

INDICATIVE SYLLABUS FOR THE POST OF JUNIOR ENGINEER (CIVIL)

SECTION-A

General Intelligence and Reasoning: The questions shall be designed to test the candidate's ability to deal with abstract ideas and symbols and their relationships, arithmetical computations, and other analytical functions. The syllabus may include both verbal and non-verbal reasoning, such as analogies, similarities and differences, space visualization, problem-solving, analysis, judgment, decision-making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, coding-decoding, statement conclusion, syllogistic reasoning, etc.

General Awareness: Questions shall be aimed at testing the candidate's general awareness of the environment and its application to society. The test may include questions relating to History, Culture, Geography, Economic, Science, General Polity, Indian Constitution, Scientific Research, Environmental Issues, Sports, Important Days, Awards and Honours, and Current Affairs of National and International importance.

Arithmetical and Numerical Ability: Questions shall be designed to test the candidate's knowledge of number systems, computation of whole numbers, decimals and fractions, relationships between numbers, percentages, ratio and proportion, averages, interest, profit and loss, discount, time and distance, time and work, basic algebra, mensuration, data interpretation, and other arithmetical concepts involving real-life problem-solving.

English Comprehension: The test shall assess the candidate's ability to understand and use correct English. The syllabus may include vocabulary, grammar, sentence structure, synonyms and antonyms, spellings, error detection, sentence improvement, comprehension passages, and basic writing ability.

SECTION-B

APPLIED PHYSICS

- ❖ ELECTROSTATICS
- ❖ D.C. CIRCUITS
- ❖ ELECTROMAGNETISM
- ❖ EXPANSION OF SOLIDS
- ❖ HEAT TRANSFER
- ❖ GEOMETRICAL OPTICS
- ❖ WAVE OPTICS
- ❖ ACOUSTICS AND ULTRASONIC

APPLIED CHEMISTRY

- ❖ PROBLEMS BASED ON VOLUMETRIC AND GRAVIMETRIC ANALYSIS
- ❖ ANALYSIS OF WATER
- ❖ TREATMENT OF WATER
- ❖ CORROSION AND LUBRICANTS
- ❖ POLYMERIZATION, METALS AND ALLOYS

APPLIED MATHEMATICS

- ❖ ALGEBRA
- ❖ DETERMINANTS
- ❖ MATRICES
- ❖ CO-ORDINATE GEOMETRY OF TWO DIMENSIONS
- ❖ VECTORS
- ❖ DIFFERENTIAL CALCULUS
- ❖ INTEGRAL CALCULUS
- ❖ APPLICATIONS OF CALCULUS
- ❖ DIFFERENTIAL EQUATIONS
- ❖ COMPLEX NUMBERS

APPLIED MECHANICS

- ❖ INTRODUCTION
- ❖ LAWS OF FORCES
- ❖ MOMENTS
- ❖ CENTRE OF GRAVITY
- ❖ MOMENT OF INERTIA
- ❖ LAWS OF MOTION
- ❖ CIRCULAR MOTION
- ❖ WORK, POWER & ENERGY
- ❖ FRICTION

- ❖ SIMPLE LIFTING MACHINES

BASIC ELECTRICAL ENGG

- ❖ DC CIRCUITS
- ❖ NETWORK THEOREMS
- ❖ ELEMENTS OF GENERATION TRANSMISSION & DISTRIBUTION SYSTEM
- ❖ ARRANGEMENT OF SUPPLY SYSTEM & DISTRIBUTION SYSTEM
- ❖ DOMESTIC INSTALLATION & SAFETY MEASURE

ELEMENTS OF MECHANICAL ENGINEERING

- ❖ TRANSMISSION OF POWER
- ❖ INTERNAL COMBUSTION ENGINES
- ❖ LUBRICANTS
- ❖ CONSTRUCTION, WORKING OF RECIPROCATING, CENTRIFUGAL AND GEAR PUMP
- ❖ AIR COMPRESSOR
- ❖ MATERIAL HANDLING
- ❖ REFRIGERATION AND AIR CONDITIONING

SURVEYING

- ❖ INTRODUCTION
- ❖ CHAIN SURVEYING
- ❖ COMPASS SURVEYING
- ❖ SIMPLE LEVELING
- ❖ PRECISE LEVELING

BUILDING CONSTRUCTION

- ❖ INTRODUCTION
- ❖ FOUNDATION
- ❖ WALLS
- ❖ PARTITION WALL
- ❖ ARCHES AND LINTELS
- ❖ DOORS AND WINDOWS
- ❖ FLOORS
- ❖ ROOFS
- ❖ SCAFFOLDING, SHORING, UNDERPINNING AND FORMWORK
- ❖ DAMP PROOFING
- ❖ STAIRS
- ❖ SURFACE FINISHES
- ❖ MAINTENANCE OF BUILDING
- ❖ BUILDING PLANNING

IRRIGATION ENGINEERING

- ❖ INTRODUCTION
- ❖ RAINFALL AND RUN OFF
- ❖ WATER REQUIREMENT OF CROPS
- ❖ LIFT IRRIGATION
- ❖ TUBE WELL IRRIGATION
- ❖ FLOW IRRIGATION
- ❖ CANAL HEAD WORKS
- ❖ REGULATORY WORKS
- ❖ CROSS DRAINAGE WORKS
- ❖ DAMS
- ❖ WATER LOGGING AND DRAINAGE

HYDRAULICS

- ❖ INTRODUCTION
- ❖ PROPERTIES OF FLUIDS
- ❖ HYDROSTATIC PRESSURE
- ❖ MEASUREMENT OF PRESSURE
- ❖ FUNDAMENTALS OF FLUID FLOW
- ❖ FLOW MEASUREMENTS
- ❖ HYDRAULIC MACHINES
- ❖ FLOW THROUGH PIPES
- ❖ FLOW THROUGH OPEN CHANNELS

COMPUTER APPLICATION

- ❖ DIGITAL COMPUTER SYSTEMS, CHARACTERISTICS, HISTORY, COMPUTER GENERATIONS, TYPES OF COMPUTERS & THEIR CLASSIFICATIONS, APPLICATION OF COMPUTER IN VARIOUS FIELDS, COMPUTER HARDWARE & SOFTWARE, ELEMENTS OF COMPUTER HARDWARE-CPU, I/O DEVICES, STORAGE MEDIA, COMPUTER SOFTWARE-TYPES OF SOFTWARE, SYSTEM SOFTWARE, APPLICATION SOFTWARE.
- ❖ BASIC CONCEPT & FUNCTIONS OF AN OPERATING SYSTEM, TEXTUAL VS GUI INTERFACE, TYPE OF OPERATING SYSTEMS, CONCEPT OF MULTIPROGRAMMING, MULTITASKING, MULTIPROCESSING, INTRODUCTION TO DISK OPERATING SYSTEM (DOS), COMMANDS AND UTILITIES, WORKING WITH MS WINDOWS, UNIX AND LINUX, WORKING KNOWLEDGE OF PC SOFTWARE WORD PROCESSOR.
- ❖ COMPUTER LANGUAGES, GENERATION OF LANGUAGES, TRANSLATORS-ASSEMBLERS, INTERPRETERS, COMPILERS, ALGORITHM, PSEUDO-CODE, LOWCHARTS- RULES & SYMBOLS, STRUCTURED PROGRAMMING CONCEPTS, VARIOUS TECHNIQUES OF PROGRAMMING, USE OF PROGRAMMING.
- ❖ INTRODUCTION TO 'C', IMPORTANCE OF C, BASIC STRUCTURE OF A C PROGRAM, CONSTANTS, VARIABLES AND DATA TYPES, OPERATORS AND

EXPRESSIONS, MANAGING I/O OPERATORS, CONTROL STATEMENT: 'IF' STATEMENT AND ITS VARIOUS FORMS, GOTO STATEMENT, FOR, WHILE AND DO-WHILE LOOPS, SWITCH DECISION MAKING STATEMENT, ARRAYS: ARRAY NOTATION, STORAGE AND REPRESENTATION, FUNCTIONS: USER DEFINED FUNCTIONS AND THEIR USE.

CONCRETE TECHNOLOGY

- ❖ INTRODUCTION
- ❖ CEMENT
- ❖ AGGREGATES
- ❖ PROPORTIONING OF CONCRETE
- ❖ CONCRETING OPERATIONS
- ❖ DURABILITY OF CONCRETE
- ❖ SPECIAL PURPOSE CONCRETE
- ❖ PROPERTIES OF CONCRETE IN PLASTIC STAGE

THEORY OF STRUCTURES

- ❖ SIMPLE STRESSES & STRAINS
- ❖ COMPOUND STRESS
- ❖ BENDING MOMENT AND SHEARING FORCE
- ❖ BENDING STRESS
- ❖ SHEAR STRESS
- ❖ COMBINED DIRECT AND BENDING STRESS
- ❖ TORSION
- ❖ COLUMNS AND STRUTS
- ❖ ANALYSIS OF TRUSSES
- ❖ STRAIN ENERGY
- ❖ THIN WALLED TUBES

ENVIRONMENTAL ENGINEERING-I

- ❖ INTRODUCTION
- ❖ QUANTITY OF WATER
- ❖ SOURCES OF WATER SUPPLY
- ❖ INTAKES AND CONVEYANCE OF WATER
- ❖ QUALITY OF WATER
- ❖ SEDIMENTATION
- ❖ FILTRATION
- ❖ DISINFECTION OF WATER
- ❖ STORAGE OF CLEAR WATER AND ITS DISTRIBUTION
- ❖ TERMS, SYSTEM OF SANITATION AND THEIR MERITS AND DEMERITS
- ❖ SYSTEM OF WASTE WATER AND THEIR ADVANTAGES AND DISADVANTAGES
- ❖ CHOICE OF WASTEWATER SYSTEM AND SUITABLE SYSTEM FOR INDIA
- ❖ QUANTITY OF SANITARY AND STORM SEWAGE.
- ❖ FLOW IN SEWERS

- ❖ CONSTRUCTION AND MAINTENANCE OF SEWERS
- ❖ CHARACTERIZATION AND EXAMINATION OF SEWAGE
- ❖ DISPOSAL OF SEWAGE
- ❖ TREATMENT OF SEWAGE
- ❖ SEPTIC AND IMMHOFF TANKS
- ❖ AIR POLLUTION: CAUSES, EFFECTS AND CONTROLS
- ❖ NOISE POLLUTION: CAUSES, EFFECTS AND CONTROLS

CONSTRUCTION MATERIALS

- ❖ BUILDING STONES
- ❖ BRICKS
- ❖ CEMENT
- ❖ LIME
- ❖ TIMBER AND WOOD BASED PRODUCTS
- ❖ PAINTS AND VARNISHES
- ❖ CEMENT PAINTS
- ❖ METALS

SOIL MECHANICS & FOUNDATION ENGINEERING

- ❖ INTRODUCTION: IMPORTANCE OF SOIL STUDIES IN CIVIL ENGG. GEOLOGICAL ORIGIN OF SOIL WITH SPECIAL REFERENCE TO SOIL PROFILES IN INDIA. RESIDUAL AND TRANSPORTED SOILS, ALLUVIAL DEPOSITS, LAKE DEPOSITS, DUNES AND LOESS, GLACIAL DEPOSITS, CONDITIONS IN WHICH ABOVE DEPOSITS ARE FORMED AND THEIR ENGINEERING CHARACTERISTICS.
- ❖ SATURATED AND PARTIALLY SATURATED SOIL
- ❖ SOIL CLASSIFICATION AND IDENTIFICATION
- ❖ FLOW OF WATER THROUGH SOILS
- ❖ EFFECTIVE STRESS
- ❖ DEFORMATION OF SOILS
- ❖ STRENGTH CHARACTERISTICS OF SOIL
- ❖ SOIL COMPACTION
- ❖ BEARING CAPACITY OF FOUNDATIONS
- ❖ SOIL EXPLORATION

DESIGN OF R.C.C. STRUCTURES-I

- ❖ INTRODUCTION: DIFFERENT GRADE OF CONCRETE AND STEEL, I.S. SPECIFICATION, PURPOSE OF PROVIDING REINFORCEMENT, MODULAR RATIO, TYPES OF LOADS ON STRUCTURES AS PER IS:875. DESIGN PHILOSOPHIES---- WORKING STRESS METHOD, ULTIMATE STRENGTH METHOD AND LIMIT STATE METHOD.
- ❖ SINGLY REINFORCED RECTANGULAR BEAMS BY WSM
- ❖ INTRODUCTION TO LIMIT STATE METHOD

- ❖ SINGLY REINFORCED RECTANGULAR BEAMS
- ❖ DOUBLY REINFORCED RECTANGULAR BEAMS
- ❖ FLANGED BEAM: SERVICEABILITY LIMIT STATES
- ❖ CURTAILMENT
- ❖ DESIGN OF SHEAR & DEVELOPMENT LENGTH
- ❖ DESIGN OF BEAMS

ANALYSIS OF STRUCTURES

- ❖ SLOPE AND DEFLECTION:
- ❖ ANALYSIS OF STATICALLY INDETERMINATE BEAMS
- ❖ PROPPED CANTILEVERS
- ❖ FIXED BEAM
- ❖ CONTINUOUS BEAM
- ❖ SLOPE DEFLECTION METHOD
- ❖ MOMENT DISTRIBUTION METHOD
- ❖ THREE HINGED ARCHES
- ❖ INFLUENCE LINES

CONSTRUCTION MANAGEMENT AND ACCOUNTS

- ❖ BASIC PRINCIPLE OF MANAGERMENTS
- ❖ ACCIDENT, SAFETY AND HOUSEKEEPING
- ❖ INDUSTRIAL LAWS
- ❖ PERSONNEL MANAGEMENT
- ❖ FINANCE MANAGEMENT
- ❖ PROJECT MANAGEMENT
- ❖ QUALITY CONTROL
- ❖ MARKETING IN CIVIL ENGINEERING
- ❖ ENTREPRENEURSHIP
- ❖ PROFESSIONAL ETHICS

CAD IN CIVIL ENGINEERING PRACTICE

- ❖ DEFINITION OF VARIOUS AUTO CAD COMMANDS USED. SIMPLE EXERCISES USING AUTO CAD COMMANDS.

TRANSPORTATION ENGINEERING

- ❖ HIGHWAYS
- ❖ ROAD GEOMETRICS
- ❖ HIGHWAY MATERIALS
- ❖ EARTH AND GRAVEL ROADS
- ❖ DESIGN OF FLEXIBLE AND RIGID PAVEMENTS- HILL ROADS: RAILWAYS
- ❖ RAILWAY TRACK & SLEEPERS
- ❖ POINTS AND CROSSINGS
- ❖ SIGNALS
- ❖ BRIDGES

DESIGN OF STEEL STRUCTURES

- ❖ INTRODUCTION: STEEL STRUCTURES, DIFFERENT TYPES OF STEEL AND STEEL STRUCTURES. STRESS STRAIN DIAGRAM AND DUCTILITY OF MILD STEEL. PROPERTIES OF STRUCTURAL STEEL AS PER IS CODE PHYSICAL AND MECHANICAL PROPERTIES, VARIOUS TYPES OF ROLLED STEEL SECTIONS. ADVANTAGES AND DISADVANTAGES OF STEEL STRUCTURES. DIFFERENT TYPES OF LOADS AND LOAD COMBINATIONS. DESIGN PHILOSOPHY, LIMIT STATE METHOD OF DESIGN AS PER IS CODE: 800-2007
- ❖ STRUCTURAL STEEL CONNECTIONS
- ❖ TENSION MEMBERS
- ❖ COMPRESSION MEMBERS
- ❖ BEAMS
- ❖ PLATE GIRDERS
- ❖ STEEL ROOF TRUSS

ESTIMATING & COSTING

- ❖ INTRODUCTION TO QUANTITY SURVEYING AND ITS IMPORTANCE. DUTIES OF QUANTITY SURVEYOR. TYPES OF ESTIMATES; PRELIMINARY ESTIMATES, PLINTH AREA ESTIMATE, CUBIC RATE ESTIMATE, ESTIMATE PER UNIT BASE. DETAILED ESTIMATES; DEFINITION, STAGES OF PREPARATION – DETAILS OF MEASUREMENT AND CALCULATION OF QUANTITIES AND ABSTRACT.
- ❖ MEASUREMENT, UNITS OF MEASUREMENT FOR VARIOUS ITEMS OF WORK AS PER BIS:1200, RULES FOR MEASUREMENTS, EARTH WORK, BRICK WORK (MODULAR AND TRADITIONAL BRICKS), RCC WORKS, SHUTTERING, WOOD WORK, PAINTING, FLOORING, PLASTERING ETC., DIFFERENT METHODS OF TAKING OUT QUANTITIES- CENTRE LINE METHOD AND LONG WALL AND SHORT WALL METHOD.
- ❖ PREPARATION OF DETAILED AND ABSTRACT ESTIMATES FROM DRAWINGS; A SMALL RESIDENTIAL BUILDING WITH A FLAT ROOF, PITCHED ROOF WITH STEEL TRUSS, TIMBER STRUCTURES.
- ❖ EARTHWORK FOR UNLINED CHANNEL, MID SECTION FORMULA, TRAPEZOIDAL FORMULA, SIMPSON'S FORMULA RULE, WATER SUPPLY LINES, SANITARY AND WATER SUPPLY FITTINGS, SEPTIC TANK FOR A DOMESTIC BUILDING AND COST ESTIMATE OF SEPTIC TANKS, WBM ROAD AND PRE-MIX CARPETING, TUBE WELL, ISOLATED AND COMBINED FOOTING, STEEL TRUSS, PILES AND PILES CAP. SINGLE SPAN RCC SLAB CULVERT, EARTHWORK FOR PLAIN, HILL ROADS, RCC WORK IN BEAMS, SLAB, COLUMN AND LINTEL. ARCHES AND THEIR BAR BENDING SCHEDULE.
- ❖ CALCULATION OF QUANTITIES OF MATERIALS FOR CEMENT MORTARS OF DIFFERENT PROPORTION, PORTLAND CEMENT CONCRETE OF DIFFERENT PROPORTION, BRICK MASONRY IN CEMENT MORTAR, PLASTERING AND POINTING, WHITE WASHING, CEMENT CONCRETE FLOORING, TERRAZO FLOORING, STONE MASONRY – RANDOM RUBBLE AND ASHLAR.
- ❖ ANALYSIS OF RATES
- ❖ VALUATION