महाराष्ट्र राजपत्रित तांत्रिक सेवा (मुख्य) स्पर्धा परीक्षा
अभियांत्रिकी सेवा (स्थापत्य) गट-अ व ब मुख्य परीक्षा 2022

प्रश्नपुस्तिका क्रमांक
BOOKLET No.

2022

102141

प्रश्नपुस्तिका – I **H17** संच क्र. **A**

स्थापत्य अभियांत्रिकी पेपर – I

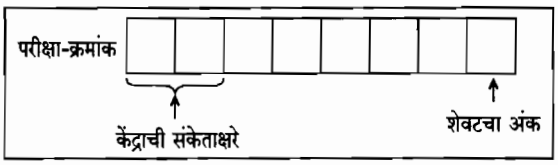
एकूण प्रश्न : 100
एकूण गुण : 200

वेळ : 2 (दोन) तास

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 प्रश्नाकडे 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. एकापेक्षा जास्त उत्तरे नमूद केल्यास ते उत्तर चुकीचे धरले जाईल व त्या चुकीच्या उत्तराचे गुण वजा केले जातील.

(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 चुकीच्या उत्तरांसाठी 25% किंवा 1/4 गुण वजा/कमी 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 व्यक्तीविरूद्ध 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 a given long column subjected to load, product of failure stress and slenderness ratio will be

(1) Constant

(2) Variable – depending on support condition

(3) Variable – depending on value of load

(4) Variable – depending on length of column

---

2. A mild steel rod of area 3140 mm^2 is fixed at one end and the other end pulls gradually till it reaches 628 kN force in axial direction. If the force is removed at this stage, then

(1) the rod regains its original shape and size

(2) the rod regains its original shape but not the size

(3) the rod shows neck formation at centre

(4) the rod neither regains its original shape nor the size

---

3. When a shaft of diameter D is subjected to a twisting moment T and a bending moment M, then the maximum normal stress is given by

(1) $\frac{16}{\pi D^3}\left[\sqrt{M^2+T^2}\right]$ (2) $\frac{16}{\pi D^3}\left[\sqrt{M^2-T^2}\right]$

(3) $\frac{16}{\pi D^3}\left[M-\sqrt{M^2+T^2}\right]$ (4) $\frac{16}{\pi D^3}\left[M+\sqrt{M^2+T^2}\right]$

---

4. A cantilever beam AB of span 5 m is fixed at end A while force at end B is subjected to a point load of 20 kN at 2 m from end A. What is the value of shear force and bending moment at 3 m from end A ?

(1) 20 kN, 60 kNm (2) 20 kN, 40 kNm

(3) 20 kN, 0 (4) 0, 0

---

5. As per middle third rule, the eccentricity 'e' in a rectangular section should be _____ . (Where, b is the width at the base)

(1) $\leq b/2$ (2) $\leq b/3$

(3) $\leq 2b/3$ (4) $\leq b/6$

---

6. _____ for buckling of column gives fairly correct result for all cases of columns ranging from short to long columns.

(1) Euler's formula

(2) Rankine's formula

(3) Mohr's formula

(4) Coulomb's formula

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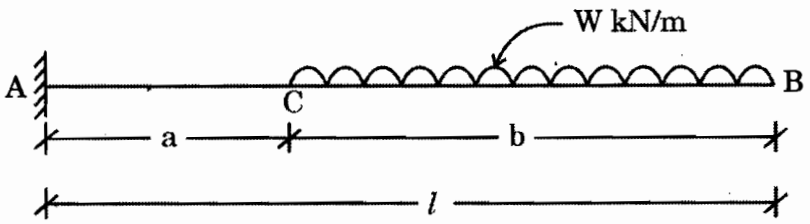
7. A cantilever beam AB as shown in the figure is subjected to uniformly distributed load (W) kN/m over a length of 'b' m from the free end B, then what is the bending moment at fixed end A ?



(1) $W.b\,(2a + \frac{b}{2})$ (2) $W.b\frac{(a+l)}{2}$

(3) $W.b\,(\frac{l}{2})$ (4) $W.a\,(a + \frac{b}{2})$

---

8. Calculate the torque which a shaft of 3 cm diameter can safely transmit, if the shear stress is 48 N/cm^2.

(1) $1{\cdot}27\pi$ N.cm (2) 81π N.cm

(3) 54π N.cm (4) 48π N.cm

---

9. The angle of twist of a shaft can be written as

(Where J – Polar MI,

G – Torsional Rigidity

L – Length

T – Torque)

(1) T.L/J (2) GJ/T.L

(3) T.L/GJ (4) T/J

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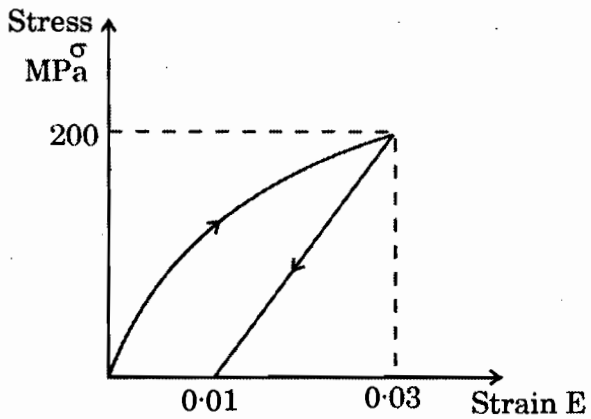
10. The loading and unloading response of a metal is shown in the figure. The elastic and plastic strain corresponding to 200 MPa stress, respectively are



(1) 0·02 and 0·01

(2) 0·02 and 0·02

(3) 0·01 and 0·01

(4) 0·01 and 0·02

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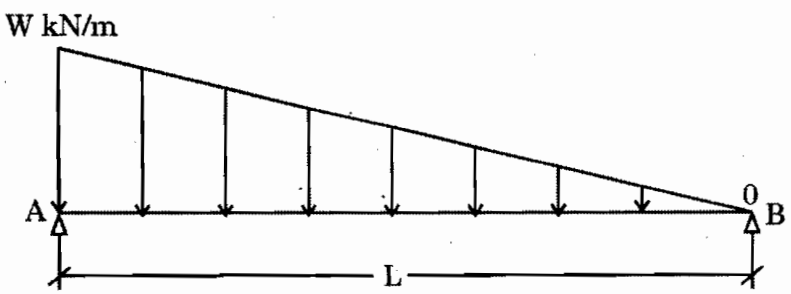
11. An SS beam AB of span 'L' is subjected to uniformly varying load of zero at end B to W kN/m at end A as shown in the figure, then what is the position of zero shear force from support B ?



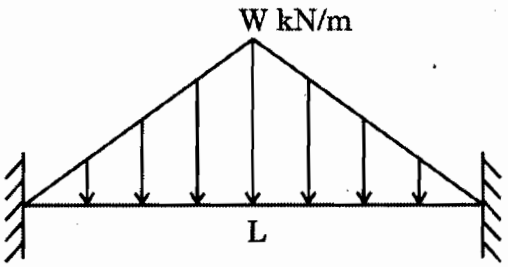
(1) $\frac{l}{\sqrt{2}}$

(2) $\frac{2l}{\sqrt{3}}$

(3) $\frac{3l}{\sqrt{2}}$

(4) $\frac{l}{\sqrt{3}}$

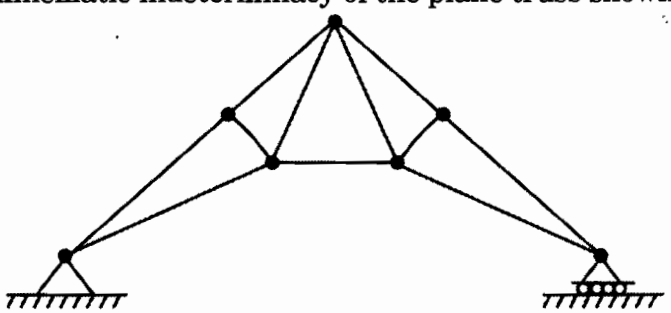
12. Fixed end moments for the beam as shown in the figure are (anticlockwise moments are positive)



(1) $\frac{WL^2}{30}, -\frac{WL^2}{20}$ (2) $\frac{3WL^2}{96}, -\frac{3WL^2}{96}$

(3) $\frac{5WL^2}{48}, -\frac{5WL^2}{48}$ (4) $\frac{5WL^2}{96}, -\frac{5WL^2}{96}$

13. The kinematic indeterminacy of the plane truss shown in the figure is



(1) 11 (2) 8 (3) 3 (4) 0

14. A cantilever of length l has flexural rigidity EI for half span and EI/2 for rest. The beam carries moment M at the free end. The slope at the free end is given by

(1) $\frac{Ml}{EI}$ (2) $\frac{Ml^2}{EI}$

(3) $\frac{2}{3}\frac{Ml}{EI}$ (4) $\frac{3}{2}\frac{Ml}{EI}$

15. The relative stiffness of a member at a joint whose farther end is hinged or simply supported is

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

(3) $\frac{l}{I}$ (4) $\frac{I}{l}$

16. In the moment area method, the change of slope between any two sections of a loaded flexural member is equal to the

(1) Area of the $\frac{M}{EI}$ diagram between these two sections

(2) Moment of the $\frac{M}{EI}$ diagram between these two sections

(3) $\frac{1}{2}\times$ Area of the $\frac{M}{EI}$ diagram between these two sections

(4) $\frac{1}{2}\times$ Moment of the $\frac{M}{EI}$ diagram between these two sections

---

17. Pick up the correct statement.

(a) In the frame analysis, using unit load method, the directions of deflection and rotation components are the same as, or the opposite to that of the unit load or the unit moment, depending on whether the answer obtained is positive or negative.

(b) Since the axial deformation of the members in a rigid frame owing to the direct axial stresses in them is always small, it can be neglected.

Answer options :

(1) Both (a) and (b) are correct

(2) Both (a) and (b) are incorrect

(3) (a) is correct; (b) is incorrect

(4) (a) is incorrect; (b) is correct

---

18. Pick up the correct methods that correspond to displacement method.

(a) Stiffness matrix method

(b) Flexibility matrix method

(c) Slope-deflection method

(d) Method of consistent deformation

Answer options :

(1) (a) and (b) (2) (a) and (c)

(3) (b) and (c) (4) (a) and (d)

---

19. Pick up the correct statement with respect to slope-deflection method.

(a) In this method all joints are considered as rigid.

(b) In this method, the angles between members at the joints are considered not to change in value as loads are applied.

Answer options :

(1) Both (a) and (b) are correct

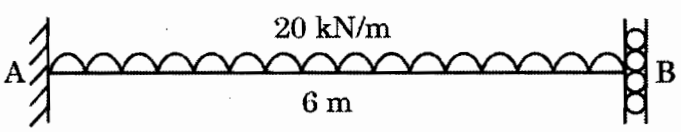
(2) Both (a) and (b) are incorrect

(3) (a) is correct; (b) is incorrect

(4) (a) is incorrect; (b) is correct

---

20. Choose the correct slope-deflection equation for member AB in the beam as shown in the figure. Take anticlockwise moment to be positive.



(1) $M_{AB} = 60 + EI\Delta_B/6$; $M_{BA} = -60 + EI\Delta_B/6$

(2) $M_{AB} = 60 - EI\Delta_B/6$; $M_{BA} = -60 - EI\Delta_B/6$

(3) $M_{AB} = 60 + 2EI\theta_B$; $M_{BA} = -60 + 2EI\theta_B$

(4) $M_{AB} = 60 - 2EI\theta_B$; $M_{BA} = -60 - 2EI\theta_B$

---

21. Whenever one of the supports of a beam is at a lower level as compared to the other, it will cause a moment at both ends

(1) $\frac{4EI\theta}{L}$ (2) $\frac{2EI\theta}{L}$ (3) $\frac{6EI\Delta}{L^2}$ (4) $\frac{12EI\Delta}{L^3}$

---

22. The maximum deflection of a cantilever of 10 m span, an EI = 200·0 MN/m^2 subjected to a distributed load of 8·0 kN/m is

(1) 20 mm (2) 50 mm

(3) 225 mm (4) 500 mm

---

23. For a two-hinged arch, if one of the supports settles down vertically, then the horizontal thrust

(1) is decreased

(2) is increased

(3) becomes zero

(4) remains unchanged

---

24. A suspension cable, having supports at the same level, has a span of 30 m and a maximum dip of 3 m. The cable is loaded with a uniformly distributed load of 10 kN/m throughout its length. Find the Horizontal Pull in the cable.

(1) 375 kN

(2) 275 kN

(3) 475 kN

(4) 140 kN

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25. Match the following :

	Cable subjected to		*Shape of Cable*
(a)	Single concentrated point load	(i)	Triangular
(b)	Uniform load/horizontal length	(ii)	Parabola
(c)	Uniform load along its length	(iii)	Catenary

Answer options :

	(a)	**(b)**	**(c)**
(1)	(ii)	(iii)	(i)
(2)	(i)	(ii)	(iii)
(3)	(iii)	(ii)	(i)
(4)	(i)	(iii)	(ii)

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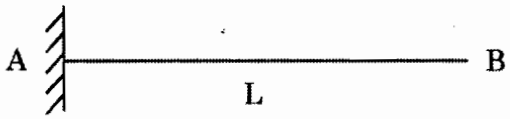
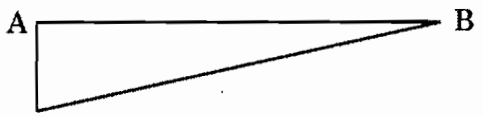
26. A parabolic three-pinned arch has a span of 20 m and central rise 4 m. It is loaded with a uniformly distributed load of 20 kN/m for a length of 8 m from the left end support. Find the horizontal thrust at supports.

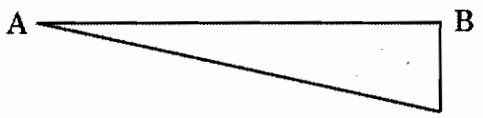
(1) 48 kN (2) 8 kN (3) 80 kN (4) 98 kN

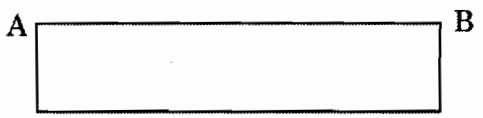
27. Influence line diagram (ILD) for the shear force at the support of the cantilever beam is

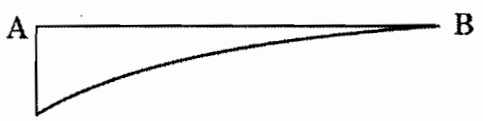


Answer options :

(1)


(2)


(3)


(4)


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28. A three-hinged parabolic arch of span 20 m has a central rise of 5 m. Find the rise of the arch crown, if the temperature rises through 30°C. Take coefficient of linear expansion for the arch material as 12×10^{-6} per °C.

(1) 28 mm (2) 81 mm (3) 58 mm (4) 18 mm

---

29. The order of flexibility matrix of a structure is

(1) Equal to the number of redundant forces

(2) More than the number of redundant forces

(3) Less than the number of redundant forces

(4) Equal to the number of redundant forces plus three

---

30. A uniformly distributed load of 50 kN/m longer than span, rolls over a beam of 25 m span. Using Influence lines, determine the maximum shear force.

(1) 125 kN (2) 225 kN (3) 260 kN (4) 525 kN

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31. A three-hinged parabolic arch of span 20 m and rise 4 m carries uniformly distributed load of 20 kN/m on the entire span. What will be the horizontal thrust H at the support ?

(1) 500 kN (2) 250 kN (3) 125 kN (4) 200 kN

32. A simply supported beam has a span of 20 m. A uniformly distributed load of 20 kN/m and 5 meters long crosses the span. Find maximum bending moment.

(1) 520 kN.m (2) 320 kN.m (3) 420 kN.m (4) 240 kN.m

33. When a rolling train is moving on a girder, then absolute maximum bending moment will be obtained when

(1) maximum load is placed on the middle of the girder.

(2) maximum load is placed such that middle of girder is equidistant from maximum load and resultant load.

(3) resultant load is placed on the middle of the girder and other loads are placed accordingly.

(4) maximum load is placed on the middle of the girder and other loads are placed accordingly.

34. "A steel section in which all fibers are stressed to yield stress at failure."

The above statement is true for _____.

(1) plastic and compact sections

(2) compact section only

(3) semi-compact section only

(4) plastic section only

35. As per IS-800 : 2007, the factored design moment 'M', at any section, in a beam due to external actions, shall satisfy _____.

(1) $M \leq Md$ (2) $M \geq Md$ (3) $M = 2Md$ (4) $2M = Md$

36. The partial safety factor for the material of bolts is _____.

(1) 1·0 (2) 1·10 (3) 1·15 (4) 1·25

37. Pick up the correct statement that corresponds to welded connection.

(a) The effective throat thickness of a complete penetration butt weld shall be taken as the thickness of the thinner part joined.

(b) The effective throat thickness of a complete penetration butt weld shall be taken as minimum thickness of the weld metal common to the parts joined excluding reinforcement.

Answer options :

(1) Both (a) and (b) are correct

(2) (a) is correct and (b) is incorrect

(3) (a) is incorrect and (b) is correct

(4) Both (a) and (b) are incorrect

---

38. As per IS-800, the thickness of lacing flat for a single lacing system should not be less than the effective length of lacing multiplied by _____.

(1) $\frac{1}{40}$ (2) $\frac{1}{50}$ (3) $\frac{1}{60}$ (4) $\frac{1}{45}$

---

39. While designing the roof trusses, generally the following type of load is not considered as per IS-875 :

(1) Dead load (2) Wind load

(3) Snow load (4) Moving load

---

40. Which are the possible failure modes of axially loaded columns ?

(a) Local buckling

(b) Overall flexural buckling

(c) Torsional buckling

(d) Flexural-torsional buckling

Answer options :

(1) (a), (b) and (c) (2) (b), (c) and (d)

(3) All of the above (4) (a), (c) and (d)

---

41. While designing the butt welds, which of the following conditions is most appropriate for tapering ?

(1) Difference in thickness of parts exceeds 50% of the thickness of thinner plate or 6 mm.

(2) Difference in thickness of parts exceeds 75% of the thickness of thinner plate or 9 mm.

(3) Difference in thickness of parts exceeds 25% of the thickness of thinner plate or 3 mm.

(4) None of the above

---

42. According to IS-800 : 2007, the design strength of tension members under axial tension as governed by yielding of gross section is given by _____ .

(1) $T_{dg} = \frac{A_g \cdot \gamma_{mo}}{f_y}$ (2) $T_{dg} = \frac{\gamma_{mo} \cdot f_y}{A_g}$

(3) $T_{dg} = \frac{A_g \cdot f_y}{\gamma_{mo}}$ (4) $T_{dg} = A_g \cdot \gamma_{mo} \cdot f_y$

---

43. The deflection at a node of pin-jointed truss using strain-energy method is given by _____ .

(1) $\delta = \sum P^2UL/AE$ (2) $\delta = \sum PUL/AE$

(3) $\delta = \sum PUL^2/AE$ (4) $\delta = \sum PUL/AE^2$

---

44. According to IS-800 : 2007, the maximum effective slenderness ratio for compression flange of a beam against lateral torsional buckling is _____.

(1) 150 (2) 180 (3) 250 (4) 300

---

45. The maximum strain in concrete at the outermost compression fibre is taken as _____ in bending.

(1) 0·3500 (2) 0·0350 (3) 0·0035 (4) 0·00035

---

46. The minimum area of tension reinforcement shall not be less than _____ of effective cross-section area of beam (i.e. bd), for Fe 500 grade of steel is used as reinforcement.

(1) 0·12% (2) 0·15% (3) 0·17% (4) 0·20%

---

47. Design bond stress for M20 grade concrete in limit state method for plain bars in tension shall be _____ N/mm^2.

(1) 1·4 (2) 1·2 (3) 1·6 (4) 1·8

---

48. When the lever arm of a reinforced concrete beam is Z and width of beam is b, then the maximum shear stress in a beam subjected to shear force F will be equal to

(1) $\frac{F.b}{Z}$ (2) $\frac{F}{b.Z}$ (3) $\frac{F.Z}{b}$ (4) F.Z.b

49. According to IS-456 : 2000, the area of tension reinforcement should not be less than _____ for slab with HYSD bars.

(1) 0·12% of Ag (2) 0·15% of Ag
(3) 0·18% of Ag (4) 0·20% of Ag

50. What is the effective depth of slab of size 4·5 m × 6 m if modification factor is 1·5 and live load on slab is 4·0 kN/m^2 ? Assume all edges of the slab are discontinuous.

(1) 100 mm (2) 115 mm (3) 125 mm (4) 150 mm

51. Recommended value of effective length of compression member, which is "effectively held in position and restrained against rotation at both ends" is _____ .

(1) 1·0 L (2) 0·75 L (3) 1·2 L (4) 0·65 L

52. For design purposes, the compressive strength of concrete in the structure shall be assumed to be _____ times the characteristic strength of concrete for design of flexure member using limit state method.

(1) 0·50 (2) 0·67 (3) 0·87 (4) 1·50

53. As per IS-456 : 2000, the ratio of the ultimate load carrying capacity of helically reinforced column to that of similar member with lateral tiles or rings is

(1) 1·10 (2) 1·05 (3) 1·00 (4) 1·20

54. The lever arm in a singly reinforced beam is equal to _____ .

(Where d = Distance between the top of beam and the centre of steel bars

n = Depth of neutral axis below the top of beam)

(1) $\frac{d-n}{3}$ (2) $\frac{2d-n}{3}$ (3) $\frac{3d-n}{3}$ (4) $\frac{4d-n}{3}$

55. A rectangular water tank is designed for total height of 3·3 m and bottom area of tank is 50 m^2 with L/B ratio of 2. If the free board is considered as 0·30 m above water level, then for what capacity is water tank to be designed ?

(1) 1,65,000 liters
(2) 1,80,000 liters
(3) 1,25,000 liters
(4) 1,50,000 liters

56. Pick up the correct statement with respect to tendon profile.

(a) In general, moments resulting from prestressing should vary in the same way as those moments due to the applied load and act in the opposite sense.

(b) The tendon profiles used for continuous spans are closely related to variation of bending moment due to the dead and live loads.

Answer options :

(1) Both (a) and (b) are correct

(2) Both (a) and (b) are incorrect

(3) (a) is correct and (b) is incorrect

(4) (a) is incorrect and (b) is correct

---

57. _____ and flexural rigidity are two fundamental properties by which short term deflections are determined.

(1) Shear force (2) Bending moment

(3) Torsional force (4) Twisting moment

---

58. In pre-tensioned work, the cover of concrete measured from the outside of the prestressing tendon shall be at least _____.

(1) 20 mm (2) 30 mm (3) 40 mm (4) 50 mm

---

59. Pick up the correct statement with respect to losses in prestress.

(a) The total residual shrinkage strain is larger in pre-tensioned members after transfer of prestress in comparison with post-tensioned members.

(b) There will be no loss due to elastic deformation of concrete under simultaneous tensioning and anchoring.

Answer options :

(1) Both (a) and (b) are correct

(2) Both (a) and (b) are incorrect

(3) (a) is correct; (b) is incorrect

(4) (a) is incorrect; (b) is correct

---

60. The distance required at the end of a pre-tensioned tendon for developing the maximum tendon stress by bond is known as _____ .

(1) Anchorage length (2) Development length

(3) Transmission length (4) Bearing length

---

61. What is the definition of anchorage in the case of post-tensioning ?

(1) A device used to anchor the tendon to the concrete member

(2) A device used to anchor the tendon during hardening of concrete

(3) A device used to transfer the stress

(4) A device used to stress the cables

---

62. The loss of prestress is due to creep of concrete obtained as the product of _____ of the prestressing steel and the ultimate creep strain of concrete fibre.

(1) Modulus of Elasticity (2) Shear modulus

(3) Bulk modulus (4) None of the above

---

63. Due to which reasons is high-strength concrete necessary in prestressed concrete ?

(1) To design commercial anchorage for prestressing steel

(2) High-strength concrete is less liable to shrinkage cracks

(3) High-strength concrete offers high resistance in tension and shear, as well as in bond and bearing

(4) All of the above

---

64. A loss of prestress will affect the _____ distribution on the section of the member.

(1) Strain (2) Stress (3) Shear (4) Bending

---

65. Which of the following systems is used for pre-tensioning ?

(1) Magnel Balton System (2) Freyssinet System

(3) Gifford Udall System (4) Hoyer's Long Line Method

---

66. What will be the loss of stress due to anchorage slip in a post-tensioned beam, if 'A' is the cross-section area of section, E_s = Modulus of elasticity of steel, E_c = Modulus of elasticity of concrete, Δ = Slip of anchorage, P = Prestressing force and L = Length of cables ?

(1) $\frac{PL}{AE_s}$ (2) $\frac{\Delta E_c}{L}$

(3) $\frac{\Delta E_s}{LE_c}$ (4) $\frac{\Delta E_s}{L}$

---

67. Match soil type and method giving highest degree of compaction, and select the correct answer using the options given below :

	Soil type		*Method of Compaction*
(a)	Sand	(i)	Kneading
(b)	Silt	(ii)	Vibration
(c)	Confined clay	(iii)	Impact

Answer options :

	(a)	**(b)**	**(c)**
(1)	(ii)	(i)	(iii)
(2)	(i)	(ii)	(iii)
(3)	(iii)	(ii)	(i)
(4)	(i)	(iii)	(ii)

---

68. The inventory control mechanism in ABC analysis is based on _____ .

(1) Value of consumption (2) Movement from store

(3) Necessity (4) None of the above

---

69. While designing structural elements for safety against fire, the fire resistance rating of these elements should be as per Codal provisions in

(1) IS-641 : 1988 (2) IS-646 : 1982

(3) IS-1435 : 1977 (4) IS-1642 : 1989

---

70. The time period available, if succeeding activity starts as early as possible and preceding activity ends as late as possible, is called as

(1) Free Float (2) Total Float

(3) Independent Float (4) Interfering Float

---

71. Safety measures to be adopted at the time of excavation should adhere to Codal provisions as per

(1) IS-3764 : 1972 (2) IS-4130 : 1991

(3) IS-1256 : 1958 (4) IS-800 : 1958

---

72. It is observed that the project duration is lengthened for increase in critical activity duration and vice versa. These activities are called as

(1) Neutral Critical Activities
(2) Reverse Critical Activities
(3) Normal Critical Activities
(4) Proportional Critical Activities

73. An activity in the PERT network has $t_0 = 1$, $t_m = 4$ and $t_p = 7$. How much will be expected duration of the activity ?

(1) 5 (2) 4 (3) 12 (4) 3

74. Which of the following are applicable to ladder networks ?

(a) These are more or less extensions of the arrow networks.
(b) These are useful for repetitive works.
(c) There are no dummy activities at all in such networks.

Answer options :

(1) Only (b) (2) Only (a) and (b)
(3) All of the above (4) Only (b) and (c)

75. The process in which the highest value EET (Earliest Event Time) is determined by adding activity duration to the EETs of the preceding event is called as

(1) Pass (2) Backward Pass
(3) Forward Pass (4) Critical Pass

76. Which of the following remarks is/are applicable to the bottom-slewing tower cranes ?

(a) They have height limitations
(b) They can be erected and dismantled quickly
(c) They are suitable for high rise construction
(d) Anchoring the crane with some fixed support is not possible

Answer options :

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

77. The first and most important step in computing critical path in PERT network is to

(1) Reduce three-time probabilistic network into a single time deterministic model.

(2) Convert three-time activity durations estimate into single event estimate.

(3) Analysing one-time estimate with the three-time event estimates.

(4) Convert uncertainties in events into activity certainties.

---

78. The FEM can be directly created from the _____ .

(1) Good model (2) Bad model

(3) CAD model (4) Excellent model

---

79. If $\phi(x) = x - \frac{f(x)}{f'(x)}$, then the condition for convergence of Newton-Raphson method is

(1) $\phi(x) > 1$ (2) $\phi(x) < 1$

(3) $\phi'(x) < 1$ (4) $\phi'(x) > 1$

---

80. How will you improve the accuracy of the trapezoidal rule ?

Consider the following statements for the answer :

(a) The integration interval shall be divided into a number of segments.

(b) The composite trapezoidal rule shall be used.

(c) The accuracy of the rule cannot be increased.

Which of the above statements is/are correct ?

(1) Only (c) (2) Only (a) and (b)

(3) Only (a) (4) Only (b)

---

81. Apply Gauss-Jordan method to solve the following equations :

$x + y + z = 9$

$2x - 3y + 4z = 13$

$3x + 4y + 5z = 40$

(1) $x = 1,\ y = 2,\ z = 3$ (2) $x = 3,\ y = 2,\ z = 1$

(3) $x = 1,\ y = 3,\ z = 5$ (4) $x = 2,\ y = 1,\ z = 3$

---

82. The bisection method is also known as

(1) Binary chopping

(2) Quaternary chopping

(3) Tri-region chopping

(4) Hex region chopping

---

83. The curve in a Simpson's rule passing through the coordinates of a parabola has a polynomial of _____ .

(1) First order (2) Second order

(3) Third order (4) Fourth order

---

84. Gauss-Seidal method is being used to solve the following system of equations :

$3x_1 - 0{\cdot}1x_2 - 0{\cdot}2x_3 = 7{\cdot}85$

$0{\cdot}1x_1 + 7x_2 - 0{\cdot}3x_3 = -19{\cdot}3$

$0{\cdot}3x_1 - 0{\cdot}2x_2 + 10x_3 = 71{\cdot}4$

In the first step x_2 and x_3 are set to zero. So what will be approximate estimate of 'x_1' in the first step ?

(1) 2·616667 (2) – 193·00

(3) 238·00 (4) – 2·794524

---

85. Which of the following indicates the formula for Simpson's rule ?

(1) $\Delta = \left(\frac{d}{3}\right) \times [(O_0 + O_n) + 4 \times (O_1 + O_3 + ...) + 2 \times (O_2 + O_4 + ...)]$

(2) $\Delta = \left(\frac{d}{3}\right) \times [(O_0 + O_n) + 2 \times (O_1 + O_3 + ...) + 2 \times (O_2 + O_4 + ...)]$

(3) $\Delta = \left(\frac{d}{3}\right) \times [\frac{(O_0 + O_n)}{2} + 4 \times (O_1 + O_3 + ...) + 2 \times (O_2 + O_4 + ...)]$

(4) $\Delta = \left(\frac{d}{3}\right) \times [(O_0 + O_n) + 2 \times (O_1 - O_3 + ...) + 4 \times (O_2 + O_4 + ...)]$

---

86. Which of the following is/are the technique/s for improving solutions as regards to the Gauss Elimination Method ?

(a) Use of more significant figures

(b) Pivoting if necessary

(c) Scaling if necessary

Answer options :

(1) Only (a)

(2) Only (c)

(3) All of the above

(4) None of the above

---

87. The procedure adopted in the Gauss-Jordan method in solving linear simultaneous equations is

(1) It is required to assume initial approximate values of the variables.

(2) It reduces the given system of equations to a diagonal matrix.

(3) It reduces the given system of equations to an equivalent triangular matrix.

(4) The given matrix is factored into lower and upper triangular matrices.

---

88. The reasons that the Gauss Elimination technique is called "naive" are listed below. Which of the following is/are correct ?

(a) "Division by zero" can occur during elimination.

(b) "Division by zero" can occur during back-substitution.

(c) The technique cannot be employed to transcedental equations.

Answer options :

(1) Only (c)

(2) Only (b) and (c)

(3) Only (a) and (b)

(4) All of the above

---

89. Which stones are considered unsuitable for construction ?

(1) Stones having specific gravity less than 2·5

(2) Stones having specific gravity greater than 2·5

(3) Stones having specific gravity in between 5·0 and 7·0

(4) Stones having specific gravity in between 3·5 and 4·5

90. Which part of National Building Code issued by BIS is for Fire Safety ?

(1) Part I (2) Part III (3) Part IV (4) Part II

91. The properties of ideal fire-resisting materials are

(a) It should not get disintegrated due to heat.

(b) It should not expand excessively due to heat.

(c) It should contract rapidly on cooling.

Which of the above statements is/are correct ?

(1) Only (a) and (b) (2) Only (b)

(3) All of the above (4) None of the above

92. As per IS-10262 : 2009, how much should the target strength of concrete be ?

(1) Characteristic Compressive Strength + 1·2 times Standard deviation

(2) Characteristic Compressive Strength + 1·75 times Standard deviation

(3) Characteristic Compressive Strength + 1·65 times Standard deviation

(4) Characteristic Compressive Strength + 1·80 times Standard deviation

93. The total area of mezzanine floor in a building should not exceed _____, generally as per building bye laws.

(1) $\frac{1}{3}$ of the plot area

(2) $\frac{1}{3}$ of the plinth area

(3) $\frac{1}{2}$ of the plot area

(4) $\frac{1}{2}$ of the plinth area

94. Which of the following is ***not*** the type of formwork used for concreting ?

(1) Standard (2) Universal

(3) Elementary (4) Special

95. Which range of slump (in mm) shall be adopted for vibrated concrete ?

(1) 12 to 25 (2) 50 to 100

(3) 5 to 10 (4) 25 to 50

---

96. A base in an oil paint performs functions such as

(a) Gives opacity to the paint.

(b) Increases resistance to abrasion.

(c) Prevents formation of shrinkage cracks.

Which of the above function/s is/are correct ?

(1) All of the above (2) Only (a)

(3) Only (a) and (c) (4) Only (b)

---

97. The ashlar masonry in which the exposed edges of stones are bevelled off at an angle of 45° is called

(1) Ashlar fine masonry

(2) Ashlar rough tooled masonry

(3) Ashlar quarry faced masonry

(4) Ashlar chamfered masonry

---

98. Portland Cement is produced by burning ingredients at what temperature ?

(1) 250°C

(2) 458°C

(3) 2300°C

(4) 1450°C

---

99. A RCC beam spans for 7·5 m. When will you allow removal of props for the same ?

(1) Any time after 7 days

(2) Any time after 14 days

(3) Any time after 21 days

(4) Any time after 3 days

---

100. Which IS code has classified the bricks according to their compressive strength ?

(1) IS-762 : 1998 (2) IS-10262 : 2000

(3) IS-1077 : 1992 (4) IS-456 : 1978

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 उत्तरक्रमांक 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