

**SCHEME AND SYLLABUS FOR THE POST OF RESEARCH ASSISTANTS IN
ENGINEERING LABORATORIES**

SCHEME:

<u>PART-A WRITTEN (OBJECTIVE TYPE) EXAMINATION</u>				
PAPER-1	General Studies	150 Marks	150 Qns	150 Minutes
PAPER-2	Civil Engineering	150 Marks	150 Qns	150 Minutes
PAPER-3	Civil Engineering	150 Marks	150 Qns	150 Minutes
<u>PART-B: INTERVIEW</u>		50 Marks		

SYLLABUS

PAPER-1 GENERAL STUDIES

- SCIENCE AND TECHNOLOGY:
 - General Science and Technology
 - Role and impact of science and Technology on India's development.
(Questions will cover general appreciation and understanding of matters of everyday observation and experience as may be expected of a well-educated person who has not made a special study of science and technology disciplines).
- INDIAN HISTORY AND CULTURE:
 - Modern Indian History from 19th century to the present
 - Nationalist Movement and Constitutional development
 - Indian culture and Heritage including architecture, Fine Arts, dance forms, music, paintings, Folk arts and performing arts.
 - History of Andhradesa Society, Culture, Geography and Economic development.
- INDIAN POLITY:

General and broad understanding of the structural (institutions) and functional (processes) aspects of Indian Political system.
- INDIAN ECONOMY AND GEOGRAPHY OF INDIA:
 - Structure of National economy
 - Economic development (including planning) since independence
 - Economic Reforms
 - Physical, economic and social Geography of India.
- CURRENT EVENTS:

Current Events of Regional, National and International importance.
- GENERAL MENTAL ABILITY: (Reasoning and analytical abilities)

PAPER-2 : CIVIL ENGINEERING

PART – A:**STRENGTH OF MATERIALS:-**

Simple stresses and Strains: Types of stresses and strains - Hook's Law, Stress-strain curve for mild steel working stress and factor of safety Poisson ratio - State of simple shear, complementary - Shear Elastic constants and their relations - Compound bars - Thermal stress.

Compound stresses Mohr's circle of stress - Principal stresses and planes.

Shear force and bending moment diagrams: S.F.D. and B.M.D. for cantilevers, simply supported beams and over hanging beams subjected to point loads and uniformly distributed loads. Relations among load, shear force and bending moment.

Bending and shear stress: Basic equation; $M/I = F/Y = E/R$ - Distribution of bending and shear stresses across various cross sections such as rectangular, circular, I and T sections, Torsion of Circular shafts - power transmission.

Columns and struts: Euler's theory and Rankine's Theory - Secant and Perry formulae for eccentrically loaded columns.

Deflections and slopes: Slopes and deflections in cantilevers simply supported beams; propped beams and fixed beams subjected to point loads and uniformly distributed loads.

PART - B:

FLUID MACHANICS AND HYDRAULIC MACHINERY:

Fluid statics: Hydrostatic force on a plane and curved area Centre of pressure and its applications to lockgates and dams Metacentric height.

Fluid Dynamics: Convective and local acceleration, Euler's equation of motion and its intergration, Bernoulli's equation motion and its application, flow in curved path. Free and forced vortex.

Flow measurements: Notches and weirs, venturimeters, pitot tube, nozzle meter, current meter.

Compressible Flow: Velocity of pressure wave, wave velocity for adiabatic and isothermal compression, Basic equations of one-dimensional flow continuity, energy and momentum equations.

Laminar and turbulant flow through pipes: Reynolds experiment significance of Reynold's number, formulae for laminar flow through circular pipes, Turbulant flow-Darcy Weisbsch equation, friction factor and Mody's diagram.

Turbines: Classification, specific speed velocity triangles Principles of design of reaction and impules Turbines, characteristic curves.

Pumps: Centrifugal pumps, velocity triangles, Work done and efficiency minimum starting speed, loss of head; specific speed and characteristic curves for centrifugal pumps.

PAPER – 3 : CIVIL ENGINEERING

1. BUILDING MATERIALS:

Timber: Different types and species of structural timber, density – moisture relationship, strength in different directions, defects, preservations, plywood.

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, mix design methods, non-destructive testing.

2. STRUCTURAL ANALYSIS:

Analysis of determinate structures – different methods. Analysis of indeterminate skeletal frames – Moment distribution, Slope deflection, Kani's, Stiffness and force methods, Energy methods, Muller Breslan principle and application. Plastic analysis of indeterminate beams and simple portal frames – Shape factors.

3. DESIGN OF STEEL STRUCTURES:

Principles of working stress method. Design of connections, Simple members, Built-up sections and Frames, Design of industrial roofs. Principles of ultimate load design. Design of simple members.

4. DESGIN OF CONCRETE AND MASONRY STRUCTURES:

Limit state design for bending, Shear, Axial compression and combined forces. Codal provision for slabs, Beams, Columns and footings. Working stress method of design of R.C. members. Principles of pre-stressed concrete design, Materials, Methods of pre-stressing, losses. Design of simple members and determinate structures. Design of brick masonry as per IS codes.

5. CONSTRUCTION PLANNING AND MANAGEMENT:

Bar chart, Linked bar chart, Work break down structures, Activity – on – arrow diagrams. Critical path, Probabilistic activity durations, Event based networks. PERT network: Time-cost study, Crashing, Resource allocation.

6. HYDROLOGY AND WATER RESOURCE ENGINEERING:

Hydrological cycle, Precipitation and related data analysis, Unit hydrographs, Evaporation and transpiration. Floods and their management, Stream gauging, Routing of floods, Capacity of reservoirs. Multi purpose uses of water: Soil-plant – Water relationships, Irrigation systems. Water demand assessment: Storages and their yields. Ground water yield and well Hydraulics. Water logging and drainage design. Design of rigid boundary canals, Lacey's and tractive force concepts in canal design, Lining of Canals, Sediment transport in canals, Non-overflow and overflow dams and their design, Energy dissipators, Design of head works, Distribution works, Falls, Cross-drainage works, Outlets, River training.

7. ENVIRONMENTAL ENGINEERING:

- a. Water Supplying Engineering: Sources of supply, Yields, Design of intakes and conductors, Estimation of demand. Water quality standards, Control of water borne diseases. Primary and secondary treatment. Conveyance and distribution systems of treated water, Leakages and control. Rural water supply. Institutional and industrial water supply.
- b. Waste Water engineering: Urban rain water disposal, Systems of sewage collection and disposal. Design of sewers and sewerage systems, Pumping. Characteristics of sewage and its treatment. Disposal of products of sewage treatment. Plumbing systems. Rural and semi-urban sanitation.
- c. Solid Waste Management: Sources and effects of air pollution, Monitoring of air pollution, Noise pollution, Standards, Ecological chain and balance. Environmental assessment.

8. SOIL MECHANICS AND FOUNDATION ENGINEERING:

Properties and classification of soil, Compaction, Permeability and Seepage, Flow nets, Inverted filters, Compressibility and consolidation. Shearing resistance, Stresses and failure. Soil testing in laboratories and in-situ, Earth pressure theories, Stress distribution in soils, Soil exploration, Samplers, Load tests, Penetration tests. 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.

9. SURVEYING AND TRANSPORT ENGINEERING:

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, Contours, Digital elevation modeling concept, Establishment of control by triangulations and traversing, Measurement 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. 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. Traffic surveys, Intersections, Signaling, Mass transit systems, Accessibility, Networking.

Sd/- SECRETARY

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ASSISTANT SECRETARY (SS)