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UPSC MAINS EXAMINATION

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CIVIL ENGINEERING

Previous Years Conventional Questions with Solutions, Subjectwise & Chapterwise

Paper-I (Conventional)

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Foreword

Dear Students,

In UPSC Engineering Services, Conventional Papers have 54.5% weightage in the entire process of written test.

In Paper-I of Civil Engineering eight subjects are included as follows:

1. Building Materials
2. Solid Mechanics
3. Structural Analysis
4. Design of Steel Structures
5. Design of Concrete and Masonry Structures
6. Construction Practice, Planning and Management

The following approach is advisable to secure maximum marks.

- The solution to any question shall have the following appropriate steps generally. Steps will also have due weightage.
  - (a) The data given
  - (b) The appropriate figure, if applicable, with parts labeled properly
  - (c) The concept on which the problem is being solved
  - (d) The relevant formulae with standard notations and abbreviations. Incase the paper setter asks to solve the question from the fundamentals, necessary derivations shall be done. Otherwise 70% of marks one has to lose. If the question carries more marks like 10 to 20 marks detailed analysis is compulsory to score high. If the question carries less marks (<8) the formulae with abbreviations and concept may be sufficient. In any case, the assumptions made shall be written clearly while solving a problem.
- The neatness and presentation of solutions will have 5% marks.
- Note that all parts of a question shall be answered together.
- Using short sentences and brevity in expressing the content is appreciated.
- Practice of numerical problems using calculator is very much essential instead of reading merely.

* **Try to understand and practice the solutions keeping in view QCAB format.**

The solutions are prepared with utmost care. In spite of this there may be some typographical mistakes or improper sequence. The student is requested to inform us regarding errors, if any to aceenggpublications@aceenggacademy.com. ACE Engineering Publications will be grateful in this regard.

Thanks to all the professors who co-operated in the preparation of this booklet. Thanks to the Academic Assistants and Data Entry section in the design of this booklet.

With best wishes to all those who wish to go through the following pages.

Y.V. Gopala Krishna Murthy,
M Tech. MIE,
Chairman & Managing Director,
ACE Engineering Academy,
ACE Engineering Publications,
Frost Interactive Service Pvt. Ltd. (ACE ONLINE).

Syllabus for Civil Engineering (CE)

PAPER – I

1. **Building Materials:**
   Stone, Lime, Glass, Plastics, Steel, FRP, Ceramics, Aluminum, Fly Ash, Basic Admixtures, Timber, Bricks and Aggregates: Classification, properties and selection criteria; Cement: Types, Composition, Properties, Uses, Specifications and various Tests; Lime & Cement Mortars and Concrete: Properties and various Tests; Design of Concrete Mixes: Proportioning of aggregate sand methods of mix design.

2. **Strength of Materials:**
   Basics of strength of materials, Types of stresses and strains, Bending moments and shear force, concept of bending and shear stresses; Elastic constants, Stress, plane stress, Strains, plane strain, Mohr's circle of stress and strain, Elastic theories of failure, Principal Stresses, Bending, Shear and Torsion.

3. **Structural Analysis:**
   Analysis of determinate and indeterminate structures; Trusses, beams, plane frames; Rolling loads, Influence Lines, Unit load method & other methods; Free and Forced vibrations of single degree and multi degree freedom system; Suspended Cables; Concepts and use of Computer Aided Design.

4. **Design of Steel Structures :**
   Principles of Working Stress methods, Design of tension and compression members, Design of beams and beam column connections, built-up sections, Girders, Industrial roofs, Principles of Ultimate load design.

5. **Design of Concrete and Masonry Structures:**
   Limit state design for bending, shear, axial compression and combined forces; Design of beams, Slabs, Lintels, Foundations, Retaining walls, Tanks, Staircases; Principles of pre-stressed concrete design including materials and methods; Earthquake resistant design of structures; Design of Masonry Structure.

6. **Construction Practice, Planning and Management:**
   Construction - Planning, Equipment, Site investigation and Management including Estimation with latest project management tools and network analysis for different Types of works; Analysis of Rates of various types of works; Tendering Process and Contract Management, Quality Control, Productivity, Operation Cost; Land acquisition; Labour safety and welfare.

Weightage of Subjects in Engineering Services Examination
Civil Engineering (2017 – 2026)
PAPER - I (Conventional)

Name of the Subject	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Building. Materials	52	52	84	52	52	84	96	80	76	44
Solid Mechanics	136	104	116	84	96	40	44	92	96	74
Structural Analysis	52	84	40	116	84	116	132	84	92	112
Design of Steel structures	84	84	44	84	52	84	64	74	52	84
Design of Concrete & Masonry Structures	104	104	104	92	144	84	84	74	92	124
Construction Practice, Planning & Management	52	52	92	52	52	72	60	76	72	42
Total No. Marks	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**	**480**

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6. Construction Practice, Planning and Management 857-988