



India's Best Institute for IES, GATE & PSUs

# IES

Engineering Services Examination - UPSC

**CIVIL ENGINEERING**

**Topic-wise Conventional I & II  
Last 24 Years Questions**

*Dedicated to Civil Engineers  
and Engineering Services aspirants.*

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**Engineers Institute of India**

28-B/7, Jia Sarai, Near IIT Hauz Khas New Delhi-110016

Tel: 011-26514888

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## A word to the students



Er. R.K. Rajesh  
(DIRECTOR)

Engineering services examination offers one of the most promising and prestigious careers for service to the nation. Over the past few years, it has become more competitive as a number of aspirants are increasingly becoming interested in government jobs due to decline in other career options and reputation and future security.

In my opinion, ESE rigorously tests candidates' overall understanding of concepts, ability to apply their knowledge and personality level by screening them through various stages. A candidate is supposed to smartly deal with the syllabus not just mugging up concepts. Thorough understanding with critical analysis of topics and ability to express clearly are some of the pre-requisites to crack this exam. The syllabus and questioning pattern has remained pretty much the same over the years. Conventional paper practice is very important to score good marks, as it checks your writing skills, deep understanding of a subject.

Mechanical engineers prefer ESE over other options due to attractive career options and diverse departments. Railways, Central engineering services and other departments are highly sought after. General category cut-off in ESE 2012 was 532/1200 and a total 169 candidates were finally recommended in ESE 2012. For more details visit our website [www.engineersinstitute.com](http://www.engineersinstitute.com)

Established in 2006 by a team of IES and GATE toppers, we at **Engineers Institute of India-E..I.I.** have consistently provided rigorous classes and proper guidance to engineering students over the nation in successfully accomplishing their dreams. We believe in providing exam-oriented teaching methodology with updated study material and test series so that our students stay ahead in the competition. The faculty at EII are a team of experienced professionals who have guided thousands to aspirants over the years. They are readily available before and after classes to assist students and we maintain a healthy student-faculty ratio. Many current and previous year toppers associate with us for contributing towards our goal of providing quality education and share their success with the future aspirants. Our results speak for themselves. Past students of EII are currently working in various departments and PSU's and pursuing higher specializations. We also give scholarships to meritorious students.


**A detailed solution of the past years conventional questions, prepared by toppers, will be available very soon.**

R.K. Rajesh

Director

Engineers Institute of India

[eii.rkrajesh@gmail.com](mailto:eii.rkrajesh@gmail.com)

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Engineering Services Examination 1991 to 2013

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**CIVIL ENGINEERING**

**ENGINEERING SERVICES EXAMINATION**

**CONVENTIONAL PAPER-I**

**Last 24 Years Questions**

# 1. BUILDING MATERIALS

## Last 24 Years Questions

### Paper 1991

1. (a) Describe the tests for the acceptance of bricks for building construction.
- (b) Explain the following and bring out their significance:  
(i) Water-cement ratio (ii) Fineness modulus (iii) Bulking of sand
- (c) Describe the method of determining the Compacting Factor for fresh concrete. What does it indicate ?
- (d) Draw the stress-strain curves for mild steel and Fe 415 grade steel and indicate the important stages.
- (e) Describe different types of industrial floorings. (5 × 8 = 40)

### Paper 1992

2. (a) Describe the main features of English and Flemish bonds. Draw neat sketches of two consecutive courses of a right angle corner of a two brick thick wall in English bond.
- (b) Briefly describe the following defects in timber, giving neat sketches: Knots, Cup and ring shakes, Star shake, Heart shake.
- (c) List the principal requirements of aggregate for concrete. Define “fineness modulus” of an aggregate and explain its significance.
- (d) Neatly sketch the typical load-extension curve obtained from a tension-test on a mild steel rod. Explain the important stages.
- (e) Describe briefly, with sketches, the following types of stone masonry : Random rubble. Coursed rubble. Ashlar. (5 × 8 = 40)

### Paper 1993

3. (a) List out the characteristics of good timber. What is meant by ‘seasoning of timber’ ? Why is it necessary ? Mention the different methods of seasoning of timber.
- (b) Name the various test specified for checking the quality of a given sample of cement. Describe briefly the test for fineness of cement, or soundness of cement.
- (c) What are the different methods of designing a concrete mix using given aggregates and cement for a required strength ? Describe any one of them.

- (d) State briefly the requirements of a good staircase. Name the materials used for construction of staircases in buildings. Give neat sketches of any two common types of staircases in buildings. (4 × 10)

**Paper 1994**

4. (a) Indicate the ingredients and their proportions in which they are used in Ascu process for the treatment of timber. How is this treatment carried out?
- (b) What are the tests conducted for Portland cement in a laboratory ? Describe any one of the methods.
- (c) Describe briefly how Portland slag cement is manufactured. What are the ingredients ? Write three advantages of Portland slag cement over ordinary Portland cement.
- (d) Draw the stress-strain curve for mild steel and Fe 415 grade steel and indicate the important stages.
- (e) What are the important design considerations for load bearing wall ? (5 × 8)

**Paper 1995**

5. (a) What is decay in timber ? How is it detected ? How can the timber be guarded against decay ? Name any two diseases of timber.
- (b) What are initial and final setting times of cement ? How are they experimentally determined ? Briefly explain the roles of gypsum and calcium chloride in cement.
- (c) Give the composition, characteristics and uses of the following stones (i) granite, (ii) quartzite, (iii) dolomite, (iv) murrum and (v) slate.
- (d) What are the factors that influence the strength of cement concrete ? Briefly discuss the effects of water-cement ratio and workability on the strength of concrete.

**Paper 1996**

6. (a) List the various types of ASHLAR masonry. Briefly describe the construction of walls with any two types.
- (b) Explain the purpose of conducting SOUNDNESS test of cement. Describe the apparatus and method of test with the help of neat sketches. What are the permissible limits of observation in the test ? (10)
- (c) By means of sketches, describe the construction of  
(i) Concrete flooring (ii) Terrazzo flooring (iii) Mosaic flooring (10)
- (d) Explain the phenomenon of BULKING of sand and its significance. How is it determined ? (10)

**Paper 1997**

7. (a) What do you understand by 'workability of concrete'? Describe briefly a test for its in-situ determination. What should be the values of observation from this test for concrete used for different purposes ? (10)
- (b) What is meant by the terms : 'seasoning of timber' and 'preservation of timber'? Name the various methods of applying preservatives to timber. Give a brief account of one method. (10)
- (c) Enumerate various factors which determine the thickness of brick walls. Give the characteristics of good bricks and name the tests that are carried out to determine them. (10)
- (d) Describe the various stages in the making of cement mortars. Why are cement mortars not ground like lime mortar ? (10)

**Paper 1998**

8. (a) Explain the preservative treatment of timber indicating the types, characteristics and methods of applications of preservatives.
- (b) Name the four important constituents of cement and state the role of each in achieving its properties.
- (c) How are bricks classified as per I.S. code ? What are the properties associated with this classification ?
- (d) What is non-destructive testing of concrete ? What are its relative merits ? Name the methods of non-destructive testing and explain briefly any one method. (4 × 10 = 40)

**Paper 1999**

9. (a) Describe the hydration of Portland cement and outline the ways in which the Vicat apparatus and the Le Chatelier apparatus can be used to assess the properties of fresh and hardened pastes. (15)
- (b) Explain how sulphate resisting cement and rapid hardening Portland cement differ from ordinary Portland cement and the specific circumstances in which these cements would be used. (15)
- (c) Name the principal compounds in Portland cement, their relative rates of reaction with water and their approximate proportions. (10)

**Paper 2000**

10. (a) Explain how do the Portland-pozzolana cement and super-sulphate cement differ from ordinary Portland cement. Under what specific circumstances these cements would be used? (10)



- (b) Describe the workability of fresh concrete and its measurement in the light of statement that workability is a composite property and each test measures only a particular aspect of it. (10)
- (c) Using a mix design procedure, mix proportions for the desired grade of concrete have been obtained as 1 : 2.1 : 3.5 (by mass) with water-cement ratio of 0.5 and air content of 3 percent. Calculate the weights of individual ingredients required to make 0.25 m<sup>3</sup> concrete. The specific gravities of cement, sand and aggregate were 3.15, 2.65 and 2.70, respectively. (10)
- (d) Give the Engineering properties of bricks. What are the characteristics of a good brick? Enumerate various factors that govern the thickness of brick wall. (10)

**Paper 2001**

11. (a) Explain the following: (10)  
(i) Plywood (ii) Laminated board (iii) Battern board (iv) Fibre board
- (b) Write short notes on the following bricks: (10)  
(i) Table moulded (ii) Refractory (iii) Pressed (iv) Machine moulded
- (c) List out the products of hydration and their influence on the properties of cement. (10)
- (d) Discuss the following: (10)  
(i) Non-destructive tests on concrete (ii) Fibre reinforced concrete

**Paper 2002**

12. (a) Explain the difference between various grades of ordinary Portland Cement. (10)
- (b) What is meant by the term 'Workability of concrete' ? List the methods used for measurement of workability of concrete. Clearly indicate the aspect of workability measured by each method. (10)
- (c) Explain the following: (10)  
(i) Grading zones of sand (ii) Grading of coarse aggregate
- (d) Explain absorption and saturation factors with regard to bricks. (10)

**Paper 2003**

13. (a) Explain pozzolanic action. (10)
- (b) Calculate the quantities of cement, sand and coarse aggregate required to produce one cubic meter of concrete for mix proportions of 1 : 1.40 : 2.80 (by volume) with water-cement ratio of 0.48 (by mass). Bulk densities of cement, sand and coarse aggregates are 14.7, 16.66 and 15.68 kN/m<sup>3</sup>, respectively. Percentage of entrained air is 2.0. Specific gravities of cement, sand and coarse aggregate are 3.15, 2.6 and 2.5 respectively. (10)
- (c) Describe four common defects in the timber. (10)

- (d) List four important tests conducted on the bricks. Describe briefly the method used to determine compressive strength of bricks. (10)

**Paper 2004**

14. (a) Describe in brief the classification of ordinary bricks according to their qualities into four categories. (10)
- (b) What is seasoning of timber and why is it done ? Discuss in brief the different methods of seasoning timber. (10)
- (c) What are the properties of good mortar ? Enumerate four main uses of mortar. (10)
- (d) Describe the brief the rebound hammer method of non destructive testing of concrete. (10)

**Paper 2005**

15. (a) Define 'workability of concrete'. What are the factors affecting workability of concrete? (10)
- (b) Draw the related stress-strain curves for a timber member under tension, compression and bending parallel to the grains. Discuss the importance of compression test results (10)
- (c) What are the properties governing the quality of bricks ? Discuss the importance of water absorption and strength under compression. (10)
- (d) Explain the compressive strength test of cement mortar and state its importance. (10)

**Paper 2006**

16. (a) Explain various defects in bricks. (10)
- (b) Estimate the quantities of cement, fine aggregate and coarse aggregate per cubic metre of concrete if the void ratio in cement is 62%, fine aggregate is 41% and coarse aggregate is 45%. The material properties are as follows:  
Mix: 1 : 2 : 4 with a w/c of 0.55, one bag of cement contains 50 kg of cement and its density is 1440 kg/ m<sup>3</sup>. The density of fine aggregate is 1700 kg/ m<sup>3</sup> and coarse aggregate is 1600 kg/ m<sup>3</sup> respectively. One bag of cement is equal to 34.7 litres. (10)
- (c) Explain how bulking of fine aggregate takes place and how it is taken care of in the field. Also explain the method of preparation of bulking chart in the laboratory. (10)
- (d) Explain the method of improving fire resistance of timber.

## Paper 2007

17. (a) Write briefly about five methods of artificial seasoning of timber. (10)
- (b) Write about the following tests on clay bricks and mention the desired test limits as per Indian Standards:  
(i) Water absorption, (ii) Crushing strength, (iii) Hardness,  
(iv) Soundness, (v) Presence of soluble salts. (10)
- (c) Which are the four important compounds formed during the setting action of cement (four principal minerals in ordinary Portland cement)? Mention their relative proportions expressed as percentages and also functions of these compounds. (10)
- (d) Write about various moduli of elasticity of plain cement concrete. Which values are used in design? What are the factors affecting Modulus of Elasticity of concrete? (10)

## Paper 2008

18. (a) What are the principal constituents of brick earth and how do they influence the quality of brick? (10)
- (b) Give a brief description of slump test for measurement of workability of concrete and its merits and demerits. What are the slump values recommended for different types of works? (10)
- (c) Give a short description of preservation of wood using various wood preservatives. (10)
- (d) List the various laboratory tests for assessing the quality of cement and their importance. (10)

## Paper 2009

19. (a) (i) Draw a sketch showing the typical creep strain-time curve under uniaxial compression for concrete. (4)  
(ii) Draw a neat sketch of macrostructure of exogenous tree. (3)  
(iii) Draw neat sketches showing various types of shakes. (3)
- (b) (i) Why is seasoning of timber required? List out the methods of seasoning. (4)  
(ii) Write briefly on the composition and properties of refractory bricks. (6)
- (c) Briefly describe the admixtures generally used in concrete and the properties they impart to the concrete. (10)
- (d) (i) Give a detailed account of the cylinder splitting test of concrete. (8)  
(ii) What are the limitations of the above test in evaluating the real tensile strength of concrete. (2)

## Paper 2010

20. (a) Describe the procedure to list the soundness of cement. Name the constituents causing soundness. (10)
- (b) What is ferrocement? List the properties of ferrocement. (10)
- (c) Explain in detail the non-destructive testing of concrete using Rebound hammer. (10)
- (d) Write short notes on:
- (i) Electrical seasoning of wood (4)
- (ii) Harmful ingredients in brick earth. (3)
- (iii) Tests on bricks to assess its suitability – list the names. (3)

## Paper 2011

21. (a) What are the different types of Portland cement as per Indian code of practice ? Discuss any two. (10)
- (b) Explain in detail the ultrasonic pulse velocity method of non-destructive testing of concrete. (5)
- (c) Discuss how consistency of cement is determined ? (5)
- (d) Discuss the types of mortar which can be used for the following types of masonry work with suggested proportions: (5)
- (i) Masonry in foundation and plinth (ii) Masonry in super-structure
- (iii) Plastering work (iv) Pointing
- (e) Discuss the factors affecting the strength of timber. (5)
- (f) Briefly describe the various defects in bricks. (5)
- (g) Briefly explain the processes involved in the manufacture of bricks in order. (5)

## Paper 2012

22. (a) List the principal constituents of fly ash. Explain its pozzolanic action when used in concrete. (10)
- (b) For a mix design of proportion 1 : 2 : 3.6 (by mass) with w/c ratio of 0.45 and air content 3% of the concrete volume, calculate the weights of water, cement, fine aggregate and coarse aggregate to make 1 m<sup>3</sup> of concrete. The specific gravities of cement, F.A. and C.A. are 3.15, 2.65 and 2.6 respectively. (10)
- (c) What are the varieties of industrial timber ? Indicate the procedure followed by making fibre boards. (10)
- (d) Discuss the properties imparted to brick-earth by its constituents alumina and silica. (10)

## Paper 2013

23. All parts carry equal marks:

- (a) Cement is made of solid complexes of oxides of calcium etc. Write the names of the four well-known complexes along with the notation used to represent these. (4)
- (b) Write the full form of the following in context of civil engineering construction: (4)
- (i) RMC      (ii) GIS      (iii) BOLT      (iv) BOQ

24. (a) A site is using a concrete where the unit content of water, cement, sand and coarse aggregate is  $180 \text{ kg/m}^3$ ,  $360 \text{ kg/m}^3$ ,  $700 \text{ kg/m}^3$  and  $1210 \text{ kg/m}^3$ , respectively. For a portion of the work, the Engineer permits volume batching and rectangular boxes measuring 35 cm by 45 cm have to be fabricated to measure coarse aggregate.

Assume the following:

- (i) The mixer available will mix concrete with one bag of cement (of 50 kg) at one time.
- (ii) 2 (two) boxes of coarse aggregate will be used in a batch (as defined above).
- (iii) When filled in a normal manner, the void content in the box is 40%.
- (iv) Specific gravity of the coarse aggregate is 2.75. Find the height of the box. (10)
- (c) Write a short answer to the following: (20)
- (i) When testing cement as per Indian Standards, it may not be possible to decide on their quality only on the basis of the compressive strength results. Why?
- (ii) What are some of the steps that can be taken to prevent the formation of 'thermal cracks' in mass concrete?
- (iii) Explain the concept of 'maturity' of concrete.
- (iv) IS 456-2000 suggests use of a certain stress-strain curve of concrete in the absence of actual experimental data. The code also allows use of an expression  $(5000 \sqrt{f_{ck}})$  to estimate the modulus of elasticity of concrete ( $E_c$ ). Draw a neat representation of that curve, briefly explain its salient features. The suggested value represents the value of E at which, if any, of the point(s) on the stress-strain curve.

25. Explain with appropriate sketches how a 'tremie' is used to place concrete underwater. (5)