Civil Engineering

BILINGUAL
MASTER GUIDE

CBT 2
Computer Based Test - Stage 2

सिविल इंजीनियरिंग

RRB-JE

Previous Year Questions Paper with Solutions & Mock Test Paper

TECHNICAL

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DIRECTOR'S *Message*

To reach heights one must start climbing and if the journey is difficult then perseverance is the key to success. As a teacher we have realized over past years that success in any competitive exam requires hard work and proper guidance. **Engineers Academy** with its unique teaching methodologies has always proved that we meet the expectations of thousands of students and parents to make their dreams come true. With changing patterns, we have adapted ourselves to deliver the best and ensure better results.

This book has been organized and executed with a lot of care, dedication and passion for lucidity. A conscious attempt has been made to simplify the concepts to facilitate better understanding of the subject.

Engineers Academy has many successful stories of students who secured All India Rank in ESE, GATE, PSUs, SSC-JEn, RRB JEn and other competitive examination. Now we invite you to become a part of Engineers Academy to explore and achieve ultimate goal of your life. We promise to provide you quality guidance with competitive environment which is far advanced and ahead than the reach of other institution.

We would feel satisfied if the book meets the needs of the students for whom it is meant.

Lastly, we are thankful to all the engineers, authors whose work has been the source of enlightenment, inspiration and guidance in presenting this book.

It is hoped that the book in its new form will enjoy its ever increasing popularity.

Regards

Dr. Pankaj Goyal

Preface

Railway Recruitment Board-Junior Engineer has always been preferred by Engineers due to job stability. Indian Railways is one of the biggest Government employers in India. With the exam being just a few a months away, it is time for the candidates planning to appear for the exam to pull up their socks and start their RRB-JE preparation.

The RRB-JE exam is conducted in two stages as shown in table given below.

RRB Exam	Subjects	Total Ques.	Total Marks	Duration
CBT – 1	Quantitative Aptitude	30	100	90 Min.
	General Intelligence & Reasoning	25		
	General Awareness	15		
	General Science	30		
CBT – 2	General Awareness	15	150	120 Min.
	Physics and Chemistry	15		
	Basics of Computer and Applications	10		
	Basics of Environment and Pollution control	10		
	Technical Abilities	100		

We hope this book will be proved an important tool to succeed in RRB-JE and Sr. Section Engineer Exams.

It is earnestly hoped that with the extensive additions and revisions, the present edition will facilitate the students not only in preparing themselves for competitive examinations but also in preparing for their regular examinations and prove more useful to the students than the earlier editions.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor typos in the book. If any such typos found, they will be highly appreciated and in corporated in the next edition. Also, please provide your valuable suggestions at :engineers.academy.india@gmail.com

All the Best!

Engineers Academy Editorial Board

SYLLABUS

1. **Engineering Mechanics**

   Force (resolution of force, moment of force, force system, composition of forces), Equilibrium, Friction, Centroid and Center of gravity, Simple machines.

2. **Building Construction**

   Building components (substructure, superstructure), type of structure (load bearing, framed and composite structures).

3. **Building materials**

   Masonry materials (stones, bricks, and mortars), Timber and miscellaneous materials (glass, plastic, fiber, aluminum steel, galvanized iron, bitumen, PVC, CPVC, and PPF).

4. **Construction of substructure**

   Job layout, earthwork, foundation (types, dewatering, coffer dams, bearing capacity).

5. **Construction of superstructure**

   Stone masonry, brick masonry, Hollow concrete block masonry, composite masonry, cavity wall, doors and windows, vertical communication (stairs, lifts, escalators), scaffolding and shoring.

6. **Building finishes**

   Floors (Finishes, process of laying), walls (plastering, pointing, painting) and roofs (roofing materials including RCC).

7. **Building maintenance**

   Cracks (causes, type, repairs- grouting, guniting, epoxy etc.), settlement (causes and remedial measures), and re-baring techniques.

8. **Building drawing**

   Conventions (type of lines, symbols), planning of building (principles of planning for residential and public buildings, rules and byelaws), drawings (plan, elevation, section, site plan, location plan, foundation plan, working drawing), perspective drawing.

9. **Concrete Technology**

   Properties of various types/grades of cement, properties of coarse and fine aggregates, properties of concrete (water cement ratio, properties of fresh and hardened concrete), Concrete mix design, testing of concrete, quality control of concrete (batching, formwork, transportation, placing, compaction, curing, waterproofing), extreme weather concreting and chemical admixtures, properties of special concrete (ready mix, RCC, pre-stressed, fiber reinforced, precast, high performance).

10. **Surveying**

    Types of survey, chain and cross staff survey (principle, ranging, triangulation, chaining, errors, finding area), compass survey (principle, bearing of line, prismatic compass, traversing, local attraction, calculation of bearings, angles and local attraction) leveling (dumpy level, recording in level book, temporary adjustment, methods of reduction of levels, classification of leveling, tilting level, auto level, sources of errors, precautions and difficulties in leveling), contouring (contour interval, characteristics, method of locating, interpolation, establishing grade contours, uses of contour maps), area and volume measurements, plane table survey (principles, setting, method), theodolite survey (components, adjustments, measurements, traversing), Tacheometric survey, curves (types, setting out), advanced survey equipment, aerial survey and remote sensing.

11. **Computer Aided Design**

    CAD Software (AutoCAD, Auto Civil, 3D Max etc.), CAD commands, generation of plan, elevation, section, site plan, area statement, 3D view.

12. **Geo Technical Engineering**

    Application of Geo Technical Engineering in design of foundation, pavement, earth retaining structures, earthen dams etc., physical properties of soil, permeability of soil and seepage analysis, shear strength of soil, bearing capacity of soil, compaction and stabilization of soil, site investigation and sub soil exploration.

13. **Hydraulics**

    Properties of fluid, hydrostatic pressure, measurement of liquid pressure in pipes, fundamentals of fluid flow, flow of liquid through pipes, flow through open channel, flow measuring devices, hydraulic machines.

14. Irrigation Engineering

Hydrology, investigation and reservoir planning, percolation tanks, diversion head works.

15. Mechanics of Structures

Stress and strain, shear force and bending moment, moment of inertia, stresses in beams, analysis of trusses, strain energy.

16. Theory of structures

Direct and bending stresses, slope and deflection, fixed beam, continuous beam, moment distribution method, columns.

17. Design of Concrete Structures

Working Stress method, Limit State method, analysis and design of singly reinforced and doubly reinforced sections, shear, bond and development length, analysis and design of T Beam, slab, axially loaded column and footings.

18. Design of Steel Structures

Types of sections, grades of steel, strength characteristics, IS Code, Connections, Design of tension and compression members, steel roof truss, beams, column bases.

19. Transportation Engineering

Railway Engineering (alignment and gauges, permanent way, railway track geometrics, branching of tracks, stations and yards, track maintenance), Bridge engineering (site selection, investigation, component parts of bridge, permanent and temporary bridges, inspection and maintenance), Tunnel engineering (classification, shape and sizes, tunnel investigation and surveying, method of tunneling in various strata, precautions, equipment, explosives, lining and ventilation).

20. Highway Engineering

Road Engineering, investigation for road project, geometric design of highways, construction of road pavements and materials, traffic engineering, hill roads, drainage of roads, maintenance and repair of roads.

21. Environmental Engineering

Environmental pollution and control, public water supply, domestic sewage, solid waste management, environmental sanitation, and plumbing.

22. Advanced Construction Techniques and Equipment

Fibers and plastics, artificial timber, advanced concreting methods (under water concreting, ready mix concrete, tremix concreting, special concretes), formwork, pre-fabricated construction, soil reinforcing techniques, hoisting and conveying equipment, earth moving machinery (exaction and compaction equipment), concrete mixers, stone crushers, pile driving equipment, working of hot mix bitumen plant, bitumen paver, floor polishing machines.

23. Estimating and Costing

Types of estimates (approximate, detailed), mode of measurements and rate analysis.

24. Contracts and Accounts

Types of engineering contracts, Tender and tender documents, payment, specifications.

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CONTENTS

1 Chapter

BUILDING MATERIALS & CONSTRUCTION

RRB Previous Year Questions

RRB : JUNIOR ENGINEER

1. Excess silica in cement

(a) increases the setting time

(b) decreases the setting time

(c) weakens the strength of the cement

(d) does not affect the setting time

[RRB JE 2014]

2. For plastering walls, cement mortar would be generally used in which ratio?

(a) 1 : 2 (b) 1 : 4

(c) 1 : 6 (d) 1 : 8

[RRB JE 2014]

3. Separation of water or sand or cement from a freshly mixed concrete is known as :

(a) Segregation (b) Creeping

(c) Bleeding (d) Flooding

[RRB JE 2014]

4. In paints, linseed oil is used as

(a) a solidifier

(b) a driver

(c) a vehicle

(d) a waterproofing base

[RRB JE 2014]

5. A bond in a brick work when headers and stretchers are placed in alternate layers is called

(a) Header bond (b) English bond

(c) Flemish bond (d) Herring bone bond

[RRB JE 2014]

1. सीमेंट में सिलिका की अधिकता

(a) जमावकाल को बढ़ाती है

(b) जमावकाल को घटाती है

(c) सीमेंट की सामर्थ्य को कम करती है

(d) जमावकाल को प्रभावित नहीं करती है

[RRB JE 2014]

2. दीवारों पर प्लस्तर करने के लिए, सीमेंट मोर्टार का प्रयोग आमतौर पर किस अनुपात में किया जाता है?

(a) 1 : 2 (b) 1 : 4

(c) 1 : 6 (d) 1 : 8

[RRB JE 2014]

3. ताजा मिश्रित कंक्रीट से जल या रेत या सीमेंट का अलग हो जाना कहलाता है।

(a) पृथक्करण (b) क्रीपिंग

(c) ब्लीडिंग (d) फ्लडिंग

[RRB JE 2014]

4. पेंट में, अलसी का तेल किस रूप में उपयोग किया जाता है?

(a) एक ठोसकारक

(b) एक चालक

(c) एक वाहक

(d) एक जलरोधी आधार

[RRB JE 2014]

5. एक ईंट चिनाई कार्य में जोड़ में जब हेडर और स्ट्रैचर को वैकल्पिक परतों में रखा जाता है, तो उसे कहा जाता है

(a) हेडर जोड़ (b) इंग्लिश जोड़

(c) फ्लेमिश जोड़ (d) हेरिंग बोन जोड़

[RRB JE 2014]

6. The outer protective layer of a tree is
(a) cambium layer
(b) pith
(c) bark
(d) sap
[RRB JE 2014]

7. Which lime is most suitable for white washing ?
(a) quick lime (b) stone lime
(c) kankar lime (d) shell lime
[RRB JE 2014]

8. A pigment generally used to impart white colour in a paint is
(a) graphite (b) lead
(c) copper sulphate (d) zinc
[RRB JE 2014]

9. The dimensions of a brick are 10 cm × 4 cm × 3 cm. What is the total surface area of this brick?
(a) 82 cm^2 (b) 164 cm^2
(c) 120 cm^2 (d) 180 cm^2
[RRB JE 2014]

10. Lime mortar is generally made with
(a) Quick lime (b) Fat lime
(c) Hydraulic lime (d) White lime
[RRB JE 2014]

11. Cement concrete is a
(a) Elastic material
(b) Visco-elastic material
(c) Non elastic material
(d) plastic material
[RRB JE 26.08.2015]

12. The structure made of rigid curved surfaces are known as
(a) Surface structure
(b) Frame structure
(c) Shell structure
(d) Space structure
[RRB JE 26.08.2015]

6. एक वृक्ष की बाहरी संरक्षक परत है।
(a) केंबियम (Cambium) परत
(b) मज्जा
(c) छाल (Bark)
(d) रस (Sap)
[RRB JE 2014]

7. सफेदी के लिए कौन–सा चूना सबसे उपयुक्त है?
(a) त्वरित चूना (b) पत्थर चूना
(c) कंकड़ चूना (d) शेल चूना
[RRB JE 2014]

8. आमतौर पर एक पेंट में सफेद रंग देने के लिए इस्तेमाल किया जाने वाला वर्णक है
(a) ग्रेफाइट (b) लेड
(c) कॉपर सल्फेट (d) जिंक
[RRB JE 2014]

9. एक ईंट की विमाएँ 10 सेमी × 4 सेमी × 3 सेमी है इस ईंट का कुल पृष्ठीय क्षेत्रफल कितना है ?
(a) 82 सेमी^{2} (b) 164 सेमी^{2}
(c) 120 सेमी^{2} (d) 180 सेमी^{2}
[RRB JE 2014]

10. मसाला बनाने के लिए कौन–सा चूना उपयुक्त है?
(a) त्वरित चूना (b) Fat चूना
(c) जलीय चूना (d) सफेद चूना
[RRB JE 2014]

11. सीमेंट कंक्रीट
(a) प्रत्यास्थ सामग्री है
(b) विस्कॉ–प्रत्यास्थ सामग्री
(c) अप्रत्यास्थ सामग्री
(d) प्लास्टिक सामग्री है
[RRB JE 26.08.2015]

12. कठोर घुमावदार सतहों से बनी संरचना, के रूप में जानी जाती ह –
(a) सतह संरचना
(b) फ्रेम संरचना
(c) शैल संरचना
(d) अंतरिक्ष (space) संरचना
[RRB JE 26.08.2015]

13. When water is added to cement
(a) Chemical reaction starts
(b) heat is absorbed
(c) heat is generated
(d) Impurities are washed out
[RRB JE 26.08.2015]

14. Initial setting time is maximum for
(a) Portland-Pozzolana cement
(b) Portland-Slag cement
(c) Low heat Portland-pozzolana cement
(d) High strength Portland cement
[RRB JE 26.08.2015]

15. A sample of cement is said to be sound when it does not contain free
(a) Lime (b) Silica
(c) Iron oxide (d) alumina
[RRB JE 27.08.2015]

16. After storage, the strength of cement
(a) Decreases
(b) Increases
(c) Remains same
(d) may increase or decrease
[RRB JE 27.08.2015]

17. Which one of the following does not react with concrete ?
(a) Sewage water
(b) Sulfuric acid
(c) Vegetable oil
(d) Alcohol
[RRB JE 28.08.2015]

18. Addition of pozzolana to ordinary Portland cement increase
(a) Bleeding
(b) Shrinkage
(c) Permeability
(d) Heat of hydration
[RRB JE 28.08.2015]

13. जब सीमेंट में पानी मिलाया जाता है तो–
(a) रासायनिक प्रतिक्रिया शुरू होती है
(b) ऊष्मा अवशोषित होती है
(c) ऊष्मा उत्पन्न होती है
(d) अशुद्धि हट जाती है
[RRB JE 26.08.2015]

14. आरंभिक जमावकाल इसके लिए अधिकतम है –
(a) पोर्टलैंड – पॉजोलाना सीमेंट
(b) पोर्टलैंड – स्लैग सीमेंट
(c) अल्प ऊष्मा पोर्टलैंड पॉजोलाना सीमेंट
(d) उच्च सामर्थ्य पोर्टलैंड सीमेंट
[RRB JE 26.08.2015]

15. एक सीमेंट के प्रतिदर्श को निर्दोष कहा जायेगा, यदि उसमें मुक्त रूप में न हो–
(a) चूना (b) सिलिका
(c) लौह ऑक्साइड (d) एल्यूमिना
[RRB JE 27.08.2015]

16. भण्डारण के बाद, सीमेंट की सामर्थ्य ..... है।
(a) घटती
(b) बढ़ती
(c) समान रहती
(d) घटती या बढ़ती
[RRB JE 27.08.2015]

17. निम्न में से कौन एक कंक्रिट के साथ क्रिया नहीं करता है –
(a) सीवेज पानी
(b) स्लफ्यूरिक एसिड
(c) वनस्पति तेल
(d) एल्कोहॉल
[RRB JE 28.08.2015]

18. साधारण पोर्टलैंड सीमेंट में पोजोलाना मिलाने से बढ़ती है।
(a) ब्लीडिंग
(b) संकुचन
(c) पारगम्यता
(d) जलयोजन की ऊष्मा
[RRB JE 28.08.2015]

19. Which of the following cement has maximum percentage of C_3S

(a) Ordinary Portland cement

(b) Low heat cement

(c) Sulphate resisting cement

(d) Rapid hardening cement

[RRB JE 28.08.2015]

20. Grading of aggregate in a concrete mix is necessary to achieve

(a) Adequate workability

(b) Higher density

(c) Reduction in voids

(d) Better durability

[RRB JE 29.08.2015]

21. As per IS specification, the maximum final setting time for ordinary portland cement should be

(a) 30 minutes (b) 1 hour

(c) 6 hours (d) 10 hours

[RRB JE 29.08.2015]

22. Bleeding of concrete is said to occur when

(a) Finer particles settle down at the bottom

(b) Coarser particles get separated

(c) Cement paste rises to the surface of concrete

(d) Finer particles collect in isolated pockets

[RRB JE 29.08.2015]

23. The setting and hardening of cement after addition of water is due to

(a) The presence of gypsum

(b) Binding action of water

(c) Hydration of some of the constituent compounds of cement

(d) Evaporation of water

[RRB JE 29.08.2015]

24. Which of the following trees yields hard wood ?

(a) Deodar (b) Chir

(c) Shishum (d) Pine

[RRB JE 26.08.2015]

19. निम्नलिखित में से किस सीमेंट में C_3S का अधिकतम प्रतिशत होता है ?

(a) साधारण पोर्टलैंड सीमेंट

(b) अल्प ऊष्मा सीमेंट

(c) सल्फेट प्रतिरोधी सीमेंट

(d) तीव्र कठोरीकृत सीमेंट

[RRB JE 28.08.2015]

20. कंक्रीट मिश्रण में कंकड़ (aggregate) की ग्रेडिंग, को प्राप्त करने के लिए आवश्यक है

(a) पर्याप्त सूकार्यता

(b) उच्च घनत्व

(c) रिक्तता में कमी

(d) बेहतर स्थायित्व

[RRB JE 29.08.2015]

21. भारतीय मानकों के अनुसार, साधारण पोर्टलैंड सीमेंट के लिए अधिकतम अंतिम जमाव काल होना चाहिए

(a) 30 मिनट (b) 60 मिनट

(c) 6 घंटे (d) 10 घंटे

[RRB JE 29.08.2015]

22. कंक्रीट की ब्लीडिंग तब कही जाती है जब

(a) महीन कण तल पर बैठ जाये

(b) मोटे कण अलग हो जाये

(c) सीमेंट पेस्ट कंक्रीट की सतह पर आ जाये

(d) अलग–अलग पॉकेट में महीन कण इकट्ठा हो जाए

[RRB JE 29.08.2015]

23. पानी मिलाने के बाद सीमेंट पेस्ट का जमना और कठोर होना किस कारण से होता है?

(a) जिप्सम की उपस्थिति से

(b) पानी जुड़ने की क्रिया से

(c) सीमेंट के कुछ संघटक यौगिको के जलयोजन के कारण

(d) पानी के वाष्पीकरण से

[RRB JE 29.08.2015]

24. निम्नलिखित में से कौन–सा वृक्ष कठोर लकड़ी प्रदान करता है ?

(a) देवदार (b) चीड़

(c) शिशम (d) पाइन

[RRB JE 26.08.2015]

114. Plaster of Paris is obtained from the calcination of-

(a) Gypsum (b) Dolomite

(c) Lime stone (d) Bauxite

[RRB CBT-2 19.09.2019]

115. The type of shore which is preferably inclined at 45° with the ground is -

(a) Dead shore (b) Vertical shore

(c) Horizontal shore (d) Raking shore

[RRB CBT-2 19.09.2019]

116. In which case will the permissible incline in belt conveyor be maximum?

(a) Dry silica sand

(b) Wet clay

(c) Foundry sand

(d) Coal run of mine

[RRB CBT-2 19.09.2019]

117. _____ is the collective term for the physical manifestations of the defects like cracks, spalling, pop out, staining and corrosion.

(a) Distress (b) Defects

(c) Preservation (d) Failure

[RRB CBT-2 19.09.2019]

114. प्लास्टर ऑफ पेरिस किसके निस्तापन (Calcination) से प्राप्त होता है?

(a) जिप्सम (b) डोलोमाइट

(c) चूना पत्थर (d) बॉक्साइट

[RRB CBT-2 19.09.2019]

115. _____शोर (shore) का वह प्रकार है जो अधिमानतः भूमि के साथ 45° पर प्रवृत्त (inclined) होता है।

(a) डेड शोर (b) अनुलम्ब शोर

(c) क्षैतिज शोर (d) रेकिंग शोर

[RRB CBT-2 19.09.2019]

116. वाहक पट्टे में किस केस में अनुज्ञेय ढाल अधिकतम होता है?

(a) सूखी सिलिका रेत

(b) गीली चिकनी मिट्टी

(c) संधानी रेत

(d) खान के कोल रन में

[RRB CBT-2 19.09.2019]

117. _____दरारें, चिंगारी पॉप आउट, धुंधला और क्षरण के दोषों की शारीरिक अभिव्यक्तियों के सामूहिक शब्द है-

(a) विपत्ति (b) दोष

(c) परिरक्षण (d) विफलता

[RRB CBT-2 19.09.2019]

○○○

Detailed Solution of BMC

SCAN ME

RRB : SENIOR SECTION ENGINEER

1. The chemical reaction between cement and water is :
   (a) Hydration (b) Chlorination
   (c) Calcination (d) None of these
   [RRB SSE 2014]

2. Batching in concrete refers to
   (a) Controlling the total quantity of each batch
   (b) Weighing accurately, the quantity of each material for a job before mixing
   (c) Controlling the quantity of each material into each batch
   (d) Adjusting the water to be added in each batch according to the moisture content of the materials being mixed in the batch
   [RRB SSE 2014]

3. Gypsum is used as an admixture in cement grouts for
   (a) accelerating the setting time
   (b) retarding the setting time
   (c) increasing the plasticity
   (d) reducing the grout shrinkage
   [RRB SSE 2014]

4. English Bond, Flemish Bond, Dutch Bond pertain to -
   (a) Masonry work
   (b) Cement bonding
   (c) Bonding between beams
   (d) Bonding in foundation
   [RRB SSE 2014]

5. King closers are related to
   (a) Doors and windows
   (b) King post truss
   (c) Queen post truss
   (d) Brick Masonry
   [RRB SSE 2014]

1. सीमेंट और पानी के बीच की रासायनिक प्रतिक्रिया कहलाती है –
   (a) जलयोजन (b) क्लोरीनेशन
   (c) निस्तापन (d) इनमें से कोई नहीं
   [RRB SSE 2014]

2. कंक्रीट में बैचिंग संदर्भित करता है –
   (a) प्रत्येक बैच की कुल मात्रा को नियंत्रित करना
   (b) एक कार्य के लिए मिश्रित करने से पहले प्रत्येक सामग्री की मात्रा का सही वजन करना
   (c) प्रत्येक बैच की प्रत्येक सामग्री की मात्रा को नियंत्रित करना
   (d) बैच में मिश्रित की जा रही सामग्री की नमी मात्रा के अनुसार प्रत्येक बैच में मिलाए जाने वाले पानी को समायोजित करना
   [RRB SSE 2014]

3. जिप्सम का उपयोग सीमेंट ग्राउट्स में एक अधिक मिश्रण के रूप में किया जाता है –
   (a) जमावकाल को तेज करने के लिए
   (b) जमावकाल को धीमा करने के लिए
   (c) प्लास्टिसिटी बढ़ाने के लिए
   (d) ग्राउट संकुचन को कम करने के लिए
   [RRB SSE 2014]

4. इंग्लिश बॉन्ड, फ्लेमिश बॉन्ड, डच बॉन्ड किससे संबंधित है ?
   (a) चिनाई कार्य
   (b) सीमेंट बॉन्डिंग
   (c) बीम के बीच बॉन्डिंग
   (d) नींव में बॉन्डिंग
   [RRB SSE 2014]

5. किंग क्लोजर किससे संबंधित है ?
   (a) दरवाजो और खिड़कियों
   (b) किंग पोस्ट ट्रस
   (c) क्वीन पोस्ट ट्रस
   (d) ईंट चिनाई
   [RRB SSE 2014]

24. Concrete in a member represented by a core test shall be considered acceptable, if the average equivalent cube strength of the cores is equal to at least X% of the corresponding cube strength. What is the value of X?

(a) 70 (b) 75

(c) 80 (d) 85

[RRB SSE 03.09.2015]

25. According to IS 456, what is minimum number of specimen to be tested for estimating the compressive strength

(a) 2 (b) 3

(c) 4 (d) 5

[RRB SSE 03.09.2015]

26. In general, the coefficient of thermal expansion of concrete does not depend on which of the following factors

(a) Type of cement

(b) Type of aggregate

(c) The cement content

(d) The quality of water

[RRB SSE 03.09.2015]

24. कोर टेस्ट द्वारा प्रदर्शित किये गए अवयव में कंक्रिट को स्वीकार्य माना जाएगा यदि कोर की औसत समतूल्य घन शक्ति संबंधित घन शक्ति के कम से कम X% के बराबर हो। X का मान क्या होगा –

(a) 70 (b) 75

(c) 80 (d) 85

[RRB SSE 03.09.2015]

25. IS 456, के अनुसार संपीड़न सामर्थ्य ज्ञात करने के लिए नमूनों की न्यूनतम संख्या होगी –

(a) 2 (b) 3

(c) 4 (d) 5

[RRB SSE 03.09.2015]

26. सामान्य तौर पर कंक्रिट के उष्मीय विस्तार का गुणांक किस पर निर्भर नहीं करता है –

(a) सीमेंट का प्रकार

(b) कंकड़ का प्रकार

(c) सीमेंट का अंश

(d) पानी की गुणवत्ता

[RRB SSE 03.09.2015]

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RRB : JE ANSWERS AND EXPLANATIONS

1. *Ans. (a)*

Ingredient	Function	Effects of quantity
Lime, (CaO)	Control strength and soundness	Its defining reduces strength and setting time Excess quantity makes cement unsound
Silica (SiO_2)	Gives strength	Excess silica works as a retarder. Its deficiency reduces strength
Alumina (Al_2O_3)	Impart quick setting	Excess quantity responsible for weakness of cement
Calcium Sulphate ($CaSO_4$)	Increase the initial setting time of cement	—
Iron oxide (Fe_2O_3)	Impart colour, hardness and strength to cement (Raddish brown colour)	—
Magnesia	Impart colour ((yellow) and hardness, make the cement sound	Excess quantity makes cement unsound
Sulphur Trioxide (SO_3)	Impart soundness	Excess quantity makes cement unsound

2. *Ans. (b)*

S.No.	Nature of work	Type of mortar
1.	Construction work in waterlogged areas and exposed positions	Cement or lime mortar prop. 1:3, lime being eminently hydraulic lime.
2.	Damp-proof courses and cement concrete roads	Cement mortar prop. 1:2.
3.	General R.C.C. work such as lintels, pillars, slabs, stairs, etc.	Cement mortar prop. 1:3, the concrete mix being 1:2:4.
4.	Internal walls and surfaces of less importance	Lime cinder mortar prop. being 1:3. Sand is replaced by ashes or cinder.
5.	Mortar for laying fire-bricks	Fire-resisting mortar consisting of 1 part of aluminous cement to 2 parts of finely crushed powder of fire-bricks.
6.	Partition walls and parapet walls	Cement mortar prop. 1:3 or lime mortar proportion 1:1. Lime should be moderately hydraulic lime.
7.	Plaster work	Cement mortar prop. 1:3 to 1:4 or lime mortar prop. 1:2.
8.	Pointing work	Cement mortar prop. 1:1 to 1:2.
9.	Reinforced brickwork	Cement mortar prop. 1:3.
10.	Stone masonry with best varieties of stones	Lime mortar prop. 1:2, lime being eminently hydraulic lime.
11.	Stone masonry with ordinary stones, brickwork, foundations, etc.	Lime mortar prop. 1:2 or cement mortar proportion 1:6. Lime should be eminently hydraulic lime or moderately hydraulic lime.
12.	Thin joints in brickwork	Lime mortar prop. 1:3, lime being fat lime.

3. *Ans. (c)*

Segregation : During handling, transporting and placing, due to jerks and vibrations the paste of cement and sand gets separated from coarse aggregate is called segregation.

Bleeding : Bleeding in concrete is a phenomenon in which free water in the mix rises upto the surface and forms a paste of cement on the surface known as 'laitance'.

Bleeding occurs in concrete when coarse aggregates tends to settle down and free water rises upto the surface.

It is seen in highly wet concrete or badly proportion mixes.

Effects of segregation in concrete :

1. The strength of concrete will be reduced.
2. Reduces the bond between the reinforcement and concrete.
3. A segregated concrete is difficult to compact properly.
4. Segregated concrete does not give a homogeneous mass throughout the structure.
5. Due to segregation excess mortar comes to the top surface, which causes plastic shrinkage cracks.
6. Honeycomb, sand streaks, porous layers, rock pockets etc. are the result of segregation in hardened concrete.

4. *Ans. (c)*

Vehicles : The vehicles are the liquid substances which hold the ingredients of a paint in liquid suspension.

They are required mainly for two reasons :

(a) To make it possible to spread the paint evenly and uniformly on the surface in the form of a thin layer.

(b) To provide a binder for the ingredients of a paint so that they may stick or adhere to the surface.

Ex. Linseed Oil, Tung oil, Poppy Oil, Nut Oil.

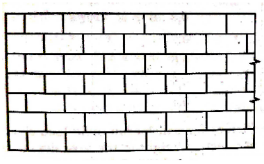
5. *Ans. (b)*

Bonds of Brick work :

1. **Stretcher Bond**

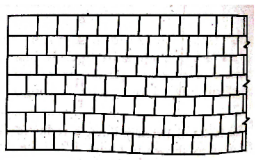
In this arrangement of bonding brick work all the bricks are laid as stretchers. It is used for half brick wall only.

It is commonly adopted in the cavity walls and partition walls.



2. **Header Bond**

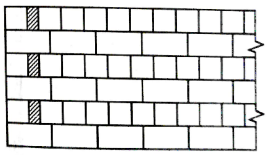
In this type of bonding all the bricks are laid as headers on the face. It is used for walls curved on plan.



3. **English bond**

The bond consists of alternate course of headers and stretchers.

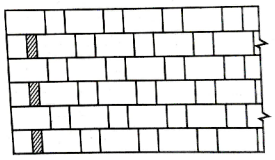
This is commonly used bond because it is stronger than other bonds.



4. **Flemish bond**

Each course consists of alternate headers and stretchers.

Flemish bond is weaker than English bond.



5. **Garden wall bond**

These types of bonds are used in compound wall, garden wall. These types of walls are constructed upto 2m height to one brick wall. These type of wall are constructed in English bond or Flemish bond.

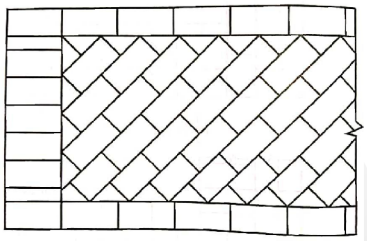
In English bond for three to five stretcher layer one header layer is provided. In Flemish bond each layer three or five stretcher course one header course is laid.

6. Raking bond

In this bond bricks are laid at any angle other than zero or ninety degrees. The bricks should be stretchers.

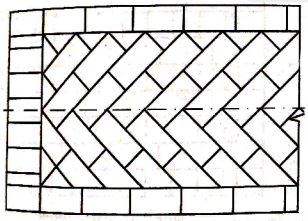
The forms of raking bond :

(a) Diagonal bond

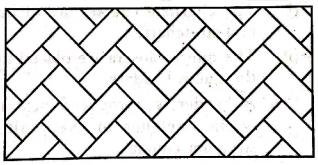


Diagonal bond

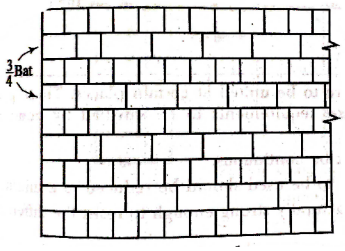
(b) Herring bone bond



(c) Zig-Zag bond



7. Dutch bond : This bond is a modification of English cross bond. Each stretching course starts at the quoin with a three quarter bat.

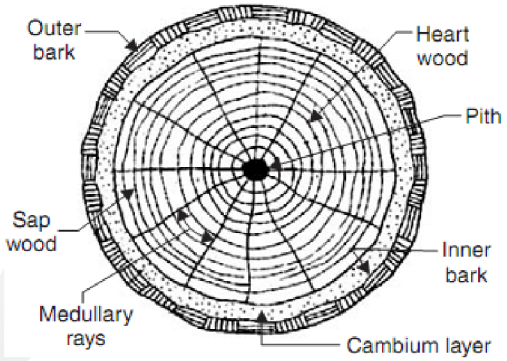


8. Brick on edge bond : In this bricks are laid on edge. It is economical but weak in strength and hence it is only recommended for garden walls or partition walls.

6. ***Ans. (c)***

Annual rings are used for predicting age of the tree. The structure of wood visible to the naked eye or at a small magnification is called the macro structure.

The cross-section of exogenous tree and its components given below.



(a) Pith : The innermost central portion or core of the tree is called pith or medulla.

- Its size and shape change with type of trees.
- It consists entirely of cellular tissues and it nourishes the plant in its young age.
- When plant is old, the pith dies up and decays.

(b) Heart Wood : The inner annual rings surrounding the pith constitute the heart wood.

- It is usually dark in colour.
- It does not take active part in the growth of tree, but it imparts rigidity to the tree and hence it provides strong and durable timber.

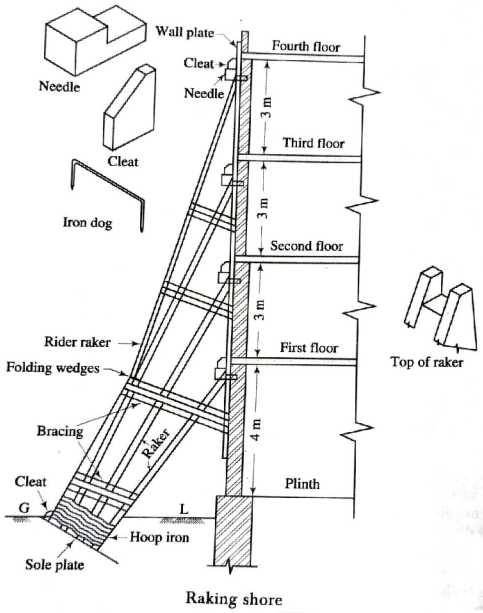
(c) Sap Wood : The outer annual rings between heart wood and cambium layer is known as the sapwood.

- It is usually light in colour and weight.
- It indicates recent growth and it contain sap.
- The annual rings of sap wood are less sharply defined than those of heart wood.
- The sap wood is also known as the alburnum.

115. *Ans. (d)*

Raking or inclined shores :–

In this arrangement, the inclined supports are given to the external walls from the ground.



Raking shore

116. *Ans. (c)*

117. *Ans. (a)*

RRB : SSE ANSWERS AND EXPLANATIONS

1. *Ans. (a)*

- The chemical reaction between cement and water is known as hydration of cement.
- About an average 23% of water by weight of cement is required for complete hydration of Portland cement. This water combines chemically with the cement compounds and is known as bound water.

About 15% water by weight of cement is required to fill the cement gel pores and is known as gel water.

Therefore, a total of 38% of water by weight of cement is required to complete the chemical reaction.

2. *Ans. (b)*

The process of measuring ingredients or materials to prepare concrete mix is known as batching of concrete

Methods of batching :

1. Volume batching
2. Weight batching

For most important works weight batching is recommended

3. *Ans. (b)*

Gypsum used as a retarder in OPC.

Retarder : Decrease the rate of hydration.

Accelerator : Increase the rate of hydration.

4. *Ans. (a)*

Bonds of Brick work :

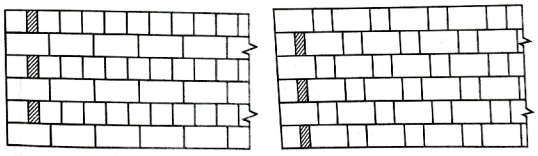
English bond : The bond consists of alternate course of headers and stretchers.

This is commonly used bond because it is stronger than other bonds.

Flemish bond : Each course consists of alternate headers and stretchers.

Flemish bond is weaker than English bond.

Dutch bond : This bond is a modification of English cross bond. Each stretching course starts at the quoin with a three quarter bat.



English bond Flemish bond

5. *Ans. (d)*

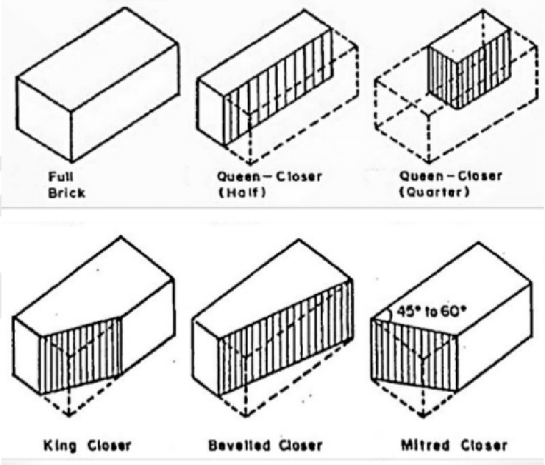
Closer : It is a portion of brick cut in such a manner that its one long face remains uncut.

1. **King closer**

   It is a brick which is cut in such a way that the width of one of its end is half of that of a full brick.

2. **Queen closer**

   It is a term applied to a brick which is half as a full brick. Queen closer is made by cutting a brick lengthwise into two portions.



6. *Ans. (b)*

Industrial and commercial buildings will require higher than 4000 psi. Some structures also require an exceptional strength of 10,000 psi, but these cases are not too common. In every day concrete work, professionals usually go for a compression strength of 7,500 psi.

7. *Ans. (d)*

Objective of the seasoning :

1. To allow the timber to burn readily, if used as fuel.
2. To decrease the weight of the timber thereby cost of transportation is reduce.
3. To impart strength, hardness, better electrical resistance to timber.
4. To maintain the size and shape of timber.
5. To make timber easily workable.
6. To make timber fit for receiving treatment of paints, preservation.
7. To make the timber safe from the attack of fungi and insects.

8. *Ans. (b)*

When water is added to cement, the chemical reaction which occur are mostly exothermic, that is, the reactions generate heat.

9. *Ans. (d)*

Bulk density of cement is into used.

10. *Ans. (b)*

The time elapsed between the moment water is added to the ordinary Portland cement and the time when the cement completely loses its plasticity and can resist certain definite pressure is termed as final setting time.

11. *Ans. (c)*

Ingredient	Composition % range
Lime, (CaO)	62-67
Silica (SiO_2)	17-25
Alumina (Al_2O_3)	3-8
Calcium sulphate ($CaSO_4$)	3-4
Iron oxide (Fe_2O_3)	3-4
Magnesia	1-3
Sulphur Trioxide) (SO_3)	1-3
Alkalies [NO_2O + K_2O]	0.2 to 1

12. *Ans. (d)*

13. *Ans. (a)*

The excessive amount of expansion due to unsound cement is usually related to Magnesia.

14. *Ans. (b)*

If inadequate amounts of gypsum are added to the cement, flash set can occur – a rapid development of rigidity in freshly mixed portland cement paste, mortar, or concrete. Further mixing can't dispel this rigidity, and a large amount of heat is produced in the process.

15. *Ans. (c)*

According to IS 456, the accuracy of the measuring equipment shall be with in ±2 percent of the quantity of cement being measured and within ±3 percent of the quantity of aggregate, admixtures and water being measured.

16. *Ans. (d)*

17. *Ans. (b)*

The recommended slump of concrete for had placed pavements is 1-3 inches.

18. *Ans. (c)*

Test Name	Purpose	Used Apparatus
Consistency test	To determine the % of water required for preparing cement paste of standard consistency	Vicat apparatus
Setting time	To determine initial & final setting time of cement	Vicat apparatus
Soundness test	To check soundness of cement (volume change after setting of cement)	(i) Le-Chatelier apparatus (for free lime) (ii) Autoclave machine (for free lime and magnesia)
Fineness test	Measure mean size of grains	Sieve test
	Find specific surface area	Blaine air permeability apparatus
Heat of hydration	To find heat of hydration of cement	Calorimeter apparatus
Specific gravity test	To determine specific gravity of cement	Le-Chatelier flask
Strength test	To determine compressive strength of cement	Cubes tested in compression testing machine
	To determine tensile strength of cement	Briquettes are tested in testing machine

19. ***Ans. (d)***

Non-distructive test is a method of testing existing concrete structures to assess the strength and durability of concrete structure.

Following the different methods of NDT on concrete:

1. Rebound hammer test
2. Ultrasonic pulse velocity method
3. Impact echo Testing
4. Profometer for rebar

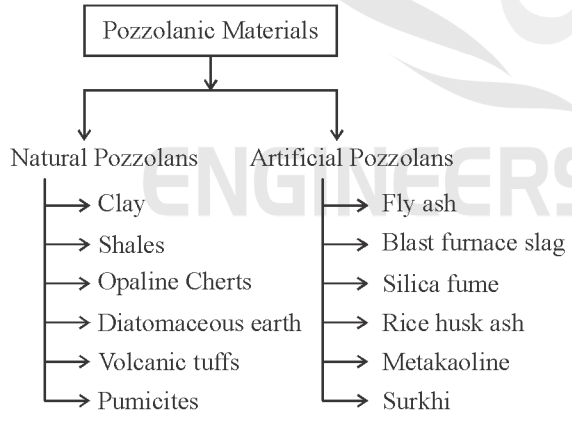
Partially Destructive Test:

1. Penetration Resistance Test
2. Pull out Testing
3. Core Test

20. ***Ans. (a)***

21. ***Ans. (d)***

Mineral additives also called supplementary cementing materials or pozzolana are finely ground siliceous materials which, as such, do not possess cementing property in themselves, but react chemically with calcium hydroxide $Ca(OH)_2$ released from the hydration of portland cement at normal temperature to form compounds of low solubility having cementing properties. The action is termed pozzolanic action.



22. ***Ans. (d)***

23. ***Ans. (d)***

The recommended slump for pumped concrete is 4–6 inches.

24. ***Ans. (d)***

25. ***Ans. (b)***

According to IS : 456, 3 specimen to be tested for estimating the compressive strength.

26. ***Ans. (d)***

The coefficient of thermal expansion (CTE) in concrete is the measure of how concrete changes in volume in response to changes in temperature. CTE is defined as the change in unit length per degree of temperature change. It is independent of quality of water.

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