प्रवक्ता (तकनीकी शिक्षा विभाग) प्रतियोगी परीक्षा, 2020

परीक्षा दिनांक :– 15-3-2021 समय :– 9.00AM-12.00 Noon.

6

पुस्तिका में पृष्ठों की संख्या : 32
Number of Pages in Booklet : 32

प्रश्न-पत्र पुस्तिका संख्या /
Question Paper Booklet No. 7413261

25/3/21

पुस्तिका में प्रश्नों की संख्या : 150
No. of Questions in Booklet : 150

Paper Code : 05
Sub: CIVIL ENGG.

LTE-12

Paper - I

समय : 3.00 घण्टे
Time : 3.00 Hours

अधिकतम अंक : 75
Maximum Marks : 75

प्रश्न-पत्र पुस्तिका एवं उत्तर पत्रक के पेपर सील/पॉलिथीन बैग को खोलने पर परीक्षार्थी यह सुनिश्चित कर लें कि उसके प्रश्न-पत्र पुस्तिका पर वही प्रश्न-पत्र पुस्तिका संख्या अंकित है जो उत्तर पत्रक पर अंकित है । इसमें कोई भिन्नता हो तो परीक्षार्थी वीक्षक से दूसरा प्रश्न-पत्र प्राप्त कर लें । ऐसा सुनिश्चित करने की जिम्मेदारी अभ्यर्थी की होगी ।

On opening the paper seal/polythene bag of the Question Paper Booklet the candidate should ensure that Question Paper Booklet No. of the Question Paper Booklet and Answer Sheet must be same. If there is any difference, candidate must obtain another Question Paper Booklet from Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश

1. **सभी** प्रश्नों के उत्तर दीजिए ।
2. **सभी** प्रश्नों के अंक समान हैं ।
3. प्रत्येक प्रश्न का केवल **एक** ही उत्तर दीजिए ।
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा ।
5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमशः 1, 2, 3, 4 अंकित किया गया है । अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले अथवा बबल को उत्तर-पत्रक पर **नीले बॉल प्वाइंट पेन** से गहरा करना है ।
6. **OMR** उत्तर-पत्रक इस परीक्षा पुस्तिका के अन्दर रखा है । जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल **नीले बॉल पॉइंट पेन** से विवरण भरें ।
7. **प्रत्येक गलत उत्तर के लिए प्रश्न अंक का 1/3 भाग काटा जायेगा** । गलत उत्तर से तात्पर्य अशुद्ध उत्तर अथवा किसी भी प्रश्न के एक से अधिक उत्तर से है । किसी भी प्रश्न से संबंधित गोले या बबल को खाली छोड़ना गलत उत्तर नहीं माना जायेगा ।
8. मोबाइल फोन अथवा इलेक्ट्रोनिक यंत्र का परीक्षा हॉल में प्रयोग पूर्णतया वर्जित है । यदि किसी अभ्यर्थी के पास ऐसी कोई वर्जित सामग्री मिलती है तो उसके विरुद्ध आयोग द्वारा नियमानुसार कार्यवाही की जायेगी ।
9. कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानीपूर्वक सही भरें । गलत अथवा अपूर्ण रोल नम्बर भरने पर **5 अंक** कुल प्राप्तांकों में से काटे जा सकते हैं ।

चेतावनी : अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, तो उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए विविध नियमों-प्रावधानों के तहत कार्यवाही की जाएगी । साथ ही विभाग ऐसे अभ्यर्थी को भविष्य में होने वाली विभाग की समस्त परीक्षाओं से विवर्जित कर सकता है ।

INSTRUCTIONS FOR CANDIDATES

1. Answer **all** questions.
2. **All** questions carry equal marks.
3. Only **one** answer is to be given for each question.
4. If more than one answers are marked, it would be treated as wrong answer.
5. Each question has four alternative responses marked serially as **1, 2, 3, 4**. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using **BLUE BALL POINT PEN**.
6. The **OMR** Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully with **blue ball point pen** only.
7. **1/3 part of the mark(s) of each question will be deducted for each wrong answer.** A wrong answer means an incorrect answer or more than one answers for any question. Leaving all the relevant circles or bubbles of any question blank will not be considered as wrong answer.
8. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable material with him/her will be strictly dealt as per rules.
9. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.

Warning : If a candidate is found copying or if any unauthorized material is found in his/her possession, F.I.R. would be lodged against him/her in the Police Station and he/she would liable to be prosecuted. Department may also debar him/her permanently from all future examinations.

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए ।
Do not open this Test Booklet until you are asked to do so.

05-□

1. The settlement of prototype in clay soil may be estimated using plate load test data from the following expression :

(1) $S_{Prototype} = S_{plate} \times \left(\frac{B_{prototype}}{B_{plate}}\right)$

(2) $S_{Prototype} = S_{plate} \times \left(\frac{B_{plate}}{B_{prototype}}\right)$

(3) $S_{Prototype} = S_{plate} \times \left(\frac{2 \times B_{prototype}}{B_{prototype}+B_{plate}}\right)^2$

(4) $S_{Prototype} = S_{plate} \times \left(\frac{B_{prototype}+B_{plate}}{2 \times B_{prototype}}\right)^2$

2. Cohesion in soil

(1) Decreases active pressure and increase passive resistance

(2) Decreases both active pressure and passive resistance

(3) Increases active pressure and decreases passive resistance

(4) Increases both active pressure and passive resistance

3. Match List – I (Suitable condition) with List – II (Foundations) and select the correct answer using the codes given below :

List – I	List – II
P. When structural load is uniform and soil is soft clay, made up of marshy land.	1. Footings
Q. When structural load is heavy and/or soil having low bearing capacity for considerable depth.	2. Piles
R. When soil is having good bearing capacity at shallow depth and structural load is within permissible limit.	3. Raft
S. When structural load of bridge is to be transferred through sandy soil to bed rock	4. Wells or pier

	P	Q	R	S
(1)	3	1	2	4
(2)	4	1	2	3
(3)	4	2	1	3
(4)	3	2	1	4

4. A sampling tube with a cutting edge is used for extracting the samples. The sampling tube has the following dimensions :

Inner diameter of cutting edge = D_c

Outer diameter of cutting edge = D_w

Inner diameter of the sampling tube = D_s

Outer diameter of the sampling tube = D_t

What is the area ratio A_r, of the sampling tube ?

(1) $A_r = \frac{D_w^2 - D_c^2}{D_c^2} \times 100\%$

(2) $A_r = \frac{D_t^2 - D_c^2}{D_c^2} \times 100\%$

(3) $A_r = \frac{D_t^2 - D_w^2}{D_w^2} \times 100\%$

(4) $A_r = \frac{D_t^2 - D_s^2}{D_s^2} \times 100\%$

5. The contact pressure distribution under a rigid footing on a cohesionless soil would be

(1) Uniform throughout

(2) Zero at center and maximum at edges

(3) Zero at edges and maximum at center

(4) Maximum at edges and minimum at center

6. A shear test was conducted on a soil sample. At failure, the ratio of $\frac{\sigma_1 - \sigma_3}{2}$ to $\frac{\sigma_1 + \sigma_3}{2}$ is equal to unity.

Which one of the following shear tests represents this condition ?

(1) Drained triaxial compression test

(2) Undrained triaxial compression test

(3) Consolidated quick triaxial compression test

(4) Unconfined compression test

7. An increase in compaction effort will lead to which of the following ?

(1) Decrease in both the Optimum Moisture Content (OMC) and maximum dry density.

(2) Decrease in the Optimum Moisture Content (OMC) and increase in the maximum dry density.

(3) Increase in the Optimum Moisture Content (OMC) and decrease in the maximum dry density.

(4) Increase in both the Optimum Moisture Content (OMC) and maximum dry density.

8. If dry density of a soil sample is 1700 kg/m^3, that of water is 1000 kg/m^3 and specific gravity of the soil sample is 2.55, the void ratio 'e' of the soil sample will be

(1) 0.50
(2) 0.60
(3) 0.10
(4) 0.70

9. If in a soil sample, the voids ratio in the loosest state is 0.70, the voids ratio in the densest state is 0.30 and the natural voids ratio of the deposit is 0.50, the 'density index' will be

(1) 0.70
(2) 0.30
(3) 0.50
(4) 0.40

10. An oven-dried soil weighing 400 gms. is placed in a pycnometer which is then completely filled with water. The total weight of the pycnometer with water and soil inside is 2000 gms. The pycnometer filled with water alone weighs 1800 gm. The specific gravity of the soil will be

(1) 1.0
(2) 20.0
(3) 2.0
(4) 4.0

11. For a soil sample, D_{10} is 0.25 mm and D_{60} is 1.0 mm, the value of Uniformity Coefficient Cu for the soil sample will be

(1) 1.0
(2) 4.0
(3) 0.25
(4) 16.0

12. Match suitable method for determination of specific gravity (List – I) of different types of soils (List – II).

List – I	List – II
A. Coarse grained soils	1. Density bottle method
B. Cohesive soils	2. Pycnometer method
C. All types of soils	

Codes :

	A	B	C
(1)	1	1	2
(2)	2	1	1
(3)	2	1	2
(4)	1	2	2

13. **Statement 1 :** 'Pore water' is free of soil attractive forces.

Statement 2 : 'Adsorbed water' is under the influence of soil attractive forces.

Which of the following option is correct in view of the above two statements ?

(1) Both 1 and 2 are incorrect.

(2) Both 1 and 2 are correct.

(3) 1 is correct, 2 is not correct.

(4) 2 is correct, 1 is not correct.

14. Match List – I with List – II and select the correct answer by using the codes given below the lists :

List – I	List – II
A. Sand	1. Particles smaller than 75 micron, can exhibit plastic properties within a certain range of moisture
B. Silt	2. Particles smaller than 75 micron, may be non-plastic or slightly plastic
C. Clay	3. Particle size range 4.75 mm – 75 micron

Codes :

	A	B	C
(1)	3	2	1
(2)	3	1	2
(3)	2	1	3
(4)	1	2	3

15. **Assertion (A) :** Gravels are highly permeable while stiff clay is the least permeable.

Reason (R) : A material having continuous voids is called permeable.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

16. If a quantity of water equal to 500 ml passed down in 600 seconds, under an effective constant head of 500 mm from a soil sample, 60 mm in height and 5000 mm^2 cross-sectional area, the value of coefficient of permeability in mm/sec will be

(1) 2×10^{-5}

(2) 5×10^{-4}

(3) 2×10^{-4}

(4) 5×10^{-5}

17. What is the value of effective pressure of the soil (in N/mm^2) if it is submerged and has total soil pressure and pore water pressures at the point respectively as 0.190 and 0.060 N/mm^2.

(1) 3.15

(2) 0.310

(3) 0.250

(4) 0.130

18. For a homogeneous earth dam 52 m high and 2 m free board, a flow net was constructed and following results were obtained :

Number of potential drops = 25

Number of flow channels = 5

What is the value of discharge per metre length of the dam, if the coefficient of permeability of the dam material is 5×10^{-5} m/second.

(1) 1×10^{-4} m^3/sec/m

(2) 2.5×10^{-4} m^3/sec/m

(3) 5×10^{-4} m^3/sec/m

(4) 5×10^{-5} m^3/sec/m

19. **Assertion (A) :** In quick sand phenomenon, a cohesionless soil loses all its shear strength and the soil particles have a tendency to move up in the direction of flow.

Reason (R) : If the seepage pressure becomes equal to the pressure due to submerged weight of the soil, the effective pressure is reduced to zero.

(1) (A) is true but (R) is false.

(2) Both (A) and (R) are true and (R) is correct explanation of (A).

(3) (A) is false but (R) is true.

(4) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

20. Match List – I with List – II and select the correct answer by using the codes given below the lists :

List – I	List – II
A. Shear strength of plastic undrained clay	1. Does not posses internal friction
B. Shear strength in cohesionless soils	2. Both from internal friction as well as cohesion
C. All soils other than cohesionless soils and plastic undrained clay	3. Intergranular friction alone

Codes :

	A	B	C
(1)	3	2	1
(2)	1	2	3
(3)	1	3	2
(4)	2	1	3

21. A clay layer, whose total settlement under a given loading is expected to be 100 mm, settles 25 mm at the end of one month after the application of load. How many months will be required to reach a settlement of 80 mm. Assume the layer to have double drainage. Take values of time factor T_v as 0.050 and 0.500 for degree of compressions of 25% and 80% respectively.

(1) 2 months

(2) 100 months

(3) 3.5 months

(4) 10 months

22. Consider the following statements :

1. The parameters 'C' and 'ϕ' can be determined from the geometry of the graph obtained by plotting shear stress at failure against normal stress.
2. 'C' and 'ϕ' can vary with drainage conditions of the test.

Which of the following is true ?

(1) Both 1 and 2 are incorrect.

(2) Only 2 is correct, 1 is incorrect.

(3) Only 1 is correct, 2 is incorrect.

(4) Both 1 and 2 are correct

23. Choose correct option regarding statements given below in connection with 'triaxial compression test'

1. A soil specimen, cylindrical in shape is subjected to direct stresses acting in three mutually perpendicular directions.
2. Length of specimen in the test is kept about 3 to 3½ times its diameter.
3. The effective minor principal stress is equal to the cell pressure minus the pore pressure.

(1) 1, 2 and 3 all are true and correct.

(2) 2 and 3 are correct, 1 is incorrect.

(3) 1 and 2 are correct, 3 is incorrect.

(4) 1 and 3 are true, 2 is incorrect.

24. Consider the following statements in view of Coulomb's theory (wedge theory) :

1. In the case of active earth pressure, the sliding wedge moves downwards and outwards on a 'slip surface' relative to the intact backfill.
2. In the case of passive earth pressure, the sliding wedge moves upwards and inwards.

Which of the following option is true ?

(1) Both statements 1 and 2 are correct.

(2) Both statements 1 and 2 are incorrect.

(3) Statement 1 is correct, 2 is incorrect.

(4) Statement 2 is correct, 1 is incorrect.

25. Choose the correct option.

(1) In an 'active' state, both the major principal stress, σ_1 and the minor principal stress, σ_3 are vertical.

(2) In an 'active' state, the major principal stress, σ_1 is vertical and the minor principal stress, σ_3 are horizontal.

(3) For 'passive' state, both the major and minor principal stresses are in vertical direction.

(4) For 'passive' state, both the major and minor principal stresses are in horizontal direction.

26. Match List – I with List – II and select the correct answer by using the codes given below the lists :

List – I	List – II
A. Standard Proctor test	1. Field compaction method
B. Pneumatic tyred rollers	2. Laboratory compaction method
C. Smooth wheel roller	

Codes :

	A	B	C
(1)	2	2	1
(2)	2	1	2
(3)	2	2	2
(4)	2	1	1

27. For general shear failure, which of the following expressions is correct ?

(1) $q_f = \gamma D N_q$

(2) $q_f = cN_c + 0.5\,\gamma B N_\gamma$

(3) $q_f = cN_c + \gamma D N_q + 0.5\,\gamma B N_\gamma$

(4) $q_f = cN_c + \gamma D N_q + \gamma B N_\gamma$

28. The total (both internal and external) degree of static indeterminacy of the plane shown in the given figure is

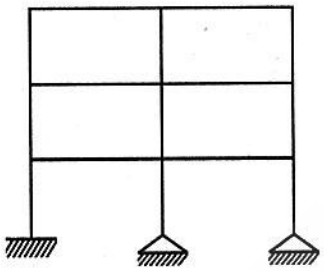


Fig.

(1) 18

(2) 16

(3) 14

(4) 13

29. Consider the two statements with regard to compaction of soil :

1. As the water-content is increased, the compacted density goes on increasing, till a maximum dry density is achieved after which further addition of water decreases the density.
2. The compacted density has a linear relationship with quantity of added water.

Which of the following options is correct ?

(1) 1 and 2 both are true.

(2) 1 is true, but 2 is incorrect.

(3) 1 is false, but 2 is true.

(4) 1 and 2, both are incorrect.

30. Which one of the following is true example of a statically determinate beam ?

(1) One end is fixed and the other end is simply supported.

(2) Both the ends are fixed.

(3) The beam overhangs over two supports.

(4) The beam is supported over three supports.

31. The total (both internal and external) degree of redundancy of the P in jointed frame shown in the given figure is

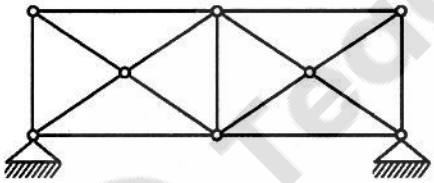


Fig.

(1) 3

(2) 4

(3) 5

(4) 6

32. The given figure shows a portal truss. The influence line diagram for force in member CH will be

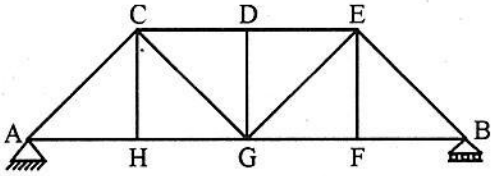
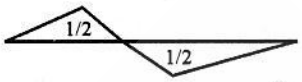


Fig.

(1) 

(2) 

(3) 

(4) 

33. Figure shows a beam and influence line diagram for shear force at C. For the given load position, the maximum positive shear force at C is

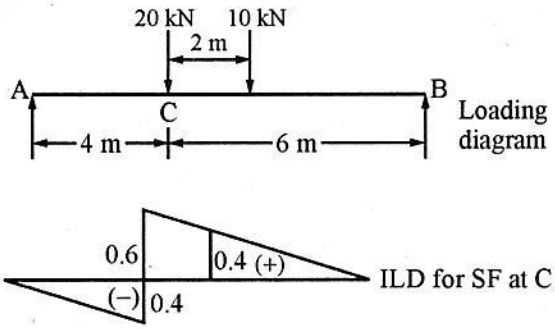


Fig.

(1) 4 kN

(2) 8 kN

(3) 12 kN

(4) 16 kN

34. Which one of the following statements is correct ?

(1) In slope-deflection method, the forces are taken as unknowns.

(2) In slope-deflection method, the joint rotations are taken as unknowns.

(3) Slope-deflection method is not applicable for beams and frames having settlement at the supports.

(4) Slope-deflection method is also known as force method.

35. The moment required to rotate the near end of a prismatic beam through unit angle without translation, when the far end fixed, is

(1) $\frac{EI}{L}$

(2) $\frac{2EI}{L}$

(3) $\frac{3EI}{L}$

(4) $\frac{4EI}{L}$

36. Clapeyron's theorem is applied to

(1) Simply supported beam

(2) Propped cantilever beam

(3) Fixed and continuous beam

(4) Continuous beam only

37. A beam carries a uniformly distributed load throughout its length. In which of the following configurations will the strain energy be maximum ?

(1) Cantilever

(2) Propped cantilever

(3) Simply supported beam

(4) Fixed beam

38. The shear equation for the portal frame shown in figure will be

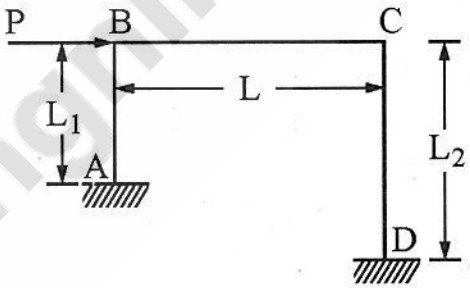


Fig.

(1) $\frac{M_{AB}+M_{BA}}{L_1}+\frac{M_{CD}+M_{DC}}{L_2}+P=0$

(2) $\frac{M_{AB}+M_{BA}}{L_1}+\frac{M_{BC}+M_{CB}}{L}+P=0$

(3) $\frac{M_{BC}+M_{CB}}{L}+\frac{M_{CD}+M_{DC}}{L_2}+P=0$

(4) $\frac{M_{AB}+M_{BC}}{L}+\frac{M_{CB}+M_{CD}}{L}-P=0$

39. Consider the following statements :

In the stiffness method of analysis,

1. statically indeterminate structures along are considered.
2. both statically determinate and indeterminate structures can be considered.
3. it is necessary to identify the redundant.
4. the displacements are considered the unknowns.
5. to calculate of equilibrium, it will be convenient to develop the stiffness matrix for the structure.

Which of these statements are correct ?

(1) 1, 3 and 4
(2) 1, 3 and 5
(3) 2, 4 and 5
(4) 2, 3, 4 and 5

40. **Assertion (A) :** In a pin-jointed plane frame consisting of straight members the total strain energy 'U' of the system may be expressed as

$$U = \Sigma \frac{P^2 L}{AE}$$

Where P is the axial force, A the uniform cross-sectional area and L the length of the individual member. E is the modulus of elasticity of the member material.

Reason (R) : In pin-jointed plane frames only axial forces are present.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(3) (A) is true but (R) is false.
(4) (A) is false but (R) is true.

41. Which one of the following methods is not considered as a force method ?

(1) The theorem of three moments
(2) The moment distribution method
(3) The method of consistent deformation
(4) Castigliano's theorem

42. For which of the following conditions, the virtual work should be zero according to the principle of virtual work ?

1. A body moving with constant acceleration
2. A body rotating with constant speed
3. A body in equilibrium
4. A body moving with constant momentum

Select the correct answer using the codes given below :

(1) 1 only
(2) 1 and 2
(3) 3 only
(4) 4 only

43. Which one of the following is correct ?

A suspension bridge with a two-hinged stiffening girder is

(1) Statically determinate
(2) Indeterminate of one degree
(3) Indeterminate of two degree
(4) A mechanism

44. For the continuous beam shown in figure, the distribution factors for members CB and CD are respectively

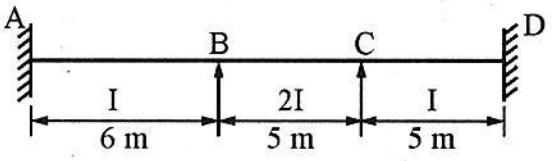


Fig.

(1) 2/3, 1/3

(2) 5/7, 2/7

(3) 2/7, 5/7

(4) 1/3, 2/3

45. Consider the following statements :

The principle of superposition is not applicable when

1. the material does not obey Hooke's law.
2. the effect of temperature changes are taken into consideration.
3. the structure is being analyzed for the effect of support settlement.

Which of the above statements is/are correct ?

(1) 1 only

(2) 1 and 2

(3) 2 and 3

(4) 1, 2 and 3

46. A statically indeterminate structure is the one which

(1) Cannot be analyzed at all.

(2) Can be analyzed using equations of statics only.

(3) Can be analyzed using equations of statics and compatibility equations.

(4) Can be analyzed using equations of compatibility only.

47. **Assertion (A) :** The concept of strain energy can be used to analyze a statically indeterminate structure.

Reason (R) : There is direct relationship between strain energy of a structure and the slopes and deflection caused in it.

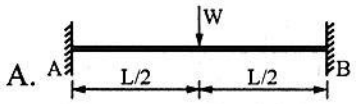
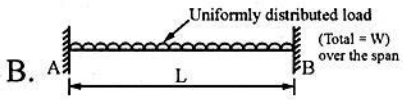
(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

48. Match loading cases given in List – I with the fixed end moment values given in List – II by using codes given below the lists :

List – I (Loading cases)	List – II (Fixed end moments)
A. 	1. $\frac{WL}{12}$
B. 	2. $\frac{WL}{8}$

Codes :

	A	B
(1)	2	2
(2)	2	1
(3)	1	1
(4)	1	2

49. Match List – I with List – II and select the correct answer by using the codes given below the lists :

List – I	List – II
A. $\frac{\partial U}{\partial Fj} = \Delta j$	1. Castigliano's first theorem
B. $\frac{\partial U}{\partial \Delta j} = Fj$	2. Castigliano's second theorem
C. $\frac{\partial U}{\partial M} = \phi$	

Codes :

	A	B	C
(1)	1	2	2
(2)	2	1	2
(3)	1	1	2
(4)	2	2	1

50. What are the values of distribution factor for BA and BC for the beam of fig.

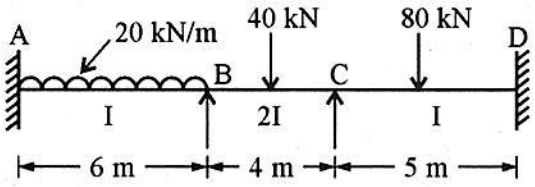


Fig.

(1) 1/4 and 3/4 respectively

(2) 1/6 and 1/2 respectively

(3) 3/4 and 1/4 respectively

(4) 1/2 and 1/6 respectively

51. Match List – I with List – II and select the correct answer by using the codes given below the lists :

List – I	List – II
A. The moment required to rotate the near end of a prismatic beam through a unit angle, without translation, the far end being simply supported	1. 4EL/L
B. The moment required to rotate the near end of a prismatic beam through unit angle, without translation the far end being fixed is	2. 3EL/L

Codes :

	A	B
(1)	1	1
(2)	2	2
(3)	2	1
(4)	1	2

52. Consider the following statements :

1. There is one single bending moment or shear force curve for the 'whole beam' under the section of a given set of loads
2. There are infinite number of influence lines, one for each section of the beam, drawn for a unit rolling load.

Which of the following option is true ?

(1) Both Statements 1 and 2 are incorrect.

(2) Statement 1 is correct, but 2 is incorrect.

(3) Both Statements 1 and 2 are correct.

(4) Statement 2 is correct but 1 is incorrect.

53. What are the values of 'distribution factor' for BA and BC for the frame of fig.

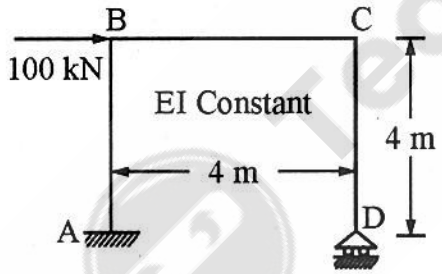


Fig.

(1) 0.33 and 0.67 respectively

(2) 0.25 and 0.75 respectively

(3) 0.75 and 0.25 respectively

(4) 0.50 and 0.50 respectively

54. Consider the two statements with regard to 'method of consistent deformation' :

1. Statically indeterminate beam or frame is analyzed by the method of consistent deformation by first obtaining a basic determinate structure.
2. There are as many physical conditions of geometry as there are redundants.

Which of the following option is true with regard to the above two statements ?

(1) 1 is incorrect, 2 is correct.

(2) 1 is correct, 2 is false.

(3) Both 1 and 2 are correct.

(4) Both 1 and 2 are incorrect.

55. Consider the two statements with regard to stiffness and flexibility methods :

1. The flexibility matrix and the stiffness matrix, both are real square matrix each.
2. Inverse of an element flexibility matrix always exists, inverse of element stiffness matrix also always exists.

Which of the following options is true ?

(1) Both 1 and 2 are correct.

(2) Both 1 and 2 are incorrect.

(3) Only 1 is correct, 2 is incorrect.

(4) Only 2 is correct, 1 is incorrect.

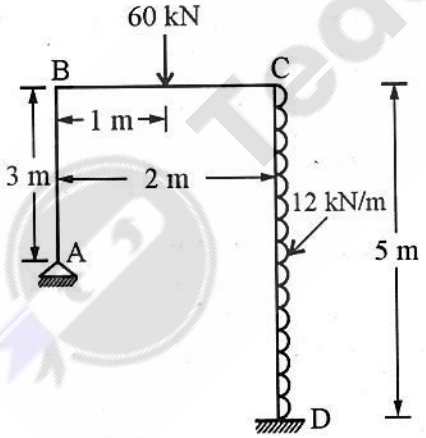
56. For a plane structure, how many equations of static equilibrium are available ?

(1) 12
(2) 3
(3) 6
(4) 9

57. Choose the correct option out of the following :

(1) Carryover moment is equal to one-half of its corresponding distributed moment and has the same sign.
(2) Carryover moment is equal to its corresponding distributed moment but with opposite sign.
(3) Carryover moment does not have relation to its corresponding distributed moment value.
(4) Carryover moment is equal to twice the magnitude of its corresponding distributed moment.

58. Choose the correct option giving value of fixed end moment for CD (MF_{CD})



(1) 50 kNm
(2) 7.5 kNm
(3) 12 kNm
(4) 25 kNm

59. For avoiding the limit state of collapse, the safety of RC structures is checked for appropriate combination of dead load (DL), imposed load (IL), wind load (WL) and earthquake load (EL). Which one of the following load combinations is not considered ?

(1) 0.9 DL + 1.5 WL
(2) 1.5 DL + 1.5 WL
(3) 1.5 DL + 1.5 WL + 1.5 EL
(4) 1.2 DL + 1.2 IL + 1.2 WL

60. The maximum strain in the tension reinforcement in the section at failure shall not be less than

(1) $0.002 + (0.87 f_y/E_s)$
(2) $0.0035 + (0.87 f_y/E_s)$
(3) $0.0035 + (f_y/1.15 E_s)$
(4) $0.002 + (f_y/1.5 E_s)$

Where E_s = modulus of elasticity of steel and f_y = yield stress in steel

61. According to IS : 456 – 2000, the modulus of elasticity of concrete, E_c (in MPa) can be expressed as

(1) $E_c = 5700\sqrt{f_{ck}}$
(2) $E_c = 5000\sqrt{f_{ck}}$
(3) $E_c = 5700 f_{ck}$
(4) $E_c = 5000 f_{ck}$

62. **Assertion (A) :** The behavior of an over-reinforced beam is more ductile than that of under-reinforced beam.

Reason (R) : Over-reinforced beam contains more steel and steel is more ductile than concrete.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

63. Consider the following statements :

In an under-reinforced concrete beam,

1. actual depth of neutral axis is less than the critical depth of neutral axis.
2. concrete reaches ultimate stress prior to steel reaching the ultimate stress.
3. moment of resistance is less than that of balanced sections.
4. lever arm of resisting couple is less than that of balanced sections.

Which of the statements given above are correct ?

(1) 1 and 2

(2) 1 and 3

(3) 2, 3 and 4

(4) 1 and 4

64. If the nominal shear stress τ_v at section does not exceed the permissible shear stress τ_c.

(1) Minimum shear reinforcement is still provided.

(2) Shear reinforcement is provided to resist the nominal shear stress.

(3) No shear reinforcement is provided.

(4) Shear reinforcement is provided for the difference of the two.

65. Which one of the following statements is correct ?

The critical section for computing design shear force in an R.C. beam where the supports exert a compressive reaction is at

(1) the center of support

(2) the face of support

(3) a distance of half of effective depth from the face of support

(4) a distance of effective depth from the face of support

66. A simply-supported beam has an effective span of 16 m. What shall be the limiting ratio of span to effective depth as per IS 456-2000 ?

(1) 26

(2) 20

(3) 12.5

(4) 7

67. A square column section of size 350 mm × 350 mm is reinforced with four bars of 25 mm diameter and four bars of 16 mm diameter, then the transverse steel should be

(1) 5 mm dia @ 240 mm c/c

(2) 6 mm dia @ 250 mm c/c

(3) 8 mm dia @ 250 mm c/c

(4) 8 mm dia @ 350 mm c/c

68. How is the depth of footing for an isolated column governed ?

1. By maximum bending moment
2. By shear force
3. By punching shear

Select the correct answer using the code given below :

(1) 2 and 3 only

(2) 1 and 2 only

(3) 1 and 3 only

(4) 1, 2 and 3

69. The allowable compressive load on a circular column with helical reinforcement :

(1) $0.45\ f_{ck}\ A_c + 0.87\ f_y\ A_{sc}$

(2) $0.4\ f_{ck}\ A_c + 0.67\ f_y\ A_{sc}$

(3) $1.05(0.4\ f_{ck}\ A_c + 0.67\ f_y\ A_{sc})$

(4) $1.05(0.45\ f_{ck}\ A_c + 0.87\ f_y\ A_{sc})$

70. Which one of the following is correct ?

While designing combined footing, the resultant of the column loads passes through the center of gravity of the footing slab such that the net soil pressure obtained is

(1) Parabolic

(2) Trapezoidal

(3) Uniform

(4) Non-uniform

71. A trapezoidal footing for two axially loaded columns is provided with

1. Width of footing near the heavier column is restricted.
2. Length of footing is restricted.
3. Projections of the footings beyond the heavier column are restricted.

Select the correct answers :

(1) 1 and 2

(2) 1 and 3

(3) 2 and 3

(4) 1, 2 and 3

72. In RCC beams, as the percentage areas of tensile steel increases

(1) Depth of neutral axis increases

(2) Depth of neutral axis decreases

(3) Depth of neutral axis does not change

(4) Lever arm increases

73. A reinforced concrete cantilever porch has thickness t. The main reinforcing steel will be placed

(1) At mid-thickness

(2) At t/3 from the top

(3) Close to the bottom surface

(4) Close to the top surface

74. Which one of the following is the correct expression to estimate the development length of deformed reinforcing bar as per IS code in limit state design ?

(1) $\frac{\phi \times \sigma_s}{4.5\ \tau_{bd}}$

(2) $\frac{\phi \times \sigma_s}{5\ \tau_{bd}}$

(3) $\frac{\phi \times \sigma_s}{6.4\ \tau_{bd}}$

(4) $\frac{\phi \times \sigma_s}{8\ \tau_{bd}}$

Where ϕ is diameter of reinforcing bar, σ_s is the stress in the bar at a section and τ_{bd} is bond stress.

75. The thickness of drop in flat slab will be designed on the basis of

(1) Maximum negative bending moment

(2) Maximum positive bending moment

(3) Punching shear

(4) One way shear

76. Match List – I with List – II and select the correct answer by using the codes given below the lists :

List – I	List – II
A. In flexure compression of concrete the maximum design stress as per IS	1. $0.67\ f_{ck}$
B. In flexure compression, the 'maximum' stress in the 'characteristic' curve of concrete as per the IS	2. $0.447\ f_{ck}$

Codes :

	A	B
(1)	2	1
(2)	2	2
(3)	1	1
(4)	1	2

77. In T-shaped cantilever retaining walls, the main reinforcement in the stem is provided on

(1) the front face in one direction

(2) the front face in both direction

(3) the inner face in one direction

(4) the inner face in both direction

78. In a over-reinforced section, if area of steel = 1000 mm^2, design stress of steel = 300 N/mm^2 and lever arm is 500 mm, what is the value of ultimate moment of resistance in kNm ?

(1) 600

(2) 150

(3) 300

(4) 1500

79. In a doubly reinforced section, the resultant compressive forces in concrete and the compression steel are 200 kN and 100 kN respectively. The lever arm for concrete and compressive steel forces are 0.4 m and 0.50 m respectively. In the case, which of the following correctly gives correct value of ultimate moment of resistance ?

(1) 80 kNm

(2) 180 kNm

(3) 130 kNm

(4) 50 kNm

80. Value of $\left(\frac{x_{umax}}{d}\right)$ depends on (as per IS)

(1) f_y only

(2) f_{ck} only

(3) f_y and f_{ck} both

(4) f_y and E_s

81. In a one way RCC slab, centre to centre (of supports) span is 4250 mm, clear span of the slab is 4000 mm, effective depth of slab is 200 mm, then which of the following option is correct for its 'effective span' value ?

(1) 4000 mm

(2) 4200 mm

(3) 4250 mm

(4) 4450 mm

82. IS code provides moment coefficients for one way continuous RCC slabs. These may be used for which of the cases given in options below ?

(1) For equal spans slabs – maximum two spans

(2) Only for equal span slabs – minimum three spans

(3) For slabs with atleast three spans which do not differ by more than 15% of the longest

(4) For slabs with unequal spans which differ upto 50% of the longest.

83. If area of steel required for main bars in a one way RCC slab is 785 mm^2, what should be the spacing of 10 mm bars ?

(1) 200 mm c/c

(2) 100 mm c/c

(3) 500 mm c/c

(4) 300 mm c/c

84. What is the value of nominal shear stress τ_v, if shear force V_u = 80 kN, width and effective depth are 200 mm and 400 mm respectively ?

(1) 0.8 N/mm^2

(2) 8 N/mm^2

(3) 1 N/mm^2

(4) 2 N/mm^2

85. Which of the following strain limit is correct for the highly compressed edge in case of an uniaxial eccentric compression ?

(1) 0.001

(2) 0.002

(3) Below 0.002 but greater than 0.001

(4) A value between 0.002 and 0.0035

86. Required spacing 's_v' of vertical stirrups for shear reinforcement in a RCC beam is given by which expression given in following options ?

(1) $s_v \leq \left(\frac{0.87 f_y (As_v)d}{b}\right)$

(2) $s_v \leq \left(\frac{0.87 f_y As_v}{(\tau_v - \tau_c)bd/d}\right)$

(3) $s_v \leq \left(\frac{As_v}{(\tau_v - \tau_c)bd/d}\right)$

(4) $s_v \leq 0.1\ d$

87. Factor of safety against overturning for design of retaining wall (RCC) should not be less than

(1) 1.40

(2) 1.50

(3) 2.0

(4) 3.0

88. For the block shear failure of a tension member, the failure occurs along a path through the connection involving

(1) Tension on the two perpendicular planes.

(2) Shear on the two perpendicular planes.

(3) Tension on one plane and shear on the other perpendicular plane.

(4) Tension on the plane of connection and compression on the other perpendicular plane.

89. In design of RCC isolated footing, at how much distance away from the face of a column is critical section for one way shear ?

(1) d/2

(2) d

(3) 2d

(4) 0.1d

90. For a tension member in a roof truss subjected to possible reversal of stress, the slenderness ratio is limited to

(1) 180

(2) 150

(3) 200

(4) 350

91. The design compressive stress of axially loaded compression member is given by, $f_{cd} = X\ (f_y/\gamma_{m0})$ where X is the stress reduction factor expression as

(1) $\varphi + (\varphi^2 - \lambda^2)^{0.5}$

(2) $1/(\varphi + (\varphi^2 - \lambda^2)^{0.5})$

(3) $\varphi + (\lambda^2 - \varphi^2)^{0.5}$

(4) $1/(\varphi - (\lambda^2 - \varphi^2)^{0.5})$

92. What is the shear lag width (bs) for the welded single angle tension member shown in figure ?

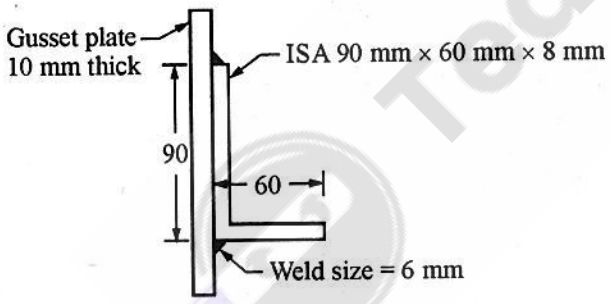


Fig.

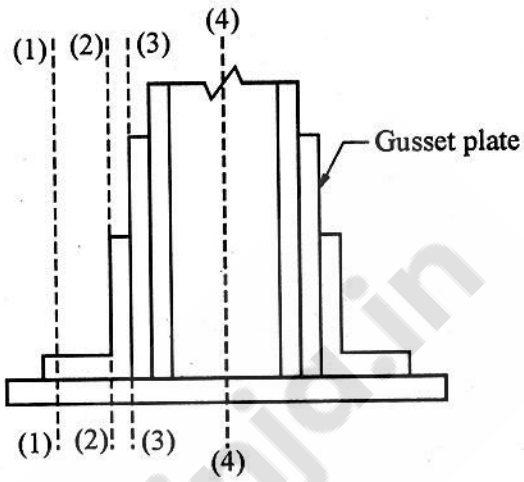
(1) 90 mm

(2) 60 mm

(3) 78 mm

(4) 48 mm

93. In a gusset base as shown in figure, the critical section for calculating thickness is



(1) 1 – 1

(2) 2 – 2

(3) 3 – 3

(4) 4 – 4

94. As per IS 800 purlins are designed as

(1) Simply supported beams

(2) Cantilever beams

(3) Continuous beams

(4) Compression beams

95. Maximum shear force in a gantry girder carrying an overhead travelling crane occurs when

(1) One of the wheel loads is at the support.

(2) The center of span coincides with center of gravity of wheel loads.

(3) One of the wheel load is at mid span and another wheel on adjacent span.

(4) Either (1) or (3).

96. For the bracket connection shown in the figure, which bolt will have the maximum resultant force ?

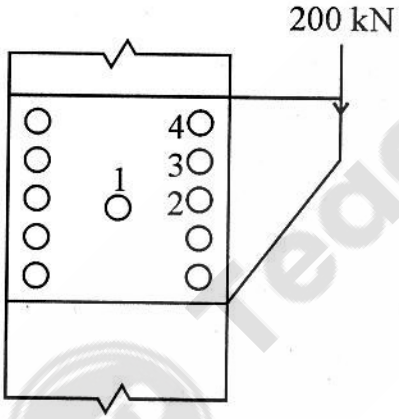


Fig.

(1) Bolt 1

(2) Bolt 2

(3) Bolt 3

(4) Bolt 4

97. Which of the following has minimum value of shape factor ?

(1) Tube section

(2) I-section

(3) Rectangular section

(4) Circular section

98. Buckling of the compression flange of a girder, without transverse stiffeners can be avoided if (with standard notations)

(1) $\frac{d}{t_w} \leq 345\ \varepsilon_f^2$

(2) $\frac{d}{t_w} \leq 270\ \varepsilon_f^2$

(3) $\frac{d}{t_w} \leq 270\ \varepsilon_w$

(4) $\frac{d}{t_w} \leq 250\ \varepsilon_w$

99. The nominal bearing strength of the bolt is given by 2.5 k_b d t fu, where k_b depends upon

1. Edge distance
2. Bolt diameter
3. Hole diameter
4. Ultimate tensile stress of bolt
5. Ultimate tensile stress of plate

Of the above

(1) 1, 3, 4 and 5 are correct.

(2) 1, 2 and 4 are correct.

(3) 3, 4 and 5 are correct.

(4) 2, 3, 4 and 5 are correct.

100. A steel column is restrained against both translation and rotation at one end and is restrained against rotation but free to translation at the other end. The design (IS : 800 – 2007) value of effective length factor of the column is

(1) 1.0

(2) 1.5

(3) 1.2

(4) 0.8

101. As per IS code, the maximum longitudinal pitch allowed in bolted joints of tension members is nominally

(1) 12 times the thickness of the plate

(2) 12 times the diameter of the bolt

(3) 16 times the thickness of the plate

(4) 16 times the diameter of the bolt

102. A fillet weld is simultaneously subjected to factored normal and shear stresses of f and q, respectively. As per IS 800 : 2007, the equivalent stress is given by

(1) $\sqrt{3f^2 + q^2}$

(2) $\sqrt{f^2 + 3q^2}$

(3) $\sqrt{5f^2 + q^2}$

(4) $\sqrt{f^2 + 5q^2}$

103. As per IS 800 : 2007, the cross-section in which the extreme fiber can reach the yield stress, but cannot develop the plastic moment of resistance due to failure by local buckling is classified as

(1) Plastic section

(2) Compact section

(3) Semi-compact section

(4) Slender section

104. What is the net area at weakest section in bolted lap joint, when bolt hole diameter = 22 mm, width of plate is 216 mm in which three bolts are connected, thickness of the two plates joined is 10 mm ?

(1) 2160 mm^2

(2) 1500 mm^2

(3) 1940 mm^2

(4) 1720 mm^2

105. Pyring forces are the additional

(1) Shearing forces on the bolts because of long joints

(2) Bending forces on the bolts because of long joints

(3) Tensile forces due to the flexibility of connected parts leading to deformation.

(4) Forces due to friction between the connected parts

106. What is the value of maximum slenderness ratio of the main member between consecutive lacing connection in a built up column ?

(1) 135 or the most unfavourable slenderness ratio of the member as a whole

(2) 50 or 0.7 times the most unfavourable slenderness ratio of the member as a whole

(3) 185

(4) 225

107. In which case of design of built up column, its effective slenderness ratio is increased by 10% ?

(1) In none of cases-laced or battened

(2) In both cases-whether laced or battened

(3) Laced only

(4) Battened only

108. What is the value of design compressive strength of an axially loaded short column, if its effective area is 2000 mm^2 and value of design compressive stress is 150 N/mm^2 ?

(1) 100 kN

(2) 200 kN

(3) 150 kN

(4) 300 kN

109. For connecting lacing flats to column sections with 20 mm dia. bolt, the minimum width of flat should be

(1) 60 mm

(2) 100 mm

(3) 120 mm

(4) 140 mm

110. What is the value of bending strength of a plastic laterally supported steel beam with $f_y = 250\ N/mm^2$ and plastic section modules value as $11 \times 10^4\ mm^3$?

(1) 2.75 kNm

(2) 27.5 kNm

(3) 25 kNm

(4) 2.5 kNm

111. The wind load on a steel truss for an industrial building will depend upon

(1) location of the structure

(2) shape of the structure

(3) shape and height of structure

(4) location, shape and height of the structure

112. What is the strength of a double V-groove weld if effective length of weld = 200 mm, thickness of plate = 10 mm and $f_y = 250\ N/mm^2$?

(1) 400 kN

(2) 500 kN

(3) 250 kN

(4) 1000 kN

113. What option out of the following gives correct value of required area of slab base, if factored axial compressive load is 2000 kN and bearing strength of concrete pedestal = 10 N/mm^2 ?

(1) 0.1 m^2

(2) 1 m^2

(3) 2 m^3

(4) 0.2 m^2

114. A tension member splice is designed for

(1) 0.3 times the member design capacity

(2) Factored tensile force

(3) Service load

(4) Maximum of compressive or tensile force in the member

115. Consider a gusset base :

1. The gusset material used increases the bearing area and consequently result in smaller thickness of base plate.
2. The gusset material used supports the base plate against bending and consequently result in smaller thickness of base plate.

(1) Both 1 and 2 are incorrect.

(2) Only 2 is correct, 1 is incorrect.

(3) Only 1 is correct, 2 is incorrect.

(4) Both 1 and 2 are correct.

116. How much is the effective length factor for double angle discontinuous strut, with angles placed on opposite sides of gusset plate ?

(1) Between 0.7 and 0.85

(2) Between 0.9 and 1.0

(3) Between 0.6 and 0.5

(4) Approx 0.3

117. What is the value of strength against yielding of a tension member whose gross area is 1100 mm^2, f_y = 250 N/mm^2 ?

(1) 250 kN

(2) 275 kN

(3) 125 kN

(4) 230 kN

118. For a single unequal angle tie member, the leg preferred for making connection is the

(1) longer one

(2) shorter one

(3) any of the two

(4) longer if welded and shorter if bolted

119. Match List – I (Theory of Failures) with List – II (Scientists) and select the correct answer :

List – I	List – II
P. Maximum principal stress theory	1. St. Venant
Q. Maximum shear stress theory	2. Beltrami and Haigh
R. Maximum principal strain theory	3. Tresca
S. Maximum distortion energy theory	4. Von-Mises
	5. Rankine

	P	Q	R	S
(1)	5	3	1	4
(2)	5	1	2	4
(3)	3	5	1	2
(4)	3	1	2	5

120. A tapering bar (diameters of end sections are d_1 and d_2) and a bar of uniform cross-section 'd' has the same length and are subjected to same axial pull. Both the bars will have the same extension if 'd' is equal to

(1) $\frac{d_1 + d_2}{2}$

(2) $\sqrt{d_1 d_2}$

(3) $\sqrt{\frac{d_1 d_2}{2}}$

(4) $\sqrt{\frac{d_1 + d_2}{2}}$

121. The strain energy U stored due to bending of the cantilever beam of length L due to point load, W at the free end will be

(1) $\frac{W^2 L^3}{6EI}$

(2) $\frac{W^2 L^2}{6EI}$

(3) $\frac{W^3 L^3}{36EI}$

(4) $\frac{W^2 L^3}{36EI}$

122. For a given shear force across a symmetrical I-section, the intensity of shear stress is maximum at the

(1) Junction of the flange and the web, but on the web

(2) Junction of the flange and the web, but on the flange

(3) Centroid of the section

(4) Extreme fibers

123. A shaft is subjected to a maximum bending stress of 80 N/mm^2 and maximum shearing stress equal to 30 N/mm^2 at a particular section. If the yield point in tension of material is 280 N/mm^2, and the maximum shear stress theory of failure is used, then the factor of safety obtained will be

(1) 2.5

(2) 2.8

(3) 3.0

(4) 3.5

124. The portion, which should be removed from top and bottom of a circular cross-section of diameter d in order to obtain maximum section modulus, is

(1) 0.01 d

(2) 0.1 d

(3) 0.011 d

(4) 0.11 d

125. Two shafts having the same length and material are joined in series. If the ratio of the diameter of the first shaft to that of the second shaft is 2, then the ratio of the angle of twist of the first shaft to that of the second shaft is

(1) 16

(2) 8

(3) 4

(4) 2

126. If a body carries two unlike principal stresses, what is the maximum shear stress ?

(1) Half the difference of magnitude of principal stresses.

(2) Half the sum of the magnitude of principal stresses.

(3) Difference of the magnitude of principal stresses.

(4) Sum of the magnitude of principal stresses.

127. Consider the following statements in case of beams :

1. Rate of change of shear force is equal to the rate of loading at a particular section.
2. Rate of change of bending moment is equal to the shear force at a particular section.
3. Maximum shear force in a beam occurs at a point where bending moment is either zero or bending moment changes sign.

Which of the above statements are correct ?

(1) 1 alone

(2) 2 alone

(3) 1 and 2

(4) 1, 2 and 3

128. At a point in two-dimensional stress system f_x = 120 N/mm^2, f_y = 40 N/mm^2 and q = 30 N/mm^2. What is the radius of the Mohr circle for stress drawn with a scale of 1 cm = 10 N/mm^2 ? (f_x & f_y are like stresses)

(1) 3 cm

(2) 4 cm

(3) 5 cm

(4) 6 cm

129. A shaft is subjected to a bending moment M = 400 Nm and torque T = 300 Nm. The equivalent bending moment is

(1) 900 Nm

(2) 700 Nm

(3) 500 Nm

(4) 450 Nm

130. A cantilever of span 3 metres is loaded by a concentrated load of 50 kN acting at its free end. What is the value of maximum shear force in kN ?

(1) 56.25

(2) 37.5

(3) 150

(4) 100

131. A circular shaft of 100 mm diameter has polar moment of inertia as 5.0×10^6 mm^4. If the shaft is subjected to a torque T = 10 kNm. What is the maximum tensile stress in N/mm^2 ?

(1) 100

(2) 200

(3) 50

(4) 1000

132. In a plane stress condition, values of the two principal stresses are 30 N/mm^2 and 10 N/mm^2, what is the value of the maximum shear stress in N/mm^2.

(1) 20

(2) 10

(3) 40

(4) 30

133. In pure bending case, which of the following option is correct for fibre at neutral axis ?

(1) Its length increases slightly.

(2) Its length increases substantially.

(3) Its length remains unchanged.

(4) Its length gets shortened.

134. A bar of steel 20 mm in diameter was subjected to a tensile load. The measured extension on a 100 mm gauge length was 1 mm and the change in diameter was 0.05 mm. What is the value of Poisson's ratio ?

(1) 4.0

(2) 1.0

(3) 0.25

(4) 0.50

135. A bar of area 500 mm^2 is 4 metre long and carries a tensile load of 100 kN. Determine the strain energy stored in the bar. Take $E = 2 \times 10^5$ N/mm^2.

(1) 100 Nm

(2) 200 Nm

(3) 1000 Nm

(4) 500 Nm

136. Statements :

1. The slope of the bending moment diagram at any point is equal to the ordinate of the shear force diagram at that point.
2. The difference in the ordinates of the bending moment diagram between any two points is equal to the area under the shear diagram between these two points.

Among the above statements, which of the following option is correct ?

(1) None of 1 and 2 are true.
(2) Both 1 and 2 are true.
(3) 1 is true, but 2 is not true.
(4) 2 is true, but 1 is not true.

137. The modulus of rigidity for a material is 4×10^4 N/mm^2. For the axially loaded material, if the value of Poisson's ratio is 0.25, calculate the modulus of elasticity (in N/mm^2).

(1) 1×10^5
(2) 2×10^5
(3) 1×10^4
(4) 5×10^4

138. If ultimate crushing stress for material of a column is 20 N/mm^2, calculate safe load for the column, using factor of safety of 5. Cross-sectional area of the column is 10000 mm^2.

(1) 4 kN
(2) 40 kN
(3) 200 kN
(4) 100 kN

139. Match List – I (Densities) with List – II (Expressions) and select the correct answer using the codes given below :

(Symbols G, e, γ_w and S stand for specific gravity of soil grains, void ratio, unit weight of water and degree of saturation respectively)

List – I	List – II
P. Dry density	1. $\left(\frac{G+Se}{1+e}\right)\gamma_w$
Q. Moist density	2. $\left(\frac{G}{1+e}\right)\gamma_w$
R. Submerged density	3. $\left(\frac{G+e}{1+e}\right)\gamma_w$
S. Saturated density	4. $\left(\frac{G-1}{1+e}\right)\gamma_w$

	P	Q	R	S
(1)	2	1	4	3
(2)	2	3	4	1
(3)	4	1	2	3
(4)	4	3	2	1

140. The value of porosity of a soil sample in which the total volume of soil grains is equal to twice the total volume of voids would be

(1) 75%
(2) 66.66%
(3) 50%
(4) 33.33%

141. With addition of lime in soil

(1) L.L. increases and P.L. decreases

(2) Plasticity index increase

(3) L.L. decreases and P.L. increases

(4) L.L. and P.L. both decrease

142. The predominant mineral responsible for shrinkage and swelling in black cotton soil is

(1) Illite

(2) Kaolinite

(3) Mica

(4) Montmorillonite

143. In a soil specimen, 70% of particles are passing through 4.75 mm I.S. sieve and 4% of particle are passing through 75μ I.S. sieve. Its uniformity coefficient is 8 and coefficient of curvature is 2. As per I.S. classification, this soil is classified as

(1) SP

(2) GP

(3) SW

(4) GW

144. **Assertion (A) :** Effective vertical stress at some depth below a river bed is unaffected by the water depth in the river.

Reason (R) : Equal amounts of increase in total stress and pore pressure will not change the effective stress.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) (A) is false but (R) is true.

145. From a flow net which of the following information can be obtained ?

1. Rate of flow
2. Pore water pressure
3. Exit gradient
4. Permeability

Select the correct answer using the code given below :

(1) 1, 2, 3 and 4

(2) 1, 2 and 3

(3) 2, 3 and 4 only

(4) 1 only

146. For the determination of shear strength parameters, c and φ of soil in the laboratory, the test to be conducted will be

(1) Triaxial compression test

(2) Sieve analysis

(3) Compaction test

(4) Relative density test

147. Unconfined compressive strength test is

(1) Undrained test

(2) Drained test

(3) Consolidated undrained test

(4) Consolidated drained test

148. The figure given shown the state of a sample of clay before and after consolidation. Based on these figures, the settlement of a clay layer of initial thickness H will be

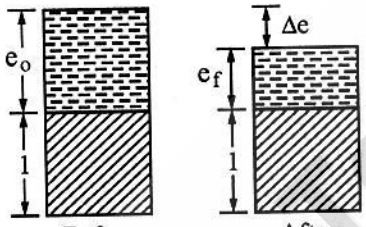


Fig.

(1) $\frac{\Delta e}{1 + e_o}$

(2) $\frac{H \times \Delta e}{1 + e_f}$

(3) $\frac{\Delta e}{1 + e_f}$

(4) $\frac{H \times \Delta e}{1 + e_o}$

149. In soil consolidation process, the following events take place after loading :

1. Decrease in excess pore pressure
2. Increase in total stress
3. Development of excess pore pressure
4. Increase in effective stress

The correct sequence of these events is

(1) 3, 2, 1, 4

(2) 2, 3, 1, 4

(3) 2, 3, 4, 1

(4) 3, 2, 4, 1

150. Identify the two false statements from the following four statements :

I. The consolidation of soil happens due to change in compressive stress.

II. When standard penetration tests are performed in fine sand below water table, the dilation correction is applied after the overburden correction is applied.

III. Over consolidated clays will have predominantly cohesive strength as compared to the frictional strength.

IV. Compaction of soils is due to expulsion of water.

(1) II and III

(2) I and IV

(3) I and III

(4) II and IV

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