महाराष्ट्र स्थापत्य अभियांत्रिकी सेवा मुख्य परीक्षा-2019
परीक्षा दि. 24/11/2019

A → संच क्रमांक

2019

T13

प्रश्नपुस्तिका क्रमांक
BOOKLET NO.

प्रश्नपुस्तिका - I

स्थापत्य अभियांत्रिकी पेपर - 1

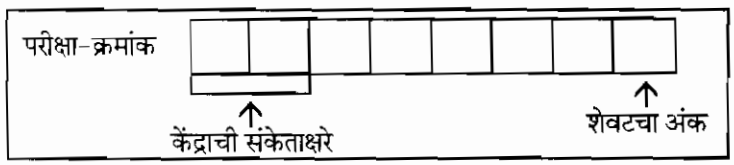
वेळ : 2 (दोन) तास

एकूण प्रश्न : 100
एकूण गुण : 200

सूचना

(1) सदर प्रश्नपुस्तिकेत 100 अनिवार्य प्रश्न आहेत. उमेदवारांनी प्रश्नांची उत्तरे लिहिण्यास सुरुवात करण्यापूर्वी या प्रश्नपुस्तिकेत सर्व प्रश्न आहेत किंवा नाहीत याची खात्री करून घ्यावी. तसेच अन्य काही दोष आढळल्यास ही प्रश्नपुस्तिका समवेक्षकांकडून लगेच बदलून घ्यावी.

(2) आपला परीक्षा-क्रमांक ह्या चौकोनांत **न विसरता बॉलपेनने** लिहावा.



(3) वर छापलेला प्रश्नपुस्तिका क्रमांक तुमच्या उत्तरपत्रिकेवर विशिष्ट जागी उत्तरपत्रिकेवरील सूचनेप्रमाणे **न विसरता नमूद करावा.**

(4) या प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाला 4 पर्यायी उत्तरे सुचविली असून त्यांना 1, 2, 3 आणि 4 असे क्रमांक दिलेले आहेत. त्या चार उत्तरांपैकी सर्वात योग्य उत्तराचा क्रमांक उत्तरपत्रिकेवरील सूचनेप्रमाणे तुमच्या उत्तरपत्रिकेवर नमूद करावा. अशा प्रकारे उत्तरपत्रिकेवर उत्तरक्रमांक नमूद करताना तो संबंधित प्रश्नक्रमांकासमोर छायांकित करून दर्शविला जाईल याची काळजी घ्यावी. **ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.**

(5) सर्व प्रश्नांना समान गुण आहेत. यास्तव सर्व प्रश्नांची उत्तरे द्यावीत. घाईमुळे चुका होणार नाहीत याची दक्षता घेऊनच शक्य तितक्या वेगाने प्रश्न सोडवावेत. क्रमाने प्रश्न सोडविणे श्रेयस्कर आहे पण **एखादा प्रश्न कठीण वाटल्यास त्यावर वेळ न घालविता पुढील प्रश्नांकडे वळावे.** अशा प्रकारे शेवटच्या प्रश्नापर्यंत पोहोचल्यानंतर वेळ शिल्लक राहिल्यास कठीण म्हणून वगळलेल्या प्रश्नांकडे परतणे सोईस्कर ठरेल.

(6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही.

(7) **प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवाराच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच ''उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची दिलेल्या चार उत्तरांपैकी सर्वात योग्य उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चार चुकीच्या उत्तरांसाठी एका प्रश्नाचे गुण वजा करण्यात येतील''.**

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

ताकीद

ह्या प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपेपर्यंत ही प्रश्नपुस्तिका आयोगाची मालमत्ता असून ती परीक्षाकक्षात उमेदवाराला परीक्षेसाठी वापरण्यास देण्यात येत आहे. ही वेळ संपेपर्यंत सदर प्रश्नपुस्तिकेची प्रत/प्रती, किंवा सदर प्रश्नपुस्तिकेतील काही आशय कोणत्याही स्वरूपात प्रत्यक्ष वा अप्रत्यक्षपणे कोणत्याही व्यक्तीस पुरविणे, तसेच प्रसिद्ध करणे हा गुन्हा असून अशी कृती करणाऱ्या व्यक्तीवर शासनाने जारी केलेल्या ''परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचा अधिनियम-82'' यातील तरतुदीनुसार तसेच प्रचलित कायद्याच्या तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.
तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरुद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

1. For the formwork design, IS-456-2000 suggested the deviation from specified dimensions of cross section of columns and beams at _____.

(1) +12 mm , −6 mm (2) +50 mm , −12 mm

(3) +25 mm , −25 mm (4) +12 mm , −12 mm

2. If the compressive strength of concrete increases, then tensile strength is also increases, but at a _____.

(1) Increasing rate (2) Decreasing rate

(3) Constant rate (4) Exponential increasing rate

3. The brick piece obtained by cutting a triangular portion of the brick such that half a headers and half a stretcher are obtained on adjoining cut faces is called as :

(1) Queen closer (2) Mitred closer

(3) King closer (4) Three-Quarter Bat

4. Maximum water-cement ratio and minimum cement content for moderate exposure used in plain cement concrete are _____ ; _____ respectively, as per IS-456-2000.

(1) 0.60 ; 220 kg/m^3 (2) 0.60 ; 240 kg/m^3

(3) 0.50 ; 250 kg/m^3 (4) 0.55 ; 260 kg/m^3

5. Which of the following tests is **not** a test for evaluating workability of concrete ?

(1) Slump Test (2) Flow Test

(3) Compacting factor Test (4) Le-Chatellier Test

6. A well caisson is a foundation facilating structure sunk in the ground or water ; which is :

(1) Open at top as well as at bottom.

(2) Open at top and closed at bottom.

(3) Open at bottom and closed at top.

(4) Closed at top as well as at bottom.

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

7. One of the following is **not** a principle related to thermal insulation :

(1) Thermal resistance is directly proportional to thickness of a material.

(2) Provision of air gap plays an important role in thermal insulation.

(3) Transfer of heat from outside to inside increases.

(4) Thermal resistance of a building depends on orientation also.

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8. _____ are provided as a protective coatings to walls at its top to prevent seepage of water.

(1) Corbels (2) Cornica (3) Copings (4) Floating

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9. Who had discovered direct relationship between water-cement ratio and strength of concrete ?

(1) Jon Abraham (2) Abraham Lincoln

(3) Duff Abrams (4) Albert Pinto

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10. One of the following measure **could not** reduce or eliminate plastic shrinkage cracks :

(1) Erect temporary wind breakers.

(2) Concrete should be poured in layers.

(3) Erect temporary roof.

(4) Reduce the time between placing and finishing.

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11. How much is the Carbon Content (%) in hard-steel ?

(1) 0.5 - 0.8 (2) 0.8 - 1.5 (3) 0.3 - 0.5 (4) 0.15 - 0.3

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12. Fire load, a fire risk criteria to classify occupancies, for a building having an area of 100 m^2 with combustible material of 1,000 kg having calorific value of 4,000 kcal/kg will be :

(1) 4,00,000 kcal/m^2 (2) 40,000 kcal/m^2

(3) 250 kcal/m^2 (4) 25 kcal/m^2

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

13. The shear force and bending moment are zero at the free end of a cantilever beam, if it carries a :

(1) Point load at the free end.

(2) Point load at the middle of its length.

(3) Uniformly distributed load over the whole length.

(4) None of the above.

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14. A steel rod of c/s area 100 mm^2 and 1 m long is subjected to a tensile force of 40 kN. What is the total elongation of the rod ? If modulus of elasticity of steel is 200 GPa.

(1) 0.5 mm (2) 0.7 mm (3) 1.2 mm (4) 2.0 mm

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15. A simply supported beam carries couple at a point on its span, the shear force :

(1) Varies by cubic law (2) Varies by parabolic law

(3) Varies linearly (4) Is uniform throughout

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16. Euler buckling load for one end fixed and the other hinged is given by :

(1) $\frac{\pi^2 EI}{l^2}$ (2) $\frac{2\pi^2 EI}{l^2}$ (3) $\frac{4\pi^2 EI}{l^2}$ (4) $\frac{\pi^2 EI}{4l^2}$

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17. A point in a strained material is subjected to two mutually perpendicular stresses of 150 MPa (tensile) and 50 MPa (compressive), then what will be the magnitude of maximum shear stress in the component ?

(1) 50 MPa (2) 100 MPa (3) 150 MPa (4) 200 MPa

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18. Euler's formula for buckling of column does not hold good if slenderness ratio $\left(\frac{le}{K}\right)$ is _____ for mild steel column.

(1) Less than 80 (2) Greater than 90

(3) 120 - 160 (4) 90 - 120

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

19. Maximum deflection of a simply supported beam with the total uniformly distributed load 'W' is :

(1) $\frac{Wl^3}{384EI}$ (2) $\frac{5}{384}\frac{Wl^3}{EI}$ (3) $\frac{Wl^3}{48EI}$ (4) $\frac{5}{48}\frac{Wl^3}{EI}$

20. If a prismatic bar of uniform c/s 'A' and length 'L' is suspended from top, then the elongation of bar due to its self weight only is _____. Where, E is modulus of elasticity of bar material and γ is the density of bar.

(1) $\frac{\gamma L^2}{2E}$ (2) $\frac{\gamma L^2}{3E}$ (3) $\frac{\gamma L^2}{5E}$ (4) $\frac{\gamma L^2}{6E}$

21. The relation governing the simple bending of beam is :

(1) $\frac{\sigma}{y} = \frac{M}{E} = \frac{I}{R}$ (2) $\frac{\sigma}{y} = \frac{M}{R} = \frac{E}{I}$ (3) $\frac{\sigma}{E} = \frac{M}{I} = \frac{y}{R}$ (4) $\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$

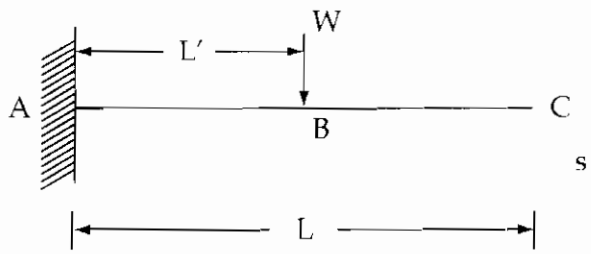
22. A steel bar of 5 mm is heated from 15° to 40°C and it is free to expand. The bar will induce _____.

(1) No stress (2) Shear stress
(3) Tensile stress (4) Compressive stress

23. A simply supported beam AB of span 10 m carries a point load W = 10 kN at C such that AC = 3 m and BC = 7 m, maximum deflection occur _____.

(1) at C (2) at centre of span
(3) between A and C (4) between B and C

24. Which of the following is **true** in the following figure ?



(1) Deflection at C = deflection at B + $\theta_B(L - L')$

(2) Deflection at C = $\frac{L}{L'}$ × deflection at B

(3) Deflection at C = deflection at B + $\theta_C(L - L')$

(4) Both (1) and (3)

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

25. 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

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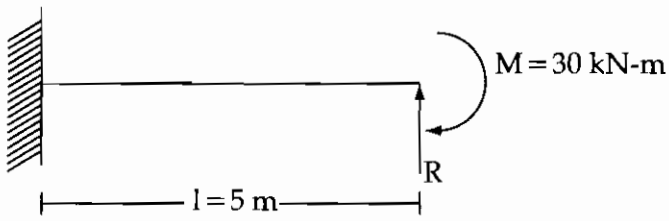
26. In the propped cantilever as shown in figure, the value of propped reaction 'R' will be :



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

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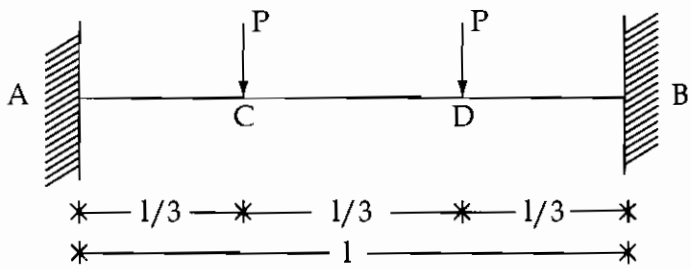
27. A fixed beam AB of length 'l' having constant flexural rigidity EI carries two loads P at its third points C and D as shown in figure.



Numerically, maximum bending moment will occur :

(1) at C and at D and will be equal to $\frac{2}{9}$Pl

(2) between C and D and will be equal to $\frac{Pl}{9}$

(3) at A and at B and will be equal to $\frac{2}{9}$Pl

(4) between A and C and also between B and D and will be equal to $\frac{Pl}{9}$

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

28. Maximum deflection for a simply supported beam subjected to udl 'W' throughout span 'l' is :

(1) $\frac{Wl^3}{48EI}$ (2) $\frac{Wl^4}{48EI}$ (3) $\frac{5}{384}\frac{Wl^3}{EI}$ (4) $\frac{5}{384}\frac{Wl^4}{EI}$

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29. The moment required to rotate the near end of a prismatic beam through a unit angle without translation, the far end being simply supported, is given by :

(1) $\frac{3EI}{l}$ (2) $\frac{4EI}{l}$ (3) $\frac{2EI}{l}$ (4) $\frac{EI}{l}$

---

30. A two hinged semi-circular arch of radius R carries a concentrated load W at the crown. Assuming uniform flexural rigidity, the horizontal thrust at each support will be :

(1) $\frac{W}{2\pi}$ (2) $\frac{W}{\pi}$ (3) $\frac{4}{3} \cdot \frac{WR}{\pi}$ (4) $\frac{W}{2}$

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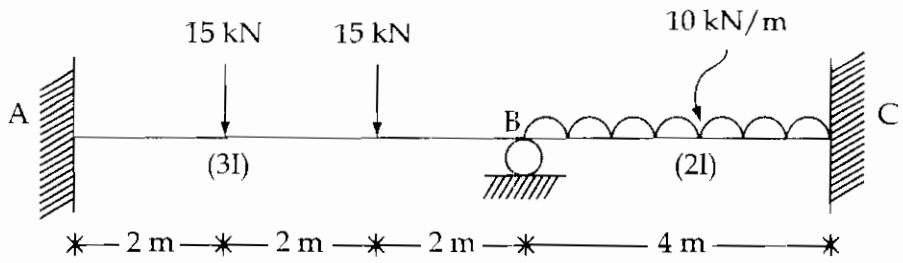
31. A two span continuous beam ABC is as shown in figure below. The distribution factors at joint B are :



(1) 0.4, 0.6 (2) 0.6, 0.4 (3) 0.5, 0.5 (4) 0.55, 0.45

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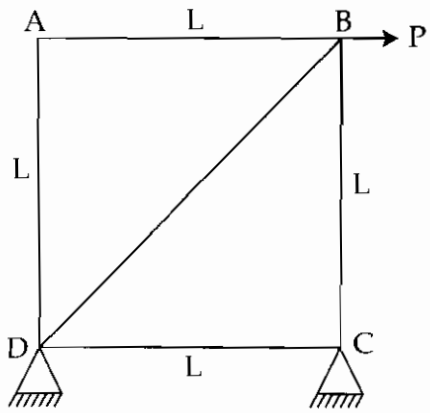
32. The deflection at the free end of a cantilever of rectangular cross-section due to certain loading is 0.8 cm. If the depth of the section is doubled keeping the width same, then the deflection at the free end due to the same loading will be :

(1) 0.1 cm (2) 0.4 cm (3) 0.8 cm (4) 1.6 cm

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

33. What is the force in member AB of the pin-jointed frame as shown below ?



(1) P (tension)

(2) P (compression)

(3) $\frac{P}{\sqrt{2}}$ (compression)

(4) Zero

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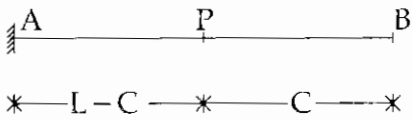
34. A cantilever beam AB of span 'L' is subjected to a moment 'M' at the free end as shown in figure. What is the slope and deflection at free end B ?

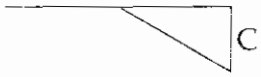
Consider same c/s and material. (i.e, EI is same)

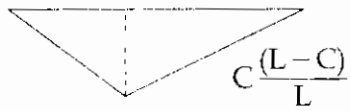
(1) $\frac{ML}{EI}, \frac{ML^2}{2EI}$ (2) $\frac{M}{LEI}, \frac{ML^2}{EI}$ (3) $\frac{2ML}{EI}, \frac{2ML^2}{EI}$ (4) $\frac{ML}{EI}, \frac{2ML^2}{EI}$

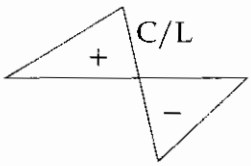
कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

35. Influence line diagram for B.M. at P for cantilever as shown is :



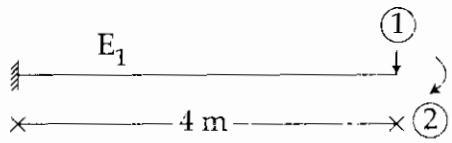
(1) 

(2) 

(3) 

(4) 

36. Displacement coordinators for the beam are as shown in figure. The flexibility matrix is given by :



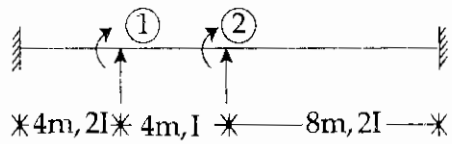
(1) $\frac{1}{E_1}\begin{bmatrix} 64/3 & -8 \\ -8 & 64 \end{bmatrix}$

(2) $\frac{1}{E_1}\begin{bmatrix} 64/3 & 8 \\ 8 & -64/3 \end{bmatrix}$

(3) $\frac{1}{E_1}\begin{bmatrix} 64/3 & 8 \\ 8 & 4 \end{bmatrix}$

(4) $\frac{1}{E_1}\begin{bmatrix} 4 & -8 \\ -8 & 64/3 \end{bmatrix}$

37. Displacement coordinators for the beam are as shown in figure. The stiffness matrix is given by :



(1) $E_1\begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$

(2) $E_1\begin{bmatrix} 3 & -0.5 \\ -0.5 & 2 \end{bmatrix}$

(3) $E_1\begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix}$

(4) $E_1\begin{bmatrix} 3 & 0.5 \\ 0.5 & 2 \end{bmatrix}$

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

38. A parabolic three hinged arch ABC is supporting Uniformly Distributed Load of 500 N/m over its entire span of 100 m. The center point 'B' is vertically 25 m high from supports A and C. The reactions shall be _____.

(1) 50 kN horizontal and vertical reactions at each support

(2) 25 kN horizontal and 50 kN vertical reaction at each support

(3) 50 kN horizontal and 25 kN vertical reaction at each support

(4) 25 kN horizontal and vertical reactions at each support

---

39. The stiffness matrix of a beam is given as :

$$K \times \begin{bmatrix} 12 & 4 \\ 4 & 5 \end{bmatrix}$$

Calculate the flexibility matrix.

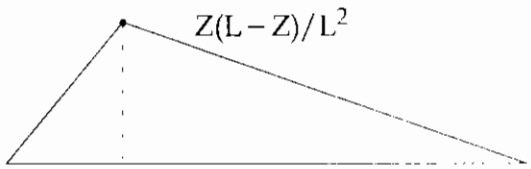
Flexibility matrix will be _____.

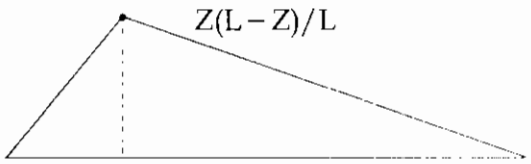
(1) $\frac{K}{44}\begin{bmatrix} 12 & -4 \\ -4 & 5 \end{bmatrix}$ (2) $\frac{K}{44}\begin{bmatrix} 12 & 4 \\ 4 & 5 \end{bmatrix}$

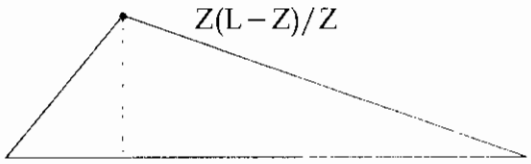
(3) $\frac{1}{44\,K}\begin{bmatrix} 12 & -4 \\ -4 & 5 \end{bmatrix}$ (4) $\frac{1}{44\,K}\begin{bmatrix} 5 & -4 \\ -4 & 12 \end{bmatrix}$

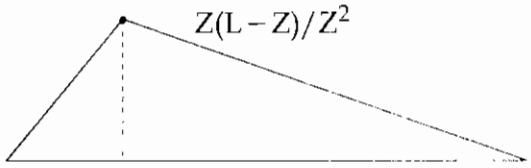
कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

40. For a simply supported beam AB of span L with point load W at point C, Z m from left support, ILD for bending moment at C (M_c) is :

(1) 

(2) 

(3) 

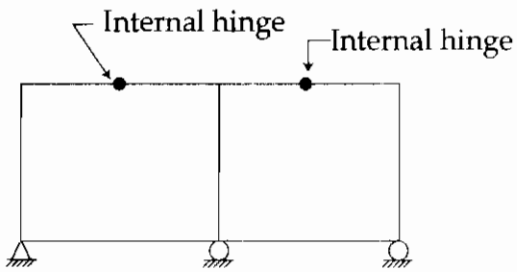
(4) 

41. The cable and arch are subjected to axial forces respectively as, _____.

(1) Tensile and Compressive (2) Compressive and Tensile

(3) Tensile and Tensile (4) Compressive and Compressive

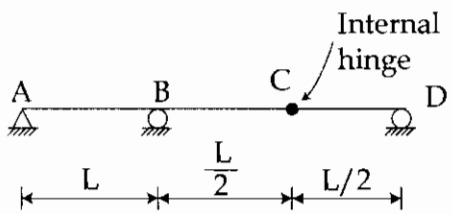
42. Degree of static indeterminancy for the frame shown below is _____.



(1) 8 (2) 7 (3) 6 (4) 5

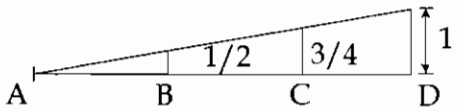
कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

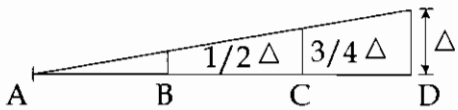
43. For the continuous beam shown in figure, the ILD for reaction at D is _____.



(1) 

(2) 

(3) 

(4) 

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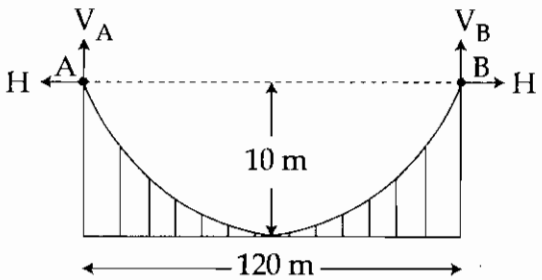
44. A cable of span 120 m and dip 10 m carries a load of 6 kN/m of horizontal span. The maximum tension in the cable is _____.



(1) 1238.42 kN (2) 1138.42 kN (3) 1038.42 kN (4) 1338.42 kN

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

45. For simply supported beam of span 10 m, Influence line diagram is drawn for bending moment at a section 4 m from left hand support. The maximum bending moment at the section due to moving point load of 160 kN is equal to _____.

(1) 640 kN-m (2) 960 kN-m (3) 384 kN-m (4) 400 kN-m

46. Spot welding is used when two plates are placed :

(1) One below the other (2) One butting against the other

(3) One next to other (4) At right angles to each other

47. An angle section can be used as purlin when slope of the roof truss is :

(1) between 40° and 70° (2) less than 30°

(3) greater than 30° (4) less than 45°

48. The purpose of stiffness in a plate girder is to :

(1) Prevent buckling of web

(2) Increase moment carrying capacity of the girder

(3) Reduce the shear stress

(4) Take care of bearing stress

49. The anchor bolts are provided to check the :

(1) settlement of foundation (2) punching shear of base plate

(3) uplift of base plate (4) moment of base plate

50. The economical range of spacing of roof trusses is :

(1) $\frac{1}{2}$ to $\frac{1}{3}$ of span (2) $\frac{1}{2}$ to $\frac{1}{4}$ of span

(3) $\frac{1}{4}$ to $\frac{1}{6}$ of span (4) $\frac{1}{3}$ to $\frac{1}{5}$ of span

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

51. The behaviour of a beam column cross section is expressed by which of the following relationship ?

(1) Moment - Curvature (2) Moment - Axial compression

(3) Axial compression - Curvature (4) Moment - Curvature - Axial compression

52. The plate used as a connecting piece at the intersection of two or more members in a roof truss is called as :

(1) Template (2) Gusset plate (3) Base plate (4) Shoe plate

53. The thickness of the base plate is determined from the :

(1) Flexural strength of the plate.

(2) Shear strength of the plate.

(3) Bearing strength of the concrete pedestal.

(4) Punching criteria.

54. The metal added at the joint while welding is known as _____.

(1) weld metal (2) filler

(3) fillet metal (4) all the above are correct

55. Which of the following statement is **correct** for reducing web buckling due to diagonal compression ?

(1) Not providing web stiffners to increase shear strength

(2) Providing web stiffner to reduce shear strength

(3) Increasing depth to thickness ratio

(4) Reducing depth to thickness ratio

56. The design shear stress for which of the following weld types is same as that for fillet welds ?

(1) Plug weld only (2) Slot weld only

(3) Plug and Slot weld only (4) Slot and Butt weld only

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

57. A column c/s 300 mm × 400 mm, 2250 mm long fixed at one end and free at other end. The ratio of effective length to the least lateral dimension is :

(1) 7.5 (2) 15 (3) 11.25 (4) 9

58. In design of slab, as per IS-456, what should be minimum percent of distribution steel if Fe 415 reinforcement is used ?

(1) 0.12% of total cross section (2) 0.15% of total cross section

(3) 0.50% of total cross section (4) 1% of total cross section

59. What is the maximum diameter of main reinforcement used in the slab of overall thickness 160 mm as per IS 456-2000 ?

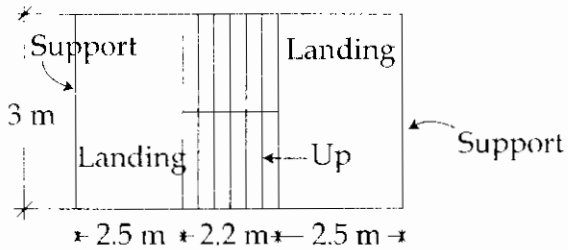
(1) 10 mm (2) 12 mm (3) 16 mm (4) 20 mm

60. For the design of staircase, self weight of waist slab is calculated as _____. Where, T = Tread, R = Riser and D = depth of waist slab, γ_c = density of R.C.C.

(1) $\gamma_c \cdot D$ (2) $\gamma_c \cdot D \cdot \left(\frac{T}{\sqrt{R^2 + T^2}} \right)$

(3) $\gamma_c \cdot \frac{\sqrt{T^2 + R^2}}{T}$ (4) $\gamma_c \cdot D \cdot \frac{\sqrt{T^2 + R^2}}{T}$

61. What is the effective span of staircase supported at each end by edge of the landing slab, which spans parallel, with the risers, if width of both landings is 2.5 m and going of stair is 2.2 m (see fig.) :



(1) 7.2 m (2) 4.7 m (3) 4.2 m (4) 2.2 m

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

62. In the design of retaining wall, both, active earth pressure and passive earth pressure is considered due to soil available on both sides (with different heights) of R.C.C. retaining wall. If angle of repose, $\phi = 30°$, then what will be the relation between coefficient of active earth pressure (K_a) and passive earth pressure (K_p) ?

(1) $K_a = \frac{1}{3}K_p$ (2) $K_a = 3K_p$ (3) $K_a = 9K_p$ (4) $K_a = \frac{1}{9}K_p$

63. What is the effective span of staircase, supported at each end by landing spanning parallel with the risers, if the width of landing is 2.5 m, width of starting passage is 1.5 m and going of the stair is 2.2 m ?

(1) 6.2 m (2) 4.2 m (3) 3.95 m (4) 4.5 m

64. The minimum area of tension reinforcement shall be not less than _____ for design of beam.

(1) $\frac{0.87}{f_y}$ bD (2) $\frac{0.85}{f_y}$ bd (3) $\frac{0.67}{f_y}$ bD (4) $\frac{0.76}{f_y}$ bd

65. For high yield strength deformed bars of grade Fe 500, the permissible stress in direct tension and flexure tension shall be _____ used in working stress method.

(1) 0.87 f_y (2) 0.67 f_y (3) 0.55 f_y (4) 0.48 f_y

66. If, in any given plane, one end of the column is unrestrained, its unsupported length 'l' shall not exceed _____. Where 'b' is width and 'D' is depth of cross section in plane under consideration.

(1) $\frac{100\ b}{D}$ (2) $\frac{100\ b^2}{D}$ (3) $\frac{100\ D}{b}$ (4) $\frac{100\ D^2}{b}$

67. If top of earth retained is horizontal, the coefficient of passive earth pressure for retaining wall become :

(1) $C\rho = \frac{1 - \sin\phi}{1 + \sin\phi}$ (2) $C\rho = \frac{1 + \sin\phi}{1 - \sin\phi}$

(3) $C\rho = \frac{\sin\phi - 1}{\sin\phi + 1}$ (4) $C\rho = \frac{\sin\phi + 1}{\sin\phi - 1}$

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

68. A concrete beam is post-tensioned by a cable carrying an initial stress of 1000 N/mm^2, the slip at jacking end was observed to be 5 mm, modulus of steel is 210 kN/mm^2 and span of beam is 30 m; what is % of loss of stress due to anchorage ?

(1) 3.5% (2) 2.5% (3) 1.5% (4) 4.0%

69. The rate of increase of stress is large in case of :

(1) Bonded beams (2) Unbonded beams

(3) Tensioned beams (4) Anchorage beams

70. A simply supported prestressed concrete beam of span 10 m is subjected to a point load of 10 kN at centre. Prestressing force of 2000 kN is applied through inclined tendon, zero eccentricity at support and 'e' at mid-span. To nullify the external point load effect, how much 'e' should be provided ? Neglect the self weight of beam.

(1) 12.5 mm (2) 50 mm (3) 70 mm (4) 85 mm

71. In a prestressed concrete beam, the ratio of applied prestressing force (P) to the concrete capacity of the section in compression is known as

(1) Moment ratio (R) (2) Eccentricity Ratio (ϵ)

(3) Reinforcement Ratio (m) (4) Efficiency factor (ρ)

72. The minimum transverse reinforcement in prestressed concrete beam is given by formula :

(1) $\frac{b S_V}{A_{S_V}} = \frac{0.87 f_y}{0.4}$ (2) $\frac{A_{S_V}}{b S_V} = \frac{0.4}{0.87 f_y}$

(3) $\frac{A_{S_V}}{0.87 f_y} = \frac{0.4}{b S_V}$ (4) $\frac{b S_V}{0.87 f_y} = \frac{A_{S_V}}{0.4}$

73. The net downward force of pre-stressed concrete beam with bent tendon is given as :

(1) $w - 2p \sin\theta$ (2) $w + 2P \sin\theta$

(3) Zero (4) 2

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

74. High tensile bars threaded at the ends are used in :

(1) Freyssinet system (2) Gifford - Udall system

(3) Lee - McCall system (4) Magnel - Blaton system

---

75. A post tensioned concrete beam is prestressed by means of three cables each 100 mm^2 area and stressed to 1100 MPa. All three cables are straight and located at an eccentricity of 50 mm. If modular ratio (m) = 6 and stress in concrete at the level of steel (f_c) = 5 MPa, then what is the loss of stress in cables due to elastic shortening if all cables are simultaneously tensioning and anchoring ?

(1) 90 MPa (2) 60 MPa (3) 30 MPa (4) 0 MPa

---

76. At the time of initial tensioning, the maximum tensile stress f_{pi} immediately behind the anchorage shall not exceed _____ of the ultimate tensile strength f_{pu} of the wire or bar or strand.

(1) 55% (2) 69% (3) 76% (4) 85%

---

77. A system usually adopted in the production of pre-tensioned members like railway sleepers, poles, etc on large scale is _____.

(1) Magnel-Blaton system (2) P.S.C. Monowire system

(3) Hoyer system (4) Gifford-Udall system

---

78. On the areas immediately behind external anchorages, the permissible unit bearing stress on the concrete, after accounting for losses due to relaxation of steel, elastic shortening and seating of anchorages, shall not exceed _____.

(1) $0.48 f_{ci} \sqrt{\frac{A_{bearing}}{A_{punching}}}$ or $0.8 f_{cK}$ whichever is smaller

(2) $0.45 f_{ci} \sqrt{\frac{A_{bearing}}{A_{punching}}}$ or $0.40 f_{cK}$ whichever is smaller

(3) $0.48 f_{ci} \sqrt{\frac{A_{bearing}}{A_{punching}}}$ or $0.76 f_{cK}$ whichever is smaller

(4) $0.40 f_{ci} \sqrt{\frac{A_{bearing}}{A_{punching}}}$ or $0.78 f_{cK}$ whichever is smaller

---

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

79. Independent float of an activity (i, j) is denoted by IF (i, j). The earliest occurrence times of i and j are denoted by E_i and E_j respectively. The latest occurrence times of i and j are denoted by L_i and L_j respectively. $D(i, j)$ indicates the duration of the activity. Select **correct** option giving IF (i, j) :

(1) $E_j - L_i - D(i, j)$ (2) $L_j - E_i - D(i, j)$

(3) $L_j - E_j - D(i, j)$ (4) $E_j - E_i$

80. A part of quality management system, that indicates the degree to which design quality is achieved in the actual construction work is called :

(1) Quality Assurance (2) Quality of design

(3) Quality of conformance (4) Quality of performance

81. Which among the following equipment found suitable for removing material from coffer dam, sewer manholes and well foundations ?

(1) Clamshell (2) Power shovel (3) Dragline (4) Back hoe

82. The following technique is not a quality control method ____ ____ ____.

(1) Inspection (2) Testing (3) Designing (4) Sampling

83. The PERT is a management tool, having expected mean time (t_m), optimistic time (t_o) and persimistic time (t_p), where the variance is given by ____ ____.

(1) $\frac{t_p - t_o}{6}$ (2) $\frac{t_o + 4\,t_m + t_p}{6}$

(3) $(t_p - t_o)^2$ (4) $\left(\frac{t_p - t_o}{36}\right)^2$

84. When was the National Safety Council set up in India ?

(1) 1966 (2) 1867 (3) 1948 (4) 1962

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

85. Items of 'C' type are identified for a project using ABC analysis. Which of the following statements are true for them ?

(a) Even rough quantity estimate is sufficient

(b) Bulk ordering is preferred

(c) Ordering on EOQ basis is preferred

(d) Even junior level staff is authorized to order

Answer Options :

(1) All of the above (2) (a), (b) and (d)

(3) Only (c) (4) None of the above

---

86. Which of the following is **not** a type of drilling equipment ?

(1) Jack Hammer (2) Shot drill (3) Drifter (4) Ripper

---

87. Which among the following construction equipment would you recommend for compaction of cohesive soil ?

(1) Smooth - Wheeled Rollers (2) Sheep Foot Rollers

(3) Vibratory Rollers (4) Tampers

---

88. A construction company has annual demand of 200 M.T. of steel. The annual cost of carrying per M.T. of steel is ₹ 2,000 and the cost to place an order is ₹ 50,000. What is the economic order quantity ?

(1) 50 M.T. (2) 70.7 M.T. (3) 100 M.T. (4) 40 M.T.

---

89. Which are some of the factors to be considered while designing site layout ?

(a) Construction sequence (b) Quantity of materials to be stored

(c) Parking of workers (d) Sanitary facilities

(e) Soil conditions

Answer Options :

(1) (a), (b), (c) and (d) (2) All of the above

(3) (a) and (b) (4) (a), (b) and (e)

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

P.T.O.

90. The convergence in the Bisection method is _____.

(1) non linear (2) linear (3) exponential (4) all of the above

---

91. The curve in a trapezoidal rule passing through the coordinates of a straight line has a polynomial of _____.

(1) First order (2) Second order (3) Third order (4) Fourth order

---

92. The Bisection method is also known as _____.

(1) Quaternary chopping (2) Tri-region chopping

(3) Binary chopping (4) Hex-region chopping

---

93. Newton - Raphson method has _____.

(1) first order convergence (2) second order convergence

(3) first order divergence (4) second order divergence

---

94. The value of $\int_{-3}^{3} x^4 \, dx$ by using Trapezoidal rule is :

(1) 112 (2) 114 (3) 113 (4) 115

---

95. A river is 80 metre wide. The depth 'd' in metres at a distance 'x' metres from one bank is given, by the following table :

x :	0	10	20	30	40	50	60	70	80
d :	0	4	7	9	12	15	14	8	3

Hence the area of c/s of the river using Simpson's rule is :

(1) 713 sq. met. (2) 710 sq. met. (3) 715 sq. met. (4) 716 sq. met.

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

96. The quadratic equation $2x^2+3x+8=0$ is to be solved numerically starting with an initially value as $x_0=2$. The new estimate of x after the first iteration using Newton Raphson method is _____.

(1) 4 (2) 1 (3) 0 (4) -1

97. Bisection method is based on the repeated application of the _____ value property.

(1) intermediate (2) mediate (3) convergent (4) divergent

98. In Gauss Jordan method which of the following transformations are allowed :

(1) Diagonal transformations (2) Column transformations

(3) Row transformations (4) Square transformations

99. A cross-section area of river flow can be calculated by using following formula _____.

(1) Simpson's rule (2) Trapezoidal rule

(3) Both (1) and (2) (4) Thumb rule

100. Evaluate $\int_0^2 \frac{1}{2x+1}$ by using Trapezoidal rule. Take number of intervals = 2 (with each step = 1).

(1) 0.867 (2) 0.933 (3) 1.267 (4) 1.333

- o 0 o -

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK

सूचना — (पृष्ठ 1 वरून पुढे....)

(8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82" यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

(9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वत:बरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. **मात्र परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.**

नमुना प्रश्न

Pick out the correct word to fill in the blank :

Q. No. 201. I congratulate you _____ your grand success.

(1) for (2) at

(3) on (4) about

ह्या प्रश्नाचे योग्य उत्तर "(3) on" असे आहे. त्यामुळे या प्रश्नाचे उत्तर "(3)" होईल. यास्तव खालीलप्रमाणे प्रश्न क्र. 201 समोरील उत्तर-क्रमांक "(3)" हे वर्तुळ पूर्णपणे छायांकित करून दाखविणे आवश्यक आहे.

प्र. क्र. 201. ① ② ● ④

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तर-क्रमांक हा तुम्हाला स्वतंत्ररीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित वर्तुळ पूर्णपणे छायांकित करून दाखवावा. **ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.**

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK