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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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

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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]

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]

6. Strength of commonly used concrete, for constructing low rise residential buildings is :
(a) 300 psi
(b) 8000 psi
(c) 15000 psi
(d) 25000 psi
[RRB SSE 2014]

7. Seasoning of timber is required to
(a) Soften the timber
(b) Harden the timber
(c) Straighten the timber
(d) Remove sap from the timber
[RRB SSE 2014]

8. Normally, when ordinary Portland cement hydrates,
(a) Heat is absorbed
(b) Heat evolves
(c) Heat neither evolves nor is absorbed
(d) Cement paste cools down below atmospheric temperature
[RRB SSE 01.09.2015]

9. Which of the following is not used in the design of concrete mixes as per the relevant Indian standard ?
(a) Air content
(b) Water content
(c) Admixture content
(d) Bulk density of cement
[RRB SSE 01.09.2015]

10. 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
(a) Initial setting time
(b) Final setting time
(c) Hydration time
(d) Gestation period
[RRB SSE 01.09.2015]

6. कम उँचाई वाले आावासीय भवनों के निर्माण के लिये सामान्यतः प्रयुक्त कि जाने वाली कंक्रिट की सामर्थ्य है –
(a) 300 psi
(b) 8000 psi
(c) 15000 psi
(d) 25000 psi
[RRB SSE 2014]

7. लकड़ी के संशोषण की आवश्यकता क्यों होती है?
(a) लकड़ी को नरम करने के लिए
(b) लकड़ी को कठोर करने के लिए
(c) लकड़ी को सीधा करने के लिए
(d) लकड़ी में से रस हटाने के लिए
[RRB SSE 2014]

8 सामान्यतः जब साधारण पोर्टलैण्ड सीमेंट का जलयोजन होता है, तो–
(a) ऊष्मा अवशोषित होती है
(b) ऊष्मा उत्सर्जित होती है
(c) ऊष्मा न तो उत्सर्जित होती है और न अवशोषित होती है
(d) सीमेंट पेस्ट वायुमण्डलीय तापमान के नीचे ठण्डा होता है
[RRB SSE 01.09.2015]

9. प्रासंगिक भारतीय मानक के अनुसार कंक्रिट मिक्स के डिजाइन में निम्नलिखित में से किसका उपयोग नहीं किया जाता है ?
(a) वायु अंश
(b) जलांश
(c) मिश्रण अंश
(d) सीमेंट का स्थूल घनत्व
[RRB SSE 01.09.2015]

10. साधारण पोर्टलैण्ड सीमेंट में जल को मिश्रित करने के समय से लेकर सीमेंट के प्रत्यास्थ अवस्था में पहुंचने तक का समय जब यह सीमेंट एक निश्चित दाब को सहने में सक्षम हो जाए तो कहते हैं–
(a) प्रारंभिक जमाव काल
(b) अन्तिम जमाव काल
(c) हाइड्रेशन समय
(d) सगर्भता अवधि
[RRB SSE 01.09.2015]

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.

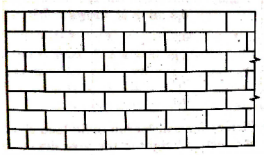
5. *Ans. (b)*

Bonds of Brick work :

1. **Stretcher Bond**

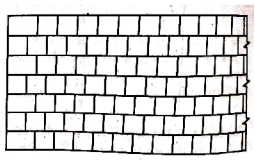
In this arrangement of bonding brick work all the bricks are laid as stretchers. It is used for half brick wall only.

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



2. **Header Bond**

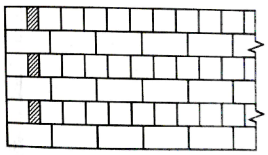
In this type of bonding all the bricks are laid as headers on the face. It is used for walls curved on plan.



3. **English bond**

The bond consists of alternate course of headers and stretchers.

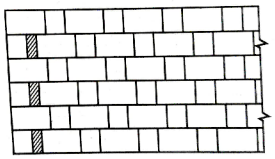
This is commonly used bond because it is stronger than other bonds.



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.

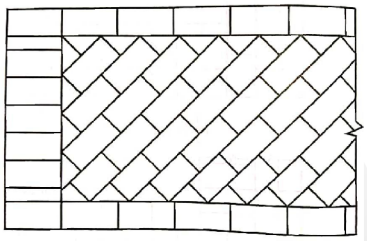
In English bond for three to five stretcher layer one header layer is provided. In Flemish bond each layer three or five stretcher course one header course is laid.

6. **Raking bond**

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

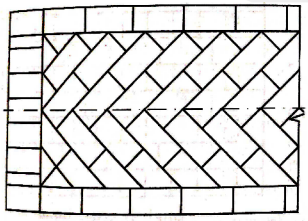
The forms of raking bond :

(a) Diagonal bond

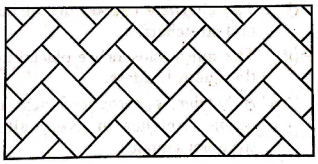


Diagonal bond

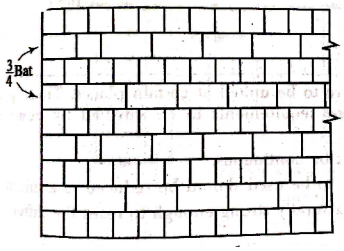
(b) Herring bone bond



(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.

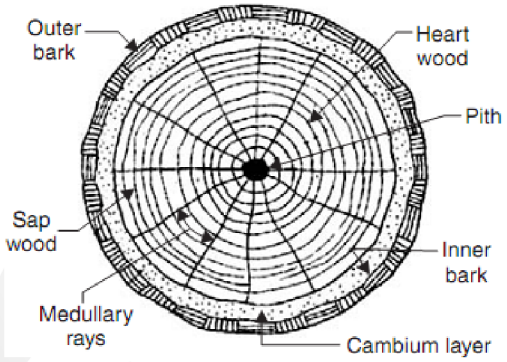


8. **Brick on edge bond :** In this bricks are laid on edge. It is economical but weak in strength and hence it is only recommended for garden walls or partition walls.

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.

(d) Cambium Layer : The thin layer of sap between sap wood and inner bark is known as cambium layer.

If the bark is removed for any reason, the cambium layer gets exposed to the environment and decay of the tree is start.

(e) Inner bark : The inner layer covering the cambium layer is known as the inner bark.

(f) Outer bark : The outer cover of the tree is known as the outer bark.

(g) Medullary rays : The thin radial fibres extending from pith to cambium layer are known as the medullary rays.

The function of these rays is to hold together the annual rings of heart wood and sap wood.

7. *Ans. (d)*

Fat lime : This lime is also known as high calcium lime, pure lime, rich lime or white lime.

- It is popularly known as the fat lime.
- After slaking its volume increased about 2 to 2.5 times.
- This lime is produce from relatively pure lime stone (having 95% calcium oxide).
- The percentage of impurites in such lime stone is less than 5%.

Properties of fat lime:

- It hardens very slowly.
- It slakes vigorously.
- It has high degree of plasticity.
- Its colour is perfectly white.
- It sets slowly in presence of air.
- It is soluble in water which is changed frequently.

Uses

- It used in white washing and plastering walls.
- With surkhi, it forms lime mortar.
- Used as a base for distemper.
- Used in manufacturing of cement.

8. *Ans. (d)*

Pigments are used to hide the surface imperfections and to impart the desired colour.

The pigments are available in the form of fine powder in various colours and qualities.

Following are five divisions of he colouring pigments :

(i) Natural earth colours such as ochres, umbers, iron oxides, etc.

(ii) Calcined colours such as lamp black, Indian red, carbon black, red lead, etc.

(iii) Precipitates such as prussian blue, chrome green, chrome yellow, etc.

(iv) Lakes prepared by discolouringbarytes or china clay with the help of suitable dyes.

(v) Metal powders such as aluminium powder, bronze powder, copper powder, zinc powder, etc.

Colouring pigments for paints

Tint of Paint	Pigments
Black	Graphite, Lamp black, Ivory black, Vegetable black
Brown	Burnt umber, raw umber
Green	Chrome green, Copper sulphate
Yellow	Yellow Ochre, Zinc Chrome
Red	Red Lead, Carmine
Blue	Indigo, Prussian blue

Pigments also improve impermeability of the paint film and enhance its resistance to weathering.

9. *Ans. (b)*

Total surface area $= 2\ (lb + bh + lh)$

$= 2(10 \times 4 + 4 \times 3 + 10 \times 3)$

$= 164\ cm^2$

10. *Ans. (c)*

Hydraulic lime : This lime is also known as the water lime as it sets under water.

- This lime does not have perfect white colour but have sufficient strength hence it is generally use for masonry work.
- Insoluble in water

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 :

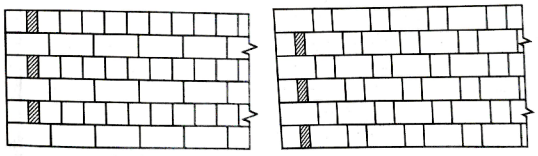
English bond : The bond consists of alternate course of headers and stretchers.

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)*

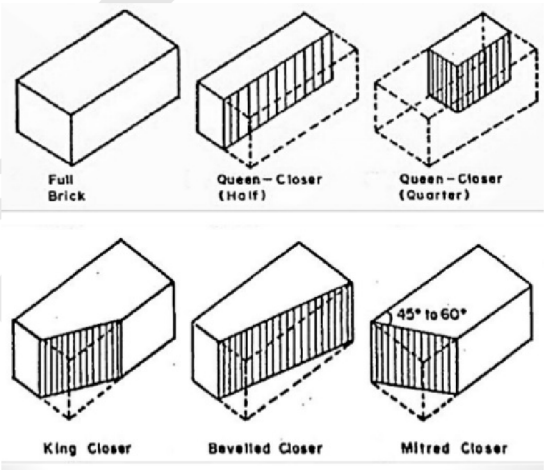
Closer : It is a portion of brick cut in such a manner that its one long face remains uncut.

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.

2 Chapter

STRENGTH OF MATERIAL

RRB Previous Year Questions

RRB : JUNIOR ENGINEER

1. The slenderness ratio of a compression member is :

(a) $\frac{\text{Effective length}}{\text{Least radius of gyration}}$

(b) $\frac{\text{Actual length}}{\text{Moment of inertia}}$

(c) $\frac{\text{Moment of inertia}}{\text{Actual length}}$

(d) $\frac{\text{Actual length}}{\text{Radius of gyration}}$

[RRB-JE : 2014]

2. The length of a bar is L meters. It extends by 2 mm when a tensile force F is applied. Find the strain produced in the bar :

(a) $\frac{0.002}{L}$ (b) $\frac{2}{L}$

(c) $\frac{0.2}{L}$ (d) $\frac{L}{0.002}$

[RRB-JE : 2014]

3. Choose the option which correctly shows the relationship between Modulus of Elasticity (E); Modulus of Rigidly (C) and Bulk Modulus (K):

(a) $E = \frac{KC}{K+C}$ (b) $E = \frac{2KC}{2K+C}$

(c) $E = \frac{9KC}{3K+C}$ (d) $E = \frac{9KC}{K+2C}$

[RRB-JE : 2014]

1. एक संपीड़न अवयव का तनुता अनुपात है :

(a) $\frac{\text{प्रभावी लंबाई}}{\text{कम से कम घूर्णी त्रिज्या}}$

(b) $\frac{\text{वास्तविक लंबाई}}{\text{जड़त्व आघूर्ण}}$

(c) $\frac{\text{जड़त्व आघूर्ण}}{\text{वास्तविक लंबाई}}$

(d) $\frac{\text{वास्तविक लंबाई}}{\text{घूर्णी त्रिज्या}}$

[RRB-JE : 2014]

2. एक छड़ की लंबाई L मीटर है। जब एक तनन बल F लगाया जाता है तो यह 2 mm तक फैल जाता है। छड़ में उत्पन्न विकृति का पता लगाएं

(a) $\frac{0.002}{L}$ (b) $\frac{2}{L}$

(c) $\frac{0.2}{L}$ (d) $\frac{L}{0.002}$

[RRB-JE : 2014]

3. वह विकल्प चुनें जो प्रत्यास्थता मापांक (E) के बीच संबंध को सही ढंग से दर्शाता है, दृढ़ता मापांक (C) और आयतन मापांक (K)

(a) $E = \frac{KC}{K+C}$ (b) $E = \frac{2KC}{2K+C}$

(c) $E = \frac{9KC}{3K+C}$ (d) $E = \frac{9KC}{K+2C}$

[RRB-JE : 2014]

4. The property of a material by which it can be rolled into sheets is called :

(a) Elasticity (b) Plasticity

(c) Ductility (d) Malleability

[RRB-JE : 2014]

5. A simply supported beam of length L is loaded with a uniformly distributed load of 'w' per unit length. The maximum bending moment will be :

(a) $\frac{wL^2}{4}$ (b) $\frac{wL^2}{8}$

(c) $\frac{wL^2}{2}$ (d) wL^2

[RRB-JE : 2014]

6. Which of the following property is generally NOT shown by metal ?

(a) Electrical conduction

(b) Sonorous in nature

(c) Dullness

(d) Ductility

[RRB-JE : 2014]

7. A Simply supported beam of span L and flexural rigidity EI, carries a unit point load at its centre. The strain energy in the beam due to bending is

(a) $\frac{L^3}{48EI}$ (b) $\frac{L^3}{192EI}$

(c) $\frac{L^3}{96EI}$ (d) $\frac{L^3}{16EI}$

[RRB-JE : 2014]

8. In terms of bulk modulus (K) and modulus of rigidity (G), Poisson's ratio can be expressed as

(a) $\frac{3K-4G}{6K-4G}$ (b) $\frac{3K+4G}{6K-4G}$

(c) $\frac{3K-2G}{6K+2G}$ (d) $\frac{3K+2G}{6K+2G}$

[RRB JE 2014]

4. किसी पदार्थ का वह गुणधर्म जिसके द्वारा उसे चादरों में लपेटा जा सकता है, कहलाता है :

(a) प्रत्यास्थता (b) सुघट्यता

(c) तन्यता (d) आघातवर्धनीयता

[RRB-JE : 2014]

5. 'L' लंबाई की एक शुद्ध आलम्बित धरन पर 'w' प्रति यूनिट लंबाई का भार समान रूप से वितरित है। अधिकतम बंकन आघूर्ण होगा

(a) $\frac{wL^2}{4}$ (b) $\frac{wL^2}{8}$

(c) $\frac{wL^2}{2}$ (d) wL^2

[RRB-JE : 2014]

6. निम्नलिखित में से कौनसा गुणधर्म आमतौर पर धातु द्वारा नहीं दिखाया जाता है?

(a) विद्युत चालन

(b) ध्वानिक प्रकृति

(c) मंदस्वनता

(d) तन्यता

[RRB-JE : 2014]

7. स्पैन L और आनमनी दृढ़ता EI का एक शुद्धलम्बित धरन, अपने केंद्र में एक इकाई बिन्दु भार वहन करता है। बंकन के कारण बीम में विकृति ऊर्जा है

(a) $\frac{L^3}{48EI}$ (b) $\frac{L^3}{192EI}$

(c) $\frac{L^3}{96EI}$ (d) $\frac{L^3}{16EI}$

[RRB-JE : 2014]

8. बल्क मापांक (K) और कठोरता मापांक (G), के संदर्भ में, पॉइसन के अनुपात को इस प्रकार व्यक्त किया जा सकता है।

(a) $\frac{3K-4G}{6K-4G}$ (b) $\frac{3K+4G}{6K-4G}$

(c) $\frac{3K-2G}{6K+2G}$ (d) $\frac{3K+2G}{6K+2G}$

[RRB JE 2014]

RRB : SENIOR SECTION ENGINEER

1. In S.I. System, unit of stress is :

(a) kg/cm^2 (b) N

(c) N/m^2 (d) Watt

[RRB-SSE : 2014]

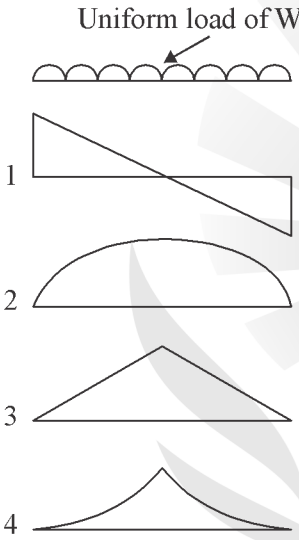
2. In C.G. S. System, the unit of strain is :

(a) cm/kg (b) m/kg

(c) No unit (d) None of these

[RRB-SSE : 2014]

3. In the case of a uniformly distributed load on a simply supported beam, the bending moment diagram would be –

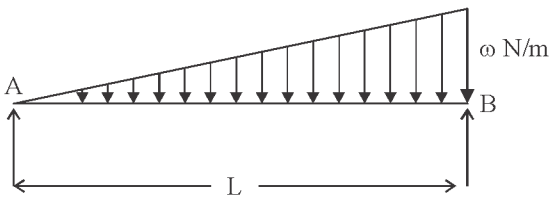


(a) 1 (b) 2

(c) 3 (d) 4

[RRB-SSE : 2014]

4. A Simply supported beam carries a varying load from zero at one end to w N/m at the other end (as under).



The length of the beam is L. The shear force will be zero at distance 'x' from A. Find 'x' :

1. S.I. प्रणाली में, प्रतिबल की इकाई_____है।

(a) kg/cm^2 (b) N

(c) N/m^2 (d) Watt

[RRB-SSE : 2014]

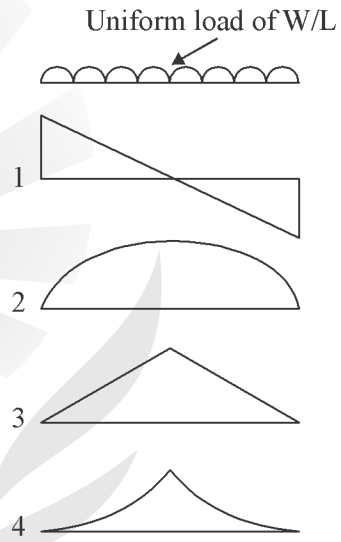
2. C.G. S. प्रणाली में, विकृति की इकाई_____है :

(a) cm/kg (b) m/kg

(c) कोई इकाई नहीं (d) इनमें से कोई नहीं

[RRB-SSE : 2014]

3. शुद्धलम्बित धरन पर एकसमान वितरित भार के मामले में, बंकन आघूर्ण आरेख_____होगा

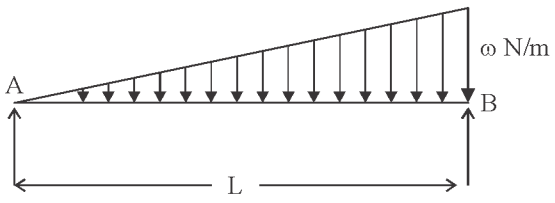


(a) 1 (b) 2

(c) 3 (d) 4

[RRB-SSE : 2014]

4. एक शुद्धलम्बित धरन, एक छोर पर शून्य से दूसरे छोर पर w N/m तक परिवर्तित भार वहन करता है (जैसा कि नीचे दिया गया है)



धरन की लंबाई L है। A से दूरी 'x' पर कतरनी प्रतिबल शून्य होगा। 'x' का मान_____होगा :

(a) $\frac{L}{2}$ (b) $\frac{L}{4}$

(c) $\frac{L}{\sqrt{3}}$ (d) $\frac{L}{3}$

[RRB-SSE : 2014]

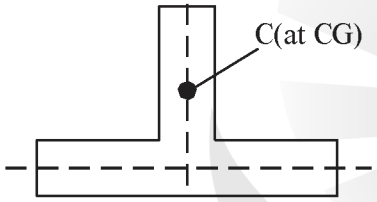
5. Maximum deflection of a fixed beam carrying a central load is one form of maximum deflection is equal to (other notations standard)

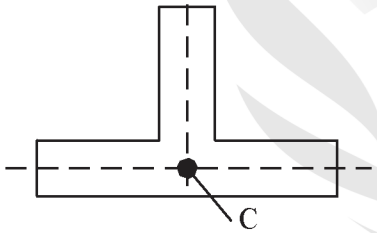
(a) $\frac{WL^3}{48EI}$ (b) $\frac{WL^3}{96EI}$

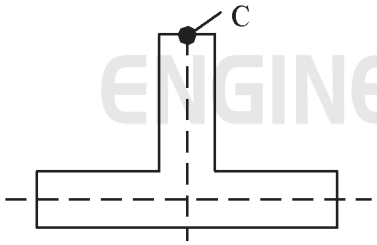
(c) $\frac{WL^3}{192EI}$ (d) $\frac{5}{384}\frac{WL^3}{EI}$

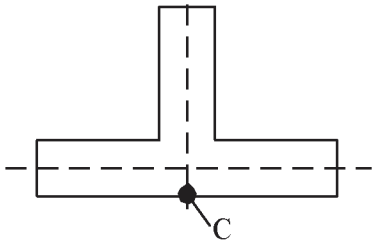
[RRB SSE 2014]

6. In a thin-wall T-section, the shear centre C is located at the point shown in

(a) 

(b) 

(c) 

(d) 

[RRB SSE 2014]

(a) $\frac{L}{2}$ (b) $\frac{L}{4}$

(c) $\frac{L}{\sqrt{3}}$ (d) $\frac{L}{3}$

[RRB-SSE : 2014]

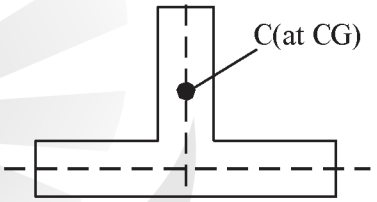
5. केंद्रीय भार W ले जाने वाले एक स्थिर बीम का अधिकतम विक्षेपण बराबर होता है –

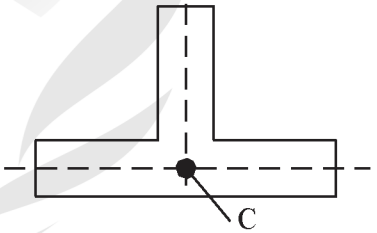
(a) $\frac{WL^3}{48EI}$ (b) $\frac{WL^3}{96EI}$

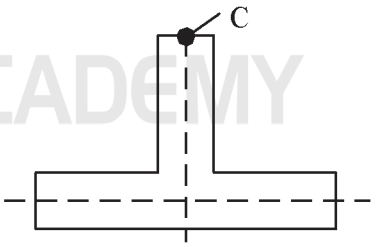
(c) $\frac{WL^3}{192EI}$ (d) $\frac{5}{384}\frac{WL^3}{EI}$

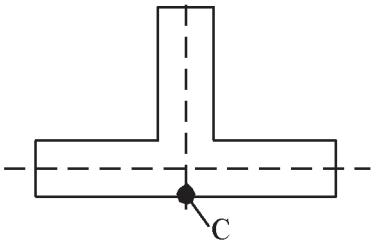
[RRB SSE 2014]

6. एक पतली दीवार वाले टी सेक्शन में, अपरूपण केंद्र C में दिखाए गए बिंदु पर स्थित है

(a) 

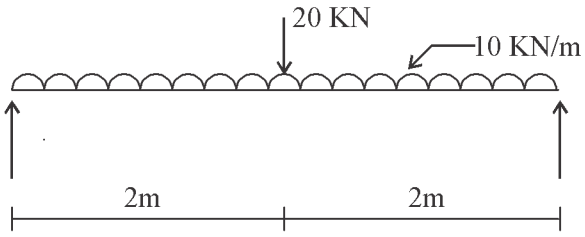
(b) 

(c) 

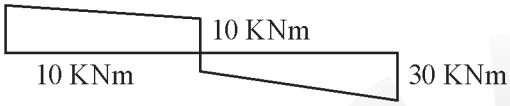
(d) 

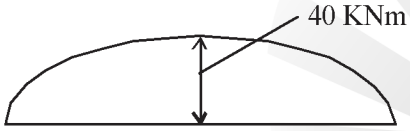
[RRB SSE 2014]

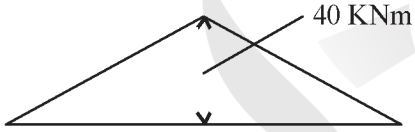
7. A simply supported beam is loaded as below

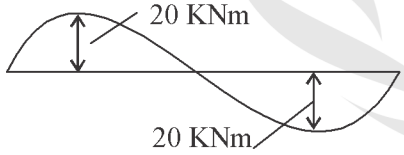


The corresponding Bending moment Diagram is

(a)


(b)


(c)


(d)


[RRB SSE 2014]

8. What is the radius of Mohr's circle in case of bi-axial state of stress ?

(a) half the sum of the two principal stresses

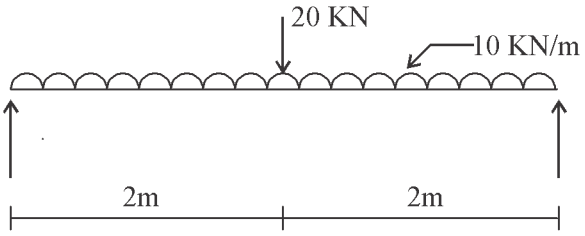
(b) half the difference of the two principal stresses

(c) Difference of the two principal stresses

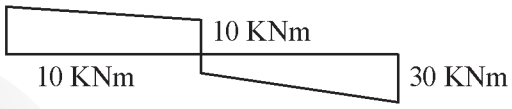
(d) Sum of the two principal stresses

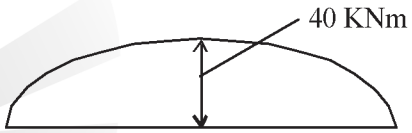
[RRB SSE 2014]

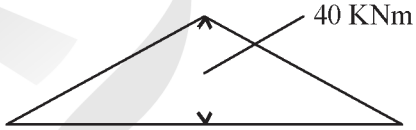
7. नीचे दिए गए चित्र में साधारण समर्थित बीम लोड किया गया है :

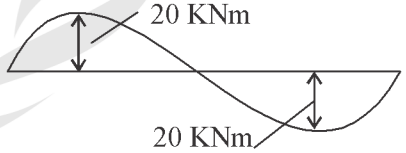


तदनुसार बंकन आघूर्ण आरेख होगा –

(a)


(b)


(c)


(d)


[RRB SSE 2014]

8. द्विअक्षीय प्रतिबल की स्थिति में मोहर वृत्त की त्रिज्या क्या है ?

(a) दो प्रमुख प्रतिबलों के योग की आधी

(b) दो प्रमुख प्रतिबलों के अंतर की आधी

(c) दो प्रमुख प्रतिबलों का अंतर

(d) दो प्रमुख प्रतिबलों का योग

[RRB SSE 2014]

RRB : JE ANSWERS AND EXPLANATIONS

1. ***Ans. (a)***

Slenderness ratio is the ratio of the length of a column and the least radius of gyration of its cross section.

2. ***Ans. (a)***

3. ***Ans. (c)***

We know that,

$$E = 2C(1 + \mu) \quad ...(i)$$

and $E = 3\ K\ (1 - 2\mu)$ ...(ii)

From (i)

$$1 + \mu = \frac{E}{2C}$$

$$\therefore \quad \mu = \left(\frac{E}{2C} - 1\right)$$

Putting this value in (ii)

$$E = 3K\left[1 - 2\left(\frac{E}{2C} - 1\right)\right]$$

$$= 3K\left[\left(1 - \frac{E}{C} + 2\right)\right]$$

$$E = 3K\left[3 - \frac{E}{C}\right] = 3K\left[\frac{3C - E}{C}\right]$$

$$EC = 3K(3C - E)$$

$$= 9\ KC - 3KE$$

$\therefore$ $EC + 3KE = 9\ KC$

$\therefore$ $E(C + 3K) = 9\ KC$

$$\therefore \quad E = \frac{9KC}{C + 3K}$$

4. ***Ans. (d)***

Malleability is a substance's ability to deform under pressure (compressive stress). If malleable, a material may be flattened into thin sheets by hammering or rolling. Malleable materials can be flattened into metal leaf. Many metals with high malleability also have high ductility.

5. ***Ans. (b)***

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

7. ***Ans. (c)***

For simply supported beam carrying a point load 'P' at the centre

Strain Energy

$$U = 2\int_0^{\frac{L}{2}} \frac{M^2}{2EI} dx; \quad M = \frac{P}{2}x;$$

$$\therefore \quad U = 2\int_0^{\frac{L}{2}} \frac{p^2x^2dx}{2\times 4EI} = \left[\frac{2P^2x^3}{2\times 4EI\times 3}\right]_0^{\frac{L}{2}}$$

At $P = 1,\ U = \frac{L^3}{96\ EI}$

8. ***Ans. (c)***

$$\mu = \frac{3K - 2G}{6K + 2G},$$

9. ***Ans. (c)***

In ideal plastic material, stress remains constant and deformation is continuous in nature.

10. ***Ans. (c)***

The word 'Brinell' is associated with hardness.

11. ***Ans. (d)***

If the modulus of elasticity is zero the material is said to be plastic

12. ***Ans. (b)***

Homogeneous material - A material of uniform composition throughout that cannot be mechanically separated into different material. Examples of "homogeneous materials" are certain types of plastics, ceramics, glass, metals, alloys, paper, board, resins, and coatings.

Isotropic material means a material having identical values of a property in all directions. Glass and metals are examples of isotropic materials.