

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

TR/TES/M/Civil-I/DEG-Gr.I/2026

Test Booklet Series

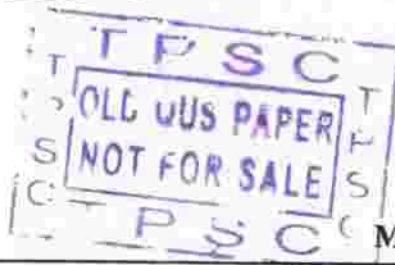
**TEST BOOKLET
CIVIL ENGINEERING
PAPER - I**

D

(Signature of the Candidate)

(Invigilator's Signature)

Time Allowed – 3 (Three) hours



Maximum Marks – 200

INSTRUCTIONS

1. IMMEDIATELY BEFORE 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, 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 responses which you want to mark on the **OMR Answer 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 **OMR 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 handover the **OMR Answer Sheet** for **SECTION-A** and Answer Book for **SECTION-B** and **SECTION-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.
8. **Instructions for wrong and multiple answer(s) for SECTION - A :**
 - (a) There will be four alternatives for the answer to every question. However, there will be no negative marking for wrong answer.
 - (b) If a candidate gives more than one answer, it will be treated as a **Wrong Answer** even if one of the given answer happens to be correct.

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

INSTRUCTIONS

1. There are a total of 60 questions. Q. No. 1 to 40 in **SECTION-A** are Multiple-Choice Questions having 2 marks each.
2. In **SECTION-B** there are 15 questions of 6 marks each, answer to which is restricted to 40 words each.
3. In **SECTION-C** there are 5 numerical questions of 6 marks each.

SECTION – A

Example : Poise is the unit of

- (A) Surface tension (B) Buoyant force
☒ (C) Coefficient of viscosity (D) Gravitational force.

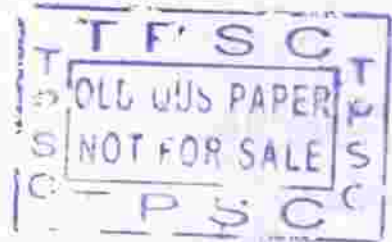
Answer : ☒ Coefficient of viscosity.

- Choose the correct answer of the following :

2×40=80

1. Efflorescence of bricks is due to

- (A) Soluble salts present in clay for making the bricks
 (B) High porosity of the bricks
 (C) High silt content in the brick earth
 (D) Excessive burning of the bricks



2. In White Cement Fe_2O_3 is limited to

- (A) 1% (B) 3%
 (C) 5% (D) 6%

3. Minimum edge distance for M22 bolt as per IS 800 is
- (A) 32 mm (B) 38 mm
(C) 44 mm (D) 50 mm
4. Welded connections preferred for shop fabrication due to
- (A) Disassembly ease (B) Lower cost
(C) Higher rigidity (D) Better quality control
5. Most common truss type for industrial roofs (20-30m span) is
- (A) Warren truss (B) Pratt truss
(C) Fink truss (D) Howe truss
6. Typical purlin spacing for industrial roofs with Z-sections is
- (A) 1.2-1.8 m (B) 2.5-3.5 m
(C) 4.0-5.0 m (D) 6.0-7.0 m
7. Maximum slenderness ratio for compression member (bracing) is
- (A) 120 (B) 150
(C) 180 (D) 250
8. Prying action is maximum in
- (A) Lap joints (B) Butt joints
(C) T-connections (D) Cleat angles



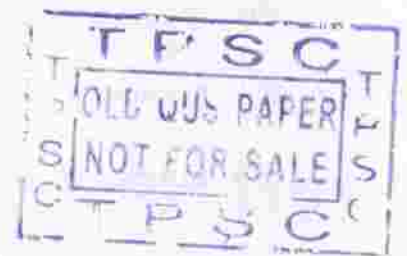
9. The effective length of a structural steel compression member of length L effectively held in position and restrained against rotation at one end but neither held in position nor restrained against rotation at the other end is

- (A) L (B) $1.2 L$
(C) $1.5 L$ (D) $2.0 L$

10. Statement 1: Beam of large span, bending moment dominates.

Statement 2 : Beam of shorter span is dominated by shear force.

- (A) Statement (1) is True and Statement (2) is False
(B) Both Statement (1) and Statement (2) are True
(C) Both Statement (1) and Statement (2) are False
(D) Statement (2) is True and Statement (1) is False



11. LSM (Limit State Method) partial safety factor for concrete (flexure)

- (A) 1.15 (B) 1.50
(C) 1.20 (D) 2.00

12. For simply supported one way slab, max span/depth ratio as per IS code is

- (A) 20 (B) 26
(C) 28 (D) 35

13. Shear reinforcement required when nominal shear is greater than

- (A) $0.5 \tau_c$ (B) τ_c
(C) $1.5 \tau_c$ (D) None of these

Where τ_c is design shear strength of concrete.

14. In an under-reinforced section
- (A) Concrete is not fully stressed upto permissible stress
 - (B) Reinforcement is not fully stressed upto permissible stress
 - (C) Either (A) or (B)
 - (D) Both (A) and (B)
15. Minimum shear reinforcement in beams is provided in the form of stirrups
- (A) to resist extra shear force due to live load
 - (B) to resist the effect of shrinkage of concrete
 - (C) to prevent abrupt formation of inclined cracks in lightly reinforced beams
 - (D) to resist shear cracks at the bottom of beam
16. τ_c maximum, permissible shear stress as per IS 456:2000 of M25 is
- (A) 0.7 MPa
 - (B) 2.5 MPa
 - (C) 3.1 MPa
 - (D) 4.0 MPa
17. Minimum reinforcement in slab (both directions) is
- (A) 0.12 % gross c/s area
 - (B) 0.15 % net c/s area
 - (C) 0.15 % gross c/s area
 - (D) 0.20 % net c/s area
18. Beam deflection limit for cantilever span is
- (A) span/180
 - (B) span/250
 - (C) span/350
 - (D) span/500



19. Critical path has

(A) Maximum float

(B) Zero float

(C) Minimum duration

(D) Maximum cost

20. Crash cost is

(A) Minimum cost

(B) Cost to reduce duration

(C) Fixed cost

(D) Overhead cost

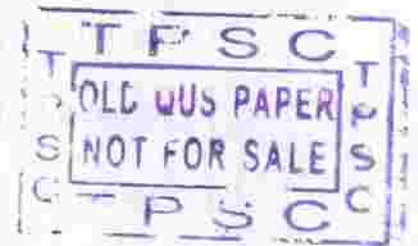
21. What is the proper term for a mortar joint in masonry that is perpendicular to the wall's front surface ?

(A) Bed joint

(B) Cross joint

(C) Wall joint

(D) Bonded joint



22. A torsional shaft is subjected to torque $T = 1200 \text{ N.m}$. Polar moment $J = 8 \times 10^6 \text{ mm}^4$, radius $r = 40 \text{ mm}$. Find max shear stress

(A) 4 MPa

(B) 6 MPa

(C) 8 MPa

(D) 10 MPa

23. The point where the shear force changes sign is called

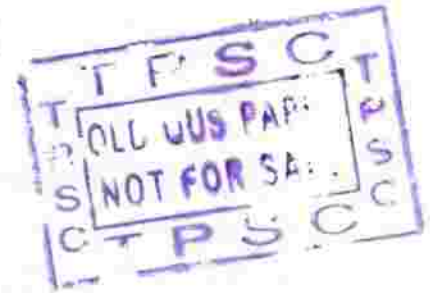
(A) Modulus of rigidity

(B) Bulk Modulus

(C) Ductility

(D) Malleability

24. For a Mohr's circle with principal stresses 120 MPa and 40 MPa, the maximum shear stress equals to
- (A) 40 MPa (B) 60 MPa
(C) 80 MPa (D) 120 MPa
25. If a shaft is simultaneously subjected to a torque T and a bending moment M , the ratio of maximum bending stress and maximum shearing stress is
- (A) M/T (B) T/M
(C) $2M/T$ (D) $2T/M$
26. The portal bracing in a truss bridge is used to
- (A) Transfer load from top of end posts to bearing
(B) Keep the rectangular shape of the bridge cross-section
(C) Stiffen the structure laterally
(D) Prevent the sideways buckling of top chord
27. The effective length of a fillet weld should not be less than
- (A) Two times the weld size (B) Four times the weld size
(C) Six times the weld size (D) None of these
28. A higher modular ratio shows
- (A) Higher compressive strength of concrete
(B) Lower compressive strength of concrete
(C) Higher tensile strength of steel
(D) Lower tensile strength of steel



29. Which of the following losses of prestress occurs only in pre-tensioning and not in post-tensioning ?

- (A) Elastic shortening of concrete (B) Shrinkage of concrete
(C) Creep of concrete (D) Loss due to friction

30. If the neutral axis depth in a rectangular beam exceeds the limiting value, the section becomes

- (A) Under-reinforced (B) Over-reinforced
(C) Balanced (D) Doubly reinforced with same moment

31. Statically Indeterminate Systems are those for which

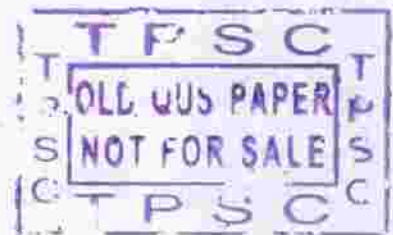
- (A) Sum of the reactions are redundant for maintaining equilibrium
(B) Internal forces can not be determined using the equations of statics alone
(C) Both (A) and (B)
(D) Either (A) or (B)

32. Stiffness can be evaluated with

- (A) Material Property only (B) Material shape only
(C) Both (A) and (B) (D) Only (A)

33. Stress developed in an elastic body is independent of

- (A) Load applied (B) Cross-section
(C) Length (D) Material property



34. Point of contra-flexure in a bending member is situated

- (A) Where Bending Moment changes its sign
- (B) Where Bending Moment is zero
- (C) Where Radius of Curvature reverses its sign
- (D) Both (A) and (C)

35. Choose the Failure theory applicable for brittle materials

- (A) Rankine theory
- (B) Maximum shear stress theory
- (C) Coulomb theory
- (D) Maximum normal stress theory

36. A homogeneous and isotropic beam of rectangular uniform cross-section (width b , height h) is simply supported with a central transverse point load P . Which location experiences the maximum bending stress ?

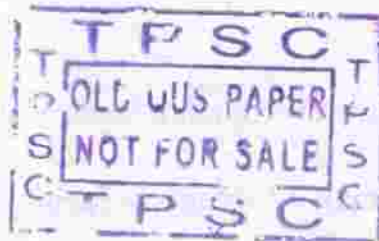
- (A) At the neutral axis at the midspan
- (B) At the supports at the neutral axis
- (C) At the top and bottom fibres at the midspan
- (D) Uniformly across the section at the midspan



37. Under plane stress with principal stresses σ_1 and σ_2 ($\sigma_1 \geq \sigma_2$), what is the maximum in-plane shear stress magnitude ?

- (A) $\tau_{\max} = \sigma_1$
- (B) $\tau_{\max} = \sigma_2$
- (C) $\tau_{\max} = (\sigma_1 + \sigma_2)/2$
- (D) $\tau_{\max} = (\sigma_2 - \sigma_1)/2$

38. According to the relevant I.S code, the weight of the timber is to be reckoned at the moisture content of
- (A) Zero (B) 4%
(C) 8% (D) 12%
39. A cube of concrete as compared to cylinder of concrete is expected to have compressive strength
- (A) Less by 15% (B) Less by 25%
(C) More by 25% (D) More by 15%
40. Seasoning of timber is required to
- (A) Soften the timber (B) Harden the timber
(C) Straighten the timber (D) Remove sap from the timber.



SECTION – B

• Answer *all* questions :

6×15=90

41. Define Radius of Gyration and its physical significance.
42. What is the difference between statically determinate and statically indeterminate system ?
43. Find out co-ordinate of center and radius of the Mohr's circle for plain element subjected to Normal stress in x-direction (Horizontal) = 50 MPa and same in y-direction (Vertical) = 75 MPa, No shear stress.
44. What is hydration of cement ?
45. Write a short note on comparison between dry and wet process of making cement.
46. Describe Efflorescence in bricks.
47. Briefly explain the possible modes of failure of axially loaded steel column.
48. What are the Plastic class and Compact class of steel sections as per IS: 800-2007 ?
49. How the resistance to web crippling is calculated ?
50. Write, in short, the various advantages of Reinforced Concrete (RC) structures over other masonry structures.
51. Write at least three assumptions of Working Stress Method.
52. Explain critical path and float concepts.
53. Discuss the factors for selecting earthmoving equipment.
54. Explain the function and advantages of concrete pump.
55. Describe Item rate, Percentage rate, and Cost plus Percentage rate contract in brief.

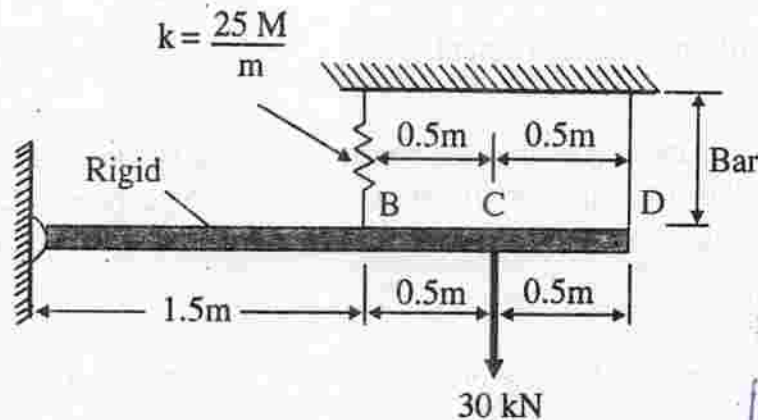


SECTION - C

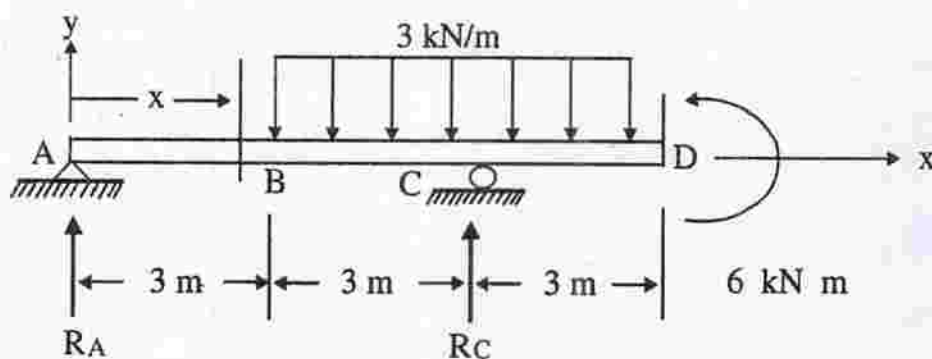
• Answer *all* questions :

6×5=30

56. A rigid bar AD (length = 2.5m) as shown in figure is connected horizontally with a pin joint with a vertical wall at A and supported by a steel rod (length = 0.5m), cross-sectional area = 50 mm² and modulus of Elasticity = 2.0×10^5 at D together with a linear spring (stiffness = 25 MN/m) at 'B' at a distance 1.5m from A. The bar carries a vertical downward load of 30 kN applied at C (midpoint of B and D). Calculate vertical displacement at point C.



57. A simply supported beam with overhang has simply supported span of 6m and overhang length of 3m. The beam is subjected to the uniformly distributed load of 3 kN/m for a length of 6m starting from the free end of the overhang. The free end of the overhang is also subjected to an anticlockwise moment of 6 kN-m. Draw Shear force and Bending moment diagram.



58. Design a bolted lap joint for two plates (Grade Fe 410), each 10 mm thick subjected to a factored tensile force of 250 kN using M 20 bolts of grade 8.8 as per IS800 : 2007.
59. For a RCC beam of M30 and Fe415 having width 300 mm and effective depth of 500 mm with effective cover 35 mm following limit state method, calculate the following under balance condition :
- (a) The limiting depth of neutral axis
 - (b) The factored compressive force
 - (c) The area of steel reinforcement.
60. The cost of a machine required at the construction site is Rs. 2,20,000 and its salvage value is Rs. 60,000. The expected life of the machine is 5 years only. Compute the yearly depreciation for the machine by using the Straight line method of depreciation.

