

BPSC AE (Civil)

**Previous Year Paper
(Civil Engg) Paper-V
11 Nov, 2022**



Test Prime

**ALL EXAMS,
ONE SUBSCRIPTION**



70,000+
Mock Tests



**Personalised
Report Card**



**Unlimited
Re-Attempt**



600+
Exam Covered



**Previous Year
Papers**



**500%
Refund**



ATTEMPT FREE MOCK NOW

27/AE/C/M-2022-5

Booklet Series

Candidate's Roll Number



Serial No.

404681

Question Booklet

Paper—V

CIVIL ENGINEERING

Time Allowed : 1 Hour

(Objective)

Maximum Marks : 100

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

BPSC AE (CIVIL)

Advt. No. 07/2020

Examination date: 11/11/2022

1. This Question Booklet contains **50** questions in all.
2. All questions carry equal marks.
3. Attempt all questions.
4. Immediately after commencement of the examination, you should check up your Question Booklet and ensure that the Question Booklet Series is printed on the top right-hand corner of the Booklet and the Booklet contains 12 printed pages and no page or question is missing or unprinted or torn or repeated. If you find any defect in this Booklet, get it replaced immediately by a complete Booklet of the same series.
5. You must write your Roll Number in the space provided on the top of this page. Do not write anything else on the Question Booklet.
6. An Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. You must write your Name, Roll No. and other particulars on the first page of the Answer Sheet provided, failing which your Answer Sheet will not be evaluated.
7. You will encode your Roll Number and the Question Booklet Series A, B, C or D as it is printed on the top right-hand corner of this Question Booklet with Black/Blue ballpoint pen in the space provided on Page-2 of your Answer Sheet. If you do not encode or fail to encode the correct series of your Question Booklet, your Answer Sheet will not be evaluated correctly.
8. Questions and their responses are printed in English only in this Booklet. Each question comprises four responses—(A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
9. In the Answer Sheet, there are four brackets—(A), (B), (C) and (D) against each question. To answer the questions you are to mark with Black/Blue ballpoint pen ONLY ONE bracket of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. Any erasure or change is not allowed.
10. You should not remove or tear off any sheet from the Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. After the examination has concluded, you must hand over your Answer Sheet to the Invigilator. Thereafter, you are permitted to take away the Question Booklet with you.
11. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.

4. Calculate the degree of indeterminacy of the frame structure given in the figure :

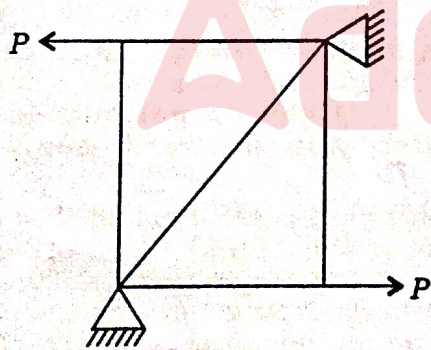
$$X(A) \frac{Z_p}{Z_e}$$

$$(B) \quad \frac{(MOB)_p}{(MOB)_e}$$

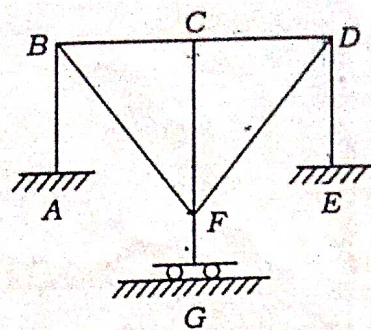
2. The rotation at a point in a real beam is equal to _____ in a conjugate beam.

- (A) twisting moment
(B) shear force
(C) bending moment
(D) translation

- 3. Calculate the number of zero force members for the following figure :**



- (A) 3
(B) 4
~~(C) 0~~
✓(D) 2

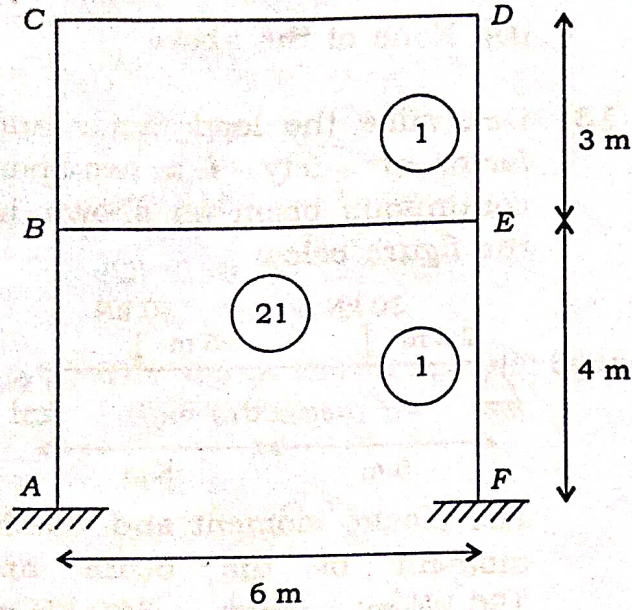


- (A) 9
✓ (B) 10
(C) 8
(D) 12

5. In a continuous beam ABC , support A is fixed and supports B and C are simply supported. A uniformly distributed load of w per meter run is applied over the span AB and span BC is subjected to a point load W at mid-span. If the beam has uniform cross-section but differs in span lengths for AB and BC , the conditions to be used for the analysis of continuous beam by the slope deflection method are

- (A) $\theta_A = 0, M_{BA} + M_{BC} = 0,$
 $\theta_C = 0$
- ☒ (B) $\theta_A = 0, M_{BA} + M_{BC} = 0,$
 $M_{CB} = 0$
- (C) $\theta_A = 0, M_{BA} = M_{BC},$
 $M_{CB} = 0$
- (D) $\theta_A = 0, M_{BA} = M_{BC}, \theta_C = 0$

6. A frame to be analyzed by moment distribution as shown in the figure below :



The distribution factors for members EB, ED and EF will be respectively

(A) $\frac{8}{13}, \frac{3}{13}, \frac{4}{13}$

(B) $\frac{3}{10}, \frac{4}{10}, \frac{3}{10}$

(C) $\frac{4}{11}, \frac{4}{11}, \frac{3}{11}$

(D) $\frac{2}{9}, \frac{4}{9}, \frac{1}{3}$

7. "If an internal stress component like shear force, bending moment or reaction component is allowed to act through a small distance thereby causing deformation of the structure, the curve of the deformed shape represents to some scale, the influence line diagram for that stress or the reaction component."

The above statement is known as

- (A) Müller-Breslau principle
(B) Castigliano's theorem
(C) Maxwell's theorem
(D) Macaulay's theorem

8. An I section beam has the following dimensions :

Width of top flange = 250 mm

Width of bottom flange = 400 mm

Thickness of both flanges = 50 mm

Width of web = 50 mm

Depth of web = 200 mm

The plastic neutral axis of the section from topmost fibre is at a distance of

- (A) 225 mm
(B) 237.5 mm
(C) 262.2 mm
(D) 210 mm

9. "For a given structure and loading, if there exists any distribution of bending moment throughout the section which is both safe and statically admissible with a set of loads W , the value of W must be less than or equal to the collapse load W_C ."

The above theorem is known as

- (A) kinematic theorem
☒ (B) static theorem
 (C) uniqueness theorem
 (D) None of the above
10. The moment which makes all the fibres at the section to yield is known as
- (A) moment of resistance
☒ (B) plastic moment capacity
☒ (C) yield moment
 (D) flexural rigidity

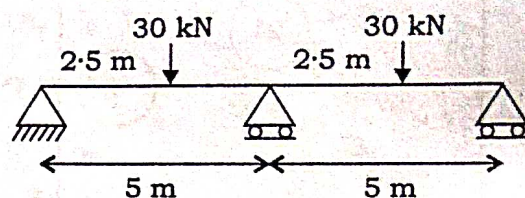
11. The stiffness matrix of a beam is given as $K \begin{bmatrix} 12 & 4 \\ 4 & 5 \end{bmatrix}$. Calculate the flexibility matrix.

- (A) $K \begin{bmatrix} 5 & -4 \\ -4 & 12 \end{bmatrix}$
 (B) $\frac{1}{44K} \begin{bmatrix} 12 & -4 \\ -4 & 5 \end{bmatrix}$
☒ (C) $\frac{1}{44K} \begin{bmatrix} 5 & -4 \\ -4 & 12 \end{bmatrix}$
 (D) $K \begin{bmatrix} 12 & -4 \\ -4 & 5 \end{bmatrix}$

12. The shape factor of an I section is

- ☒ (A) 1.2
 (B) 1.5
 (C) 2.0
☒ (D) None of the above

13. Determine the load factor and factor of safety of a two-span continuous beam as shown in the figure below :



The plastic moment and elastic moment of the beam are 150 kN-m and 100 kN-m respectively.

- (A) 4.0 and 2.35
☒ (B) 6.0 and 4.0
☒ (C) 4.0 and 4.35
 (D) 6.0 and 2.0
14. If t is the thickness of thinner plate in a bolted connection of tension member, pitch shall not be more than
- (A) $16t$ or 200 mm whichever is more
☒ (B) $12t$ or 150 mm whichever is less
 (C) $12t$ or 150 mm whichever is more
☒ (D) $16t$ or 200 mm whichever is less

15. In a roof truss a member normally acting as tension member but occasionally subjected to compression due to wind load, slenderness ratio should not exceed

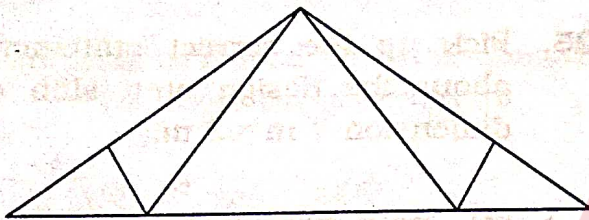
☒ (A) 250

☒ (B) 350

(C) 450

(D) 150

16. The truss shown in the figure below is known as



(A) Howe

☒ (B) Fink

(C) Pratt

☒ (D) King post

17. If standard deviation is 4 N/mm^2 , the target mean strength of M_{20} concrete should be

(A) 20 N/mm^2

(B) 24 N/mm^2

☒ (C) 26.4 N/mm^2

(D) 16 N/mm^2

18. IS 456 : 2000 considers concrete has reached its limit state of collapse when the strain is

(A) 0.0020

(B) 0.0030

☒ (C) 0.0035

(D) 0.0015

19. The centroid of a compression block representing stress in concrete at limit state, the distance being measured from extreme compression edge is



☒ (A) $0.42x_u$

(B) $0.48x_u$

☒ (C) $0.53x_u$

(D) $0.36x_u$

where x_u = depth of compression cone.

20. Limiting value of depth of neutral axis in RC beam of depth d with Fe250 steel is

☒ (A) $0.42d$

(B) $0.48d$

☒ (C) $0.53d$

(D) $0.36d$

21. As per IS 456, in a column the maximum distance between two longitudinal bars should not greater than

- ☒ (A) 300 mm
- (B) 250 mm
- (C) 350 mm
- (D) 200 mm

22. What is the effective length of the column when effectively restrained against translation at both the ends but restrained against rotation at one end only?

- ☒ (A) $0.8L$ *Recommended value*
- (B) $0.65L$
- (C) $0.5L$
- ☒ (D) $0.707L$ *Theoretical value*

23. In an RC beam main reinforcement consists of 16 mm bars and coarse aggregate size used is 20 mm. The horizontal distance between two parallel reinforcing bars should not be less than

- ☒ (A) 20 mm
- (B) 21 mm
- ☒ (C) 25 mm
- (D) 16 mm

24. The maximum area of tensile reinforcement to be used in a beam is to be restricted to

- (A) $0.04 \times$ effective area of the section
- (B) $0.057 \times$ gross area of the section
- (C) $0.057 \times$ effective area of the section
- ☒ (D) $0.04 \times$ gross area of the section

25. Pick up the correct statement about the design of a slab of dimension 7 m \times 3 m.

- ☒ (A) Main reinforcement will be in 3 m direction and distribution in 7 m direction.
- (B) Provide main reinforcement in 7 m direction and there is no need of distribution steel.
- (C) Provide main reinforcement in 3 m direction and there is no need of distribution steel.
- ☒ (D) Main reinforcement will be in the direction 7 m and distribution reinforcement in 3 m.

26. For a circular column of 200 mm radius, a circular footing of radius 1.25 m is provided. If the depth of footing is 600 mm and factored earth pressure is q_u , the design two-way shear will be

(A) $1.44pq_u$

✓ (B) $1.3125pq_u$

✗ (C) $0.9225pq_u$

(D) $1.5225pq_u$

27. Mortars used for brick masonry shall conform generally to

(A) IS 456 : 2000

✗ (B) IS 1332 : 1982

✓ (C) IS 2250 : 1981

(D) IS 2116 : 1980

28. Negative skin friction on piles is dominant in

✓ (A) friction piles in soft clays

✗ (B) friction piles in sands

✗ (C) friction per bearing piles

(D) piles resting on hard sands

29. Higher density and a lower optimum water content is easily achieved by

✗ (A) fine grained soil

(B) cohesion-less soil

(C) saturated soil

✓ (D) coarse grained soil

30. Ratio of bearing capacity of double underreamed (UR) pile to that of single-reamed pile is nearly

✓ (A) 1.5

✗ (B) 1.2

(C) 1.7

(D) 2

31. Stokes' law is applicable to soil particles of size between

✗ (A) 0.2 mm to 0.2 m

(B) 0.3 mm to 3 m

✓ (C) 0.2 mm to 2 m

(D) 0.3 mm to 0.2 m

32. If consistency index is zero, it means that the soil

✗ (A) is at liquid limit

✓ (B) behaves like liquid

✗ (C) is stiff

(D) is at plastic limit

33. Shear strength of soil increases with increase in



- (A) cohesion of soil
- (B) angle of internal friction
- (C) normal stress on soil
- ✓(D) All of the above

34. In a tri-axial test when the drainage is allowed initially only and not during latter stage, the test is known as

- ✓(A) consolidated undrained test
- (B) unconsolidated drained test
- (C) unconsolidated undrained test
- (D) consolidated drained test

35. The coefficient of active earth pressure for a dense sand is $1/3$. Then coefficient of passive earth pressure is

- (A) $1/3$
- (B) 1
- ✓(C) 3
- (D) None of the above

36. According to IS specifications in any case depth of foundation in sand and clay should not be less than _____ respectively.

- ✓(A) 800 mm and 900 mm
- ✗(B) 900 mm and 1000 mm
- (C) 1000 mm and 1200 mm
- (D) 600 mm and 800 mm

37. When width of foundation is 900 mm, the settlement is found to be 30 mm. Under the same condition, if width of footing is 600 mm, the settlement will be

- (A) 30 mm
- ✗(B) 20 mm
- (C) 10 mm
- ✓(D) None of the above

38. In plate load test preloading recommended by IS 1888 : 1982 is

- (A) 100 gm/cm^2
- ✗(B) 120 gm/cm^2
- (C) 125 gm/cm^2
- ✓(D) 70 gm/cm^2

39. Which of the following is the cube size used for laboratory test on compressive strength of cement?

- (A) 100 mm
✓ (B) 70.6 mm
(C) 200 mm
✗ (D) 150 mm *Comm*

40. What is the loading rate used in compressive strength test?

- ✓ (A) 14 N/mm² per minute
(B) 20 N/mm² per minute
(C) 40 N/mm² per hour
(D) 14 N/mm² per hour

41. What is the depth should the needle in Vicat apparatus penetrate into the cement paste in consistency test?

- ✓ (A) 33-35 mm from top of the mould
(B) 33-35 cm from top of the mould
(C) 33-35 cm from bottom of the mould
(D) 33-35 mm from bottom of the mould

42. The minimum strength of brick required for building wall is

- (A) 5.0 N/mm²
✓ (B) 3.5 N/mm²
(C) 2.5 N/mm²
(D) 7.5 N/mm²

43. Gypsum is added during the manufacture of cement

- (A) during burning in the kiln
✓ (B) at the beginning of grinding the clinker
(C) after grinding the clinker
(D) while mixing the raw materials

44. Indian standard specifications for estimating tensile strength and modulus of elasticity of concrete, if the characteristic strength f_{ck} is known, are respectively

- ✓ (A) $0.7\sqrt{f_{ck}}$ and $5000\sqrt{f_{ck}}$
(B) $0.75f_{ck}$ and $7000f_{ck}$
(C) $0.7f_{ck}$ and $5000f_{ck}$
(D) $0.75\sqrt{f_{ck}}$ and $7000\sqrt{f_{ck}}$

45. The absolute bending moment in a simply supported beam of span 10 m due to a moving load of 40 kN/m spanning over 5 m is
- ✓ (A) 375 kN-m at midpoint
- ✗ (B) 375 kN-m at 3.75 m from end A
- (C) 500 kN-m at mid-span
- (D) 375 kN-m at 2.5 m from end A
46. Four point loads 8 kN, 15 kN, 15 kN and 10 kN have centre-to-centre spacing of 2 m between consecutive loads and they traverse a girder of 30 m span from left to right with 10 kN load leading. The maximum shear force at 8 m from left support will be
- (A) 25.4 kN
- ✓ (B) 30.2 kN
- ✗ (C) 42.2 kN
- (D) 8.2 kN
47. Which structure is more stable?
- ✓ (A) Indeterminate
- (B) Determinate
- (C) Both (A) and (B)
- (D) None of the above
48. The strain energy of a structure due to bending is given by
- (A) $\frac{1}{3} \int \frac{M^2 dx}{EI}$
- ✓ (B) $\frac{1}{2} \int \frac{M^2 dx}{EI}$
- (C) $\int \frac{M^2 dx}{EI}$
- (D) $2 \int \frac{M^2 dx}{EI}$
49. Total distribution factor for a rigid joint is always
- ✗ (A) 0.5
- (B) 1.5
- (C) 0
- ✓ (D) 1
50. A beam carries a uniform distributed load through its length. In which of the following configurations will the strain energy be maximum?
- ✗ (A) Fixed
- (B) Simply supported
- (C) Propped cantilever
- ✓ (D) Cantilever