANSISTOR
THYRISTOR
OPTOELECTRONICS
INTEGRATED CIRCUITS

2. ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

Definition & brief explanations of:
Range, sensitivity, true & indicated value, Errors (including limiting errors),
Resolutions, Accuracy, Precision and instrument efficiency.
Classification of instruments:
Basic Requirements for measurements:
Different types of instruments:
voltmeter, ammeter, multimeter, energy-meter.
Multi-range ammeter and voltmeter
Methods of measuring diff. Electrical quantities:
1-phase Induction type energy meter.
Errors adjustments
Phantom loading
Testing of energy meters.
Classifications of resistances
Description of Meggar.
Measurement of capacitance:
Magnetic measurements:
Instrument Transformers:
CT
PT or VT
Diff. Types of faults

3. CIRCUIT THEORY

NETWORKS & A.C. FUNDAMENTALS

Single-phase A.C. Circuits:
R-L-C Series Circuit:
Parallel Circuit:

RESONANCE & SELECTIVITY

SERIES RESONANCE:
PARALLEL RESONANCE:

TRANSIENTS (FOR ELECTRICAL ENGINEERING ONLY)

Steady State & Transient Response.

POLYPHASE CIRCUITS:

COUPLED CIRCUITS:

LAPLACE TRANSFORMATIONS:

FILTERS:

LAPLACE TRANSFORMATIONS

4. ELECTRICAL MEASUREMENT & CONTROL

Measurement of Power/Energy & Industrial Metering:

Digital energy-meter

Operation & Utility of Tri-vector meter.

Digital frequency meter

(i) Mech. Resonance type (ii) Electrical resonance type Frequency meter

Power manager.

Synchroscope:

Phase-sequence meter

Digital multimeter

C.R.O.—block diagram representation & operation, applications

Use of dual trace oscilloscope.

Function generator—

Frequency Counter—

Elements of Servomechanism:

Stepper Motor—

Measurement of Non-electrical quantities:

Study of the following transducers:

Piezo-electric crystal.

Thermistor.

Strain gauge.

Proximity switch.

Thermocouple.

LVDT.

Tachogenerator(a.c.& d.c.)

Capacitive transducers—

Seismic transducers.

CONTROL SYSTEM:

Brief descriptions with physical example (alongwith schematic diagram) of:

On-off controller.

Proportional controller.

Proportional plus derivative controller.

P+I controller.

P + D + I controller.

5. ELECTRICAL INSTALLATION, MAINTENANCE AND TESTING

General guidelines for Installation:

Loading & unloading of heavy electrical m/c:

Electrical Installation requirements:

Earthing Installation:

General requirement of electric installation according to I.E. Rules:

Motor generator set for battery charging and to supply various loads.

Synchronization of two alternators.
Maintenance of electrical installations
Insulation:
Troubleshooting:
Repair & Maintenance with Maintenance Schedule of:
D.C. machine
Transformer
Induction motor
Switchgear & Substation:
Relays
Brief account of maintenance of contactors.
Storage Batteries-
OH lines and Cables:
Testing
Electric Safety Regulations:

Sd/-
(*T.K. Bhowmik*)
Deputy Secretary
Public Works Department
Govt. of Tripura.