

DO NOT OPEN THIS TEST BOOKLET TILL YOU ARE ASKED TO DO SO.

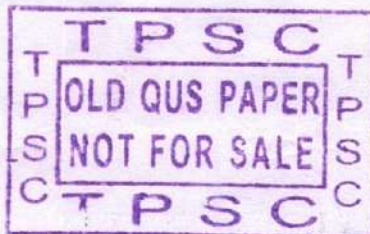
TR/TES(CV-I)/IV/15

**TEST BOOKLET
CIVIL ENGINEERING PAPER-I**

Test Booklet Series

Signature of the Candidate

Invigilator's Signature



Time allowed : 3 hours (Three hours)

Maximum Marks : 200

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY TEST BOOKLET OF SAME SERIES.
2. **ENCODE CLEARLY THE TEST BOOKLET SERIES IN THE OMR ANSWER SHEET ONLY IN THE APPROPRIATE PLACE IN THE ANSWER SHEET BY BLACK BALL POINT PEN ONLY.**
3. This Test Booklet is divided into three sections i.e. **Section-A, Section-B and Section-C.**
 - (A) **Section-A (MCQ pattern)** contains 40 items (questions). Each question carrying 2 (two) marks only, has four responses (answers). You will select the response which you want to mark on the **OMR Sheet**. In case you feel that there is more than one correct response, mark the response which you consider the most appropriate. In any case, choose **ONLY ONE** response for each item.
 - (B) Questions under **Section-B (Conventional method) and Section-C (Conventional method)** are to be answered in separate **answer book**.
4. You have to mark all your responses of **Section-A by Black Ball Point Pen only** on the separate OMR Answer Sheet provided. See directions in the Answer Sheet.
5. Before you proceed to mark in the Answer Sheet the responses to various items of **Section-A** in the Test Booklet, you have to fill in some particulars in the Answer Sheet.
6. On completion of the Examination, you should hand over the OMR Answer Sheet for Section-A and Answer Book for Section-B and C to the Invigilator only. You are permitted to take the Test Booklet with you.
7. Sheets for rough work are appended on the Test Booklet at the end.

DO NOT OPEN THIS TEST BOOKLET TILL YOU ARE ASKED TO DO SO.

All symbols have their usual meaning.

SECTION – A

Select the single best correct answer and mark on the OMR sheet. 40×2=80

1. If P is the standard consistency of cement, the amount of water used in conducting the initial setting time test on cement is :
(A) $0.65 P$
(B) $0.85 P$
(C) $0.55 P$
(D) None of these
2. In the Los-Angeles Abrasion Test on aggregate, if the speed of the drum is increased upto 50 rpm, then the abrasion value will
(A) decrease
(B) remain unchanged
(C) be unpredictable
(D) None of these
3. The unit weight of plain concrete is generally taken as
(A) 23 KN/m^3
(B) 24 KN/m^3
(C) 25 KN/m^3
(D) None of these
4. The sum of the cumulative percentages retained on the sieves divided by 100 give the
(A) Fineness modulus
(B) Frequency modulus
(C) First modulus
(D) None of these
5. The standard sand now used in India is obtained from
(A) Dombivali (Mumbai)
(B) Gopalpur (Orissa)
(C) Ennore (Chennai)
(D) None of these
6. The bottom diameter, top diameter and height of the slump cone are respectively
(A) 20 cm, 10 cm, 30 cm
(B) 30 cm, 10 cm, 40 cm
(C) 10 cm, 20 cm, 30 cm
(D) None of these

7. The product $E.I$ is also known as
- Modulus of rigidity
 - Flexural rigidity
 - Stiffness
 - None of these
8. Grading in which one or more intermediate size fractions are absent is known as
- Gap grading
 - Nil - grading
 - Average grading
 - None of these
9. Le-Chatelier's method can be used to determine
- Fineness of aggregate
 - Sulphur content
 - Soundness of cement
 - None of these
10. The ratio of the change in volume to the original volume is called
- Volumetric stress
 - Volumetric strain
 - Volume change
 - None of these
11. When the deformation of the member is within the elastic limit, it is found that the ratio of the lateral strain to the longitudinal strain is a constant for a given material. The ratio is called
- Poisson's ratio
 - Volumetric strain
 - Shear modulus
 - None of these
12. 'When a material is loaded within its elastic limit, the stress is proportional to the strain.' This law is known as
- Hooke's law
 - Hook's law
 - Hoke's law
 - None of these
13. Shear force (V) and bending moment (M) are related by
- $V = \int M \, dx$
 - $V = \int MZ \, dx$
 - $V = \frac{dM}{dx}$
 - None of these
14. Which of the following is the unit of Young's modulus of elasticity?
- Newton / sq. cm
 - Kg / cm
 - Kg
 - None of these

15. The bending moment diagram for an overhanging beam is shown in the figure 1.

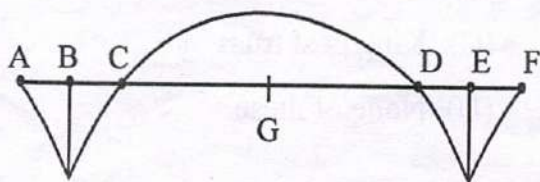


Fig.1

The points of contraflexure would include

- (A) A and F
 - (B) B and E
 - (C) C and D
 - (D) None of these
16. A cantilever of length 'L' carries a concentrated load 'W'. If the length of the cantilever is doubled, the deflection at the free end, for the same load will be

- (A) 4 times
- (B) 8 times
- (C) 12 times
- (D) None of these

17. Two like principal stresses ' P_1 ' and ' P_2 ' are acting on a member. There is an inclined plane of sectional area ' A ', length ' l ', width ' b ' at an angle of ' θ '. The tangential stress ' P_t ' will be calculated by

- (A) $\frac{P_1 - P_2}{2} \sin 2\theta$
- (B) $\frac{P_1}{l} \sin 2\theta + \frac{P_2}{b} \cos 2\theta$
- (C) $\frac{P_1 + P_2}{2A} + \frac{P_1 - P_2}{2A} \cos 2\theta$
- (D) None of these

18. The moment of inertia of a circular section about an axis passing through its c. g. (where D = diameter)

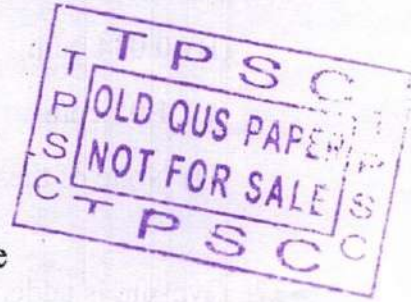
- (A) $\frac{\pi}{64} D^3$
- (B) $\frac{\pi}{62} D^4$
- (C) $\frac{\pi}{16} D^4$
- (D) None of these

19. The moment of inertia of a rectangular section about an axis passing through its c. g. (where b and d are the breadth and depth of the rectangle respectively).

- (A) $\frac{1}{3} bd^3$
- (B) $\frac{1}{12} bd^2$
- (C) $\frac{1}{12} bd^3$
- (D) None of these

20. A plane, which is not subjected to shear stress, is called as
- (A) Principle plane
 - (B) Shear plane
 - (C) Principal plane
 - (D) None of these
21. When a section is subjected to two equal and opposite pulls, as a result of which the body tends to lengthen, the stress induced is called
- (A) Compressive stress
 - (B) Tensile strain
 - (C) Compound stress
 - (D) None of these
22. PERT means
- (A) Programme evaluation and research technique
 - (B) Programme evaluation and review technique
 - (C) Programme evaluation, rating and timing
 - (D) None of these
23. Critical Path Method (CPM) network is
- (A) Speed oriented
 - (B) Activity oriented
 - (C) Slack oriented
 - (D) None of these
24. Queen closers are related to
- (A) Queen post truss
 - (B) Doors and windows
 - (C) King post truss
 - (D) None of these
25. The bond in which headers and stretchers are laid alternately in the same course, is called
- (A) English bond
 - (B) Flemish bond
 - (C) Zig-zag bond
 - (D) None of these
26. The bricks having one or two edges rounded for use in slightly curved corners are called
- (A) Bull nose
 - (B) Closer
 - (C) Specific nose
 - (D) None of these
27. The layer of bricks laid on the same bed, is known as a
- (A) Coarse
 - (B) Course
 - (C) Corse
 - (D) None of these

28. The corner or the external angle on the face side of a wall is known as
- (A) Quoin
 - (B) Edge
 - (C) Bevelled edge
 - (D) None of these
29. The horizontal distance between two consecutive risers is known as
- (A) Scotia
 - (B) Soffit
 - (C) Going
 - (D) None of these
30. A good brick (first class) should not absorb water by weight more than
- (A) 10%
 - (B) 20%
 - (C) 30%
 - (D) None of these
31. The distance between the centres of adjacent rivets in the same row is called
- (A) Pitch
 - (B) Gauge line
 - (C) Edge distance
 - (D) None of these
32. For levelling or finishing earthwork, making and maintaining roads, construction of air fields etc. the suitable equipment is
- (A) Bucket
 - (B) Blade
 - (C) Grader
 - (D) None of these
33. The temporary network erected to support a number of platforms at different levels for the convenience of workers is called
- (A) Scaffolding
 - (B) Throating
 - (C) Corbel
 - (D) None of these
34. In Vicat's apparatus, the cement paste is said to be of normal consistency, if the rod (plunger) penetrates (from top) by
- (A) 5 mm to 10 mm
 - (B) 23 mm to 25mm
 - (C) 33 mm to 35 mm
 - (D) None of these
35. The rule of water-cement ratio was established by
- (A) W. Simms
 - (B) Terzaghi
 - (C) Duff Abrahms
 - (D) None of them



36. Volume of 1 bag of cement weighing 50 kg is

- (A) 3.4 cum
- (B) 0.034 cum
- (C) 1.05 cum
- (D) None of these

37. Gypsum is added in cement to

- (A) increase its strength
- (B) increase its fineness
- (C) increase its bond strength
- (D) None of these

38. When a body is subjected to three mutually perpendicular stresses of equal intensity, the ratio of direct stress to the corresponding volumetric strain is known as bulk modulus. Mathematically bulk modulus (K),

- (A) $K = \frac{mE}{3(m-1)}$
- (B) $K = \frac{mE}{3(m-2)}$
- (C) $K = \frac{mE}{3(m-4)}$
- (D) None of these

[Where, $\frac{1}{m}$ = Poisson's ratio and
E = modulus of elasticity]

39. When a symmetrical column section is subjected to a load with eccentricity about one axis, then maximum stress

- (A) $\frac{P}{A} \left(1 + \frac{6e}{b} \right)$
- (B) $\frac{P}{2A} \left(1 + \frac{6e}{b} \right)$
- (C) $\frac{P}{A} \left(1 + \frac{4e}{b} \right)$
- (D) None of these

[Where,

P = eccentric load

A = area of the cross-section

e = eccentricity of the load

b = width of the column]

40. When a body is subjected to a tensile or compressive force, its deformation (δl)

- (A) $\delta l = \frac{Pl}{2AE}$
- (B) $\delta l = \frac{P}{AEl}$
- (C) $\delta l = \frac{Pl}{AE}$
- (D) None of these

[Where,

P = force acting on the body

A = cross-sectional area of the uniform body

E = modulus of elasticity of the body

l = length of the body]

SECTION – B

Answer *all* questions restricting each answer to 40 (forty) words.

15×6=90

1. What are the functions of sand in mortar ? Give the requirements of good sand.
2. Why joints are essential to be provided in large buildings ? What should be the spacings of joints ?
3. Explain clearly the term 'modulus of rigidity'.
4. What do you understand by prestressed concrete ? Why it is done ?
5. Draw a neat sketch of a 'drag line' and explain its uses and working.
6. Explain what is structural steel. List out the important properties of such steel.
7. Explain how limit state method differs from working stress method of design.
8. What are the objects of seasoning of timber ?
9. Distinguish between the ordinary Portland cement and Portland Pozzolana cement.
10. What do you understand by workability of concrete ? What are the factors on which it depends ?
11. Explain various defects in timber that develop during the growth of tree.
12. Explain with the help of a diagram, the working of a pugmill.
13. What do you understand by the term 'flitched beam' ? How would you find out the bending stresses in such a beam when it is of (a) a symmetrical section and (b) an unsymmetrical section.
14. Explain the difference between 'primary strain' and 'secondary strain'.
15. How would you distinguish between first class and second class bricks ?

SECTION – C

Answer *all* the questions.

5×6=30

1. Three bars made of copper, zinc and aluminium are of equal length and have cross-section 5, 7.5 and 10 square cm respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 25 tonnes, estimate the proportion of load carried on each rod and the induced stresses.

Take, $E_c = 1.3 \times 10^6 \text{ kg/cm}^2$ (for Copper)

$E_{\text{zinc}} = 1.0 \times 10^6 \text{ kg/cm}^2$ (for Zinc) and

$E_{\text{al}} = 0.8 \times 10^6 \text{ kg/cm}^2$ (for Aluminium)

2. A steel wire of 5 mm diameter is bent into a circular shape of 5 metres radius. Determine the maximum stress induced in the wire. Take $E = 2.0 \times 10^6 \text{ kg/cm}^2$

3. A reinforced concrete beam 300 mm wide and 600 mm deep has a span of 6 metres. Find the necessary tension reinforcement at the mid span to enable the beam to carry a load of 8000 Newtons per metre in addition to its own weight.

Concrete cover below the steel centre = 35 mm

Weight of RCC = 25000 N/m³

Allowable stress in concrete = 5 N/mm²

Allowable stress in steel = 140 N/mm²

Modular ratio = 18.

4. Design a simply supported slab supported on masonry walls to the following requirements

(i) Clear span = 3.75 metre

(ii) Live load = 2000 N/metre²

Use M_{15} concrete and ribbed for steel.

5. A prestressed concrete beam section is 250 mm wide and 300 mm deep. The initial prestressing force is 450 KN at an eccentricity of 60 mm. The beam has a span of 5.75 metre and has to carry a superimposed load of 7.50 KN/m. Analyse the beam section for the stresses produced at mid span before and after application of the live load. Allow a loss of prestress of 15%.