महाराष्ट्र अभियांत्रिकी (स्थापत्य) सेवा मुख्य पर

परीक्षा दि : १५ व १६ डिसेंबर 2012

प्रश्नपुस्तिका क्रमांक
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प्रश्नपुस्तिका

स्थापत्य अभियांत्रिकी
पेपर – I

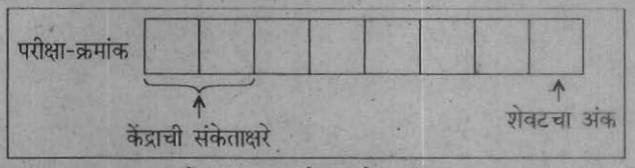
वेळ : 2 (दोन) तास

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. असा 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.

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

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.

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

SEAL

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

1. In Residential building, kitchen should have _____ aspect.
   (1) Eastern (2) Southern (3) South-Eastern (4) Northern

2. Workability of concrete can be measured by
   (1) Slump test (2) Compaction factor test
   (3) Kelly ball test (4) All the above

3. For a rectangular room, better proportion is to adopt length as _____ times of breadth.
   (1) 1 to 1·2 (2) 1·2 to 1·7 (3) 1·2 to 1·5 (4) 1·5 to 1·7

4. The laboratory slump test result of the fresh concrete is between 25 – 50 mm. The degree of workability of such concrete is
   (1) very low (2) low (3) medium (4) high

5. Black cotton soil is a product of decomposition of
   (1) Granite (2) Marble
   (3) Basalt (4) Sandstone

6. The strength achieved by a brick depends on
   (1) composition of brick earth (2) nature of moulding adopted
   (3) burning and cooling process (4) All the above

7. Capacity of concrete to bear imposed stresses safely is called as
   (1) Compressive strength (2) Shear strength
   (3) Durability (4) Resistance

8. State whether the following statements are true or false :
   a. Consistency test is used to determine the percentage of water required for preparing cement paste.
   b. Vicat Apparatus is used for determining the consistency of cement.
   (1) a true, b true (2) a false, b false
   (3) a true, b false (4) a false, b true

SPACE FOR ROUGH WORK

9. Durability of construction material is

(1) Resistance to crushing (2) Resistance to weathering

(3) Shear strength (4) Compressive strength

10. Seasoning of timber means

(1) removing the moisture content (2) reducing weight of timber

(3) Both (1) and (2) (4) None of the above

11. _____ is the quantity of fine aggregate required per 50 kg of cement of M 150 – 1 : 2 : 4 grade of concrete.

(1) 0·340 kg (2) 0·053 kg

(3) 0·035 kg (4) 0·070 kg

12. Artificial method of seasoning timber is

(1) boiling (2) chemical seasoning

(3) water seasoning (4) All of the above

13. Laterite is used in

(1) carving and ornamental works (2) fire resistance works

(3) electrical switchboards (4) heavy engineering works

14. In medium carbon steel, carbon content varies from

(1) 0·25% to 0·60% (2) 0·10% to 0·25%

(3) 0·60% to 0·75% (4) 0·75% to 1·00%

15. Light weight concrete is also known as

(1) low concrete (2) lean concrete

(3) transparent concrete (4) cellular concrete

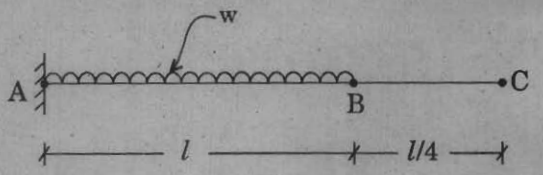
16. The process of tempering is applied to steel in hardening process for improving

(1) ductility (2) strength

(3) roughness (4) All of the above

SPACE FOR ROUGH WORK

17. A cantilever beam 'AC' of uniform cross-section carries a uniformly distributed load over the portion 'AB' of length 'l' as shown. Slope at free end 'C' will be



(1) $\frac{wl^3}{6\,EI}$ (2) $\frac{5\,wl^2}{96\,EI}$ (3) $\frac{5\,wl^3}{48\,EI}$ (4) $\frac{wl^2}{2\,EI}$

18. Shrinkage strain developed in post-tensioning beam when prestressing force transfer at the age of 't' days is

(1) $\frac{0{\cdot}003}{\log_{10}(t+2)}$ (2) $\frac{0{\cdot}002}{\log_{10}(t+2)}$ (3) $\frac{0{\cdot}0035}{\log_{10}(t+2)}$ (4) $\frac{0{\cdot}001}{\log_{10}(t+1)}$

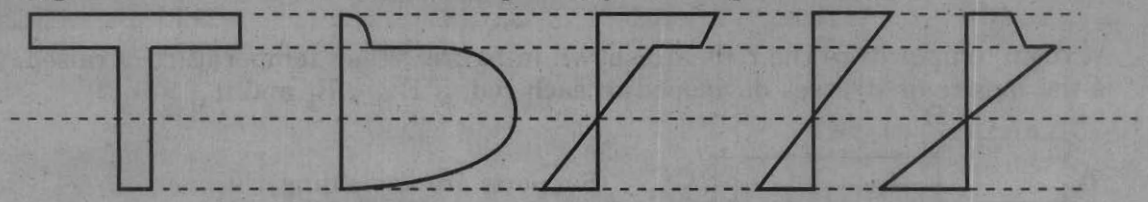
19. The _____ at any section in a given beam is equal to _____ at corresponding section in conjugate beam.

(1) slope, shear force (2) deflection, shear force
(3) slope, bending moment (4) slope, deflection

20. A beam of span 'L' carries a U.D.L. of 'w' per m run and prestressing force in the cable is 'P'. What will be the eccentricity of parabolic cable at centre (i.e. dip) so as to nullify the bending effect ?

(1) $\frac{3\,L^2}{3\,P}$ (2) $\frac{3\,wL^2}{5\,P}$ (3) $\frac{wL^2}{8\,P}$ (4) $\frac{wL^3}{8\,P}$

21. A cast iron beam is a T-section as shown. It is supported and carrying a uniformly distributed load. Which of the following is the correct bending stress distribution diagram if the element is stressed perfectly within plastic limit ?



(1) (2) (3) (4)

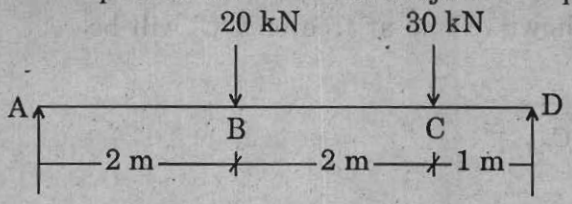
22. In pretensioned system, when prestressed force is transferred by releasing tendon, the end of wire swells and develops wedge effect. At the end, prestressing force becomes zero. This is known as

(1) Hoyer effect (2) Shear effect
(3) Wobbling effect (4) Bursting effect

SPACE FOR ROUGH WORK

P.T.O.

23. Which part of the beam is subjected to pure bending in the following figure ?



(1) AB
(2) BC
(3) CD
(4) No part of beam is subjected to pure bending

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24. Progressive increase in the inelastic deformation of concrete under sustained stress component is known as

(1) Shrinkage of concrete (2) Creep of concrete
(3) Deformation of concrete (4) Yielding of concrete

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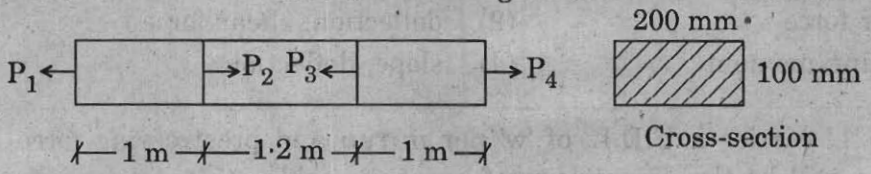
25. Calculate the maximum stress acting on the cross-section of following element :



Take P_1 = 45 kN, P_2 = 445 kN and P_4 = 130 kN.

(1) 20 N/mm^2 (2) 22·5 N/mm^2 (3) 28·75 N/mm^2 (4) 6·5 N/mm^2

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26. What are the stresses developed at the top and bottom of a rectangular beam subjected to prestressing force of 50 kN at a distance of 50 mm from bottom. The c/s of beam is 100 × 100 mm.

(1) (5, 5) (2) (20, 10) (3) (5, 10) (4) (10, 5)

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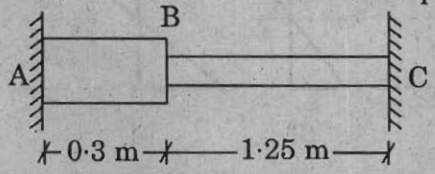
27. At room temperature the rods are shown in figure. When temperature is raised, what is the nature of stresses developed in each rod, if $E_{Al} < E_s$ and $\alpha_{Al} > \alpha_s$?



Supports are unyielding

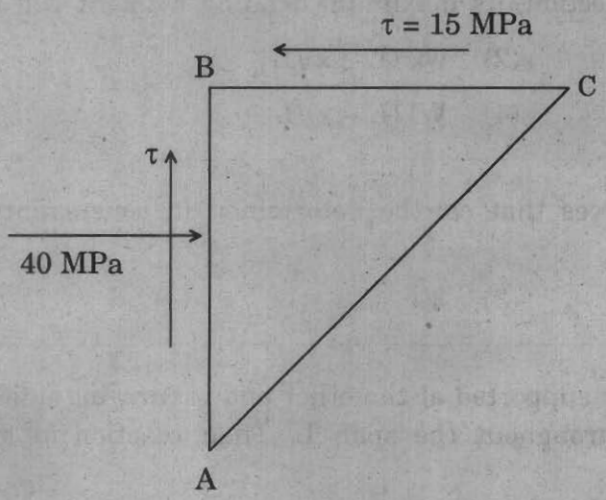
(1) Compressive in aluminium and steel
(2) Tensile in aluminium and steel
(3) Compressive in aluminium and tensile in steel
(4) Tensile in aluminium and compressive in steel

SPACE FOR ROUGH WORK

28. The prestressed concrete is considered as a combination of steel and concrete, steel taking tensile force passing through the tendon and concrete taki compressive force passing through the C.G. of stress distribution so that the two materials form a resisting couple to resist external moment. This concept is called as

(1) strength concept
(2) stress concept
(3) load balancing concept
(4) moment concept

29. If AC is principal plane, then magnitude of principal tensile stresses will be



(1) 15 MPa
(2) 5 MPa
(3) 45 MPa
(4) Zero

30. In a post-tensioning system, high tension steel wires 5 mm to 8 mm diameter about 12 in number are arranged to form a group into a cable with a spiral spring inside. This system is known as

(1) The Freyssinet System
(2) The Magnel Blaton System
(3) P.S.C. Monowire System
(4) C.C.L. Standard System

SPACE FOR ROUGH WORK

31. A simply supported beam subjected to uniformly varying load of intensity w at end (A) reduces to zero at right end (B). Then slope at end B is

(1) $\frac{5\,WL^3}{360\,EI}$ (2) $\frac{9\,WL^3}{360\,EI}$ (3) $\frac{3\,WL^3}{360\,EI}$ (4) $\frac{7\,WL^3}{360\,EI}$

32. If a moment is applied to the hinged end of a prismatic propped cantilever, then the moment at the fixed end will be

(1) M (2) M/2 (3) M/3 (4) M/4

33. A single concentrated load W rolling over the beam of span L will cause the maximum bending moment and shear force on a section X at a distance x from left support. When the load is on the section, its maximum bending moment will be

(1) $wxL^2/(L - x)$ (2) $wx\,(L - x)/L$

(3) $wx^2(L - x)/L^2$ (4) $WL(L - x)/L$

34. Maximum number of unknown forces that can be determined in concurrent force system under equilibrium is

(1) zero (2) 2 (3) 3 (4) 6

35. A beam fixed at one end and simply supported at the other end is carrying uniformly distributed load of intensity 'w' throughout the span L. Then reaction at simply supported end is

(1) $\frac{5}{8}$ wL (2) $\frac{3}{8}$ wL (3) $\frac{8}{5}$ wL (4) $\frac{3}{2}$ wL

36. A two span continuous beam having equal spans each of length l is subjected to u.d.l. of w per unit run over the whole beam. The beam has constant EI. The bending moment at the middle support is

(1) $wl^2/4$ (2) $wl^2/8$

(3) $wl^2/12$ (4) $wl^2/16$

37. A beam fixed at one end and free at the other end is subjected to U.D.L. of intensity 'w' over the entire span 'L'. Then the deflection at free end will be

(1) $wL^4/8\,EI$ (2) $wL^3/3\,EI$

(3) $wL^2/8\,EI$ (4) $wL^4/3\,EI$

SPACE FOR ROUGH WORK

38. A two span continuous beam having equal spans each of length l is subjected u.d.l. w per unit length. The beam has constant EI. The reaction at the middle support is

(1) wl (2) $5\,wl/2$ (3) $5\,wl/4$ (4) $5\,wl/8$

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39. A cable is supported at both ends at the same level and is subjected to U.D.L. over the entire span. If y_c is the central dip and 'l' is the span of a cable, then horizontal thrust developed at the support is

(1) $wl^3/8y_c$ (2) $wl^2/3y_c$ (3) $wl^2/8y_c$ (4) $wl^2/2y_c$

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40. U_1 and U_2 are the strain energies stored in a prismatic bar due to axial tensile forces P_1 and P_2 respectively. The strain energy U stored in the same bar due to combined action of P_1 and P_2 will be

(1) $U = U_1 + U_2$ (2) $U = U_1 \times U_2$

(3) $U < U_1 + U_2$ (4) $U > U_1 + U_2$

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41. "The bending moment at any point of an arch axis is proportional to the vertical intercept between the theoretical arch" is the statement of

(1) Mohr's theorem (2) Eddy's theorem

(3) Castigliano's theorem (4) Theorem of least work

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42. A three-hinged symmetrical parabolic arch is subjected to a u.d.l. of w per unit run over the whole span. Then the bending moment is zero at

(1) supports (2) quarter spans

(3) crown (4) All the three above

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43. When 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. The magnitude of this moment introduced in slope deflection equation is

(1) $-\frac{3\,EI\,\delta}{l^2}$ (2) $-\frac{4\,EI\,\delta}{l^2}$ (3) $-\frac{6\,EI\,\delta}{l^2}$ (4) $-\frac{2\,EI\,\delta}{l^2}$

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44. A two-hinged parabolic arch is subjected to u.d.l. w over entire span. Then the horizontal thrust is

(1) $wl^2/3h$ (2) $wl^2/4h$

(3) $wl^2/6h$ (4) $wl^2/8h$

SPACE FOR ROUGH WORK

P.T.O.

45. The distance between rivet centers measured along transverse to the direc force is

(1) Gauge (2) Pitch

(3) End distance (4) Maximum pitch

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46. Determine the rivet value of 20 mm diameter rivets connecting 12 mm thick plate if it is in single shear. Gross area of rivet is 363·05 mm^2, permissible stresses in shear and bearing are 80 MPa and 250 MPa respectively.

(1) 64·5 kN (2) 645 kN

(3) 29·044 kN (4) 290·44 kN

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47. The effective length of fillet weld of length 200 mm and size 12 mm is

(1) 188 mm (2) 176 mm (3) 388 mm (4) 200 mm

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48. The type of weld used for joining two surfaces approximately at right angles to each other is known as

(1) Butt weld (2) U groove weld

(3) V groove weld (4) Fillet weld

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49. The net effective cross-sectioned area of a single angle section connected by one leg to the gusset plate is

(1) $\frac{3A_1}{3A_1 + A_2}$ (2) $\frac{5A_1}{5A_1 + A_2}$ (3) $\frac{3A_1}{3A_1 - A_2}$ (4) $\frac{5A_1}{5A_1 - A_2}$

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50. The effective length of compression steel column of length 'L' which is effectively held in position at both ends but not restrained against rotation is

(1) 0·65 L (2) 0·8 L (3) L (4) 1·5 L

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51. The axial force in each lacing in double lacing system is

(1) $\frac{V}{4n \sin\theta}$ (2) $\frac{V}{2n \sin\theta}$

(3) $\frac{V}{n \sin\theta}$ (4) $\frac{2V}{n \sin\theta}$

SPACE FOR ROUGH WORK

52. The beam is subjected to U.D.L. of 41·25 kN/m. Effective span of beam is 8 m. Find section modulus for the section. Assume σ_{bc} = 165 MPa.

(1) 2×10^6 mm^3 (2) 2×10^3 mm^3

(3) $2{\cdot}5 \times 10^6$ mm^3 (4) $2{\cdot}5 \times 10^3$ mm^3

53. What is the effective length of beam if compression flange is restrained fully against lateral bending, as per IS 800 : 200 ?

(1) L (2) 0·8 L (3) 0·85 L (4) 0·7 L

54. As per IS 800 : 1984, the thickness of slab base is

(1) $\frac{3w}{\sigma_{bs}}\left(a^2 - \frac{b^2}{4}\right)$ (2) $\frac{3w}{\sigma_{bs}}\left(\frac{a^2 - b^2}{4}\right)$

(3) $\sqrt{\frac{3w}{\sigma_{bs}}\left(a^2 - \frac{b^2}{4}\right)}$ (4) $\sqrt{\frac{3w}{\sigma_{bs}}\left(\frac{a^2 - b^2}{4}\right)}$

55. Intermediate vertical stiffners are required in plate girder when d/t_w ratio of the web exceeds

(1) 85 (2) 80 (3) 90 (4) 75

56. In plate girder, flanges are designed to resist

(1) Shear force (2) Bending moment

(3) Axial force (4) Torsional moment

57. The flange splice in plate girder should be selected at

(1) maximum shear location (2) minimum shear location

(3) maximum moment location (4) minimum moment location

58. Structural members of the truss which are supported on the principal rafter and which run transverse to the truss are called

(1) Rafters (2) Purlins

(3) Sag tie (4) Struts

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59. The moment of resistance offered by balanced section in W.S.M. is given b
(As per IS 456 – 2000)

(1) $\frac{1}{2} \cdot \sigma_{cbc} \cdot b \cdot x^2$ (2) $\frac{1}{2} \cdot \sigma_{cbc} \cdot b \cdot d^2$

(3) $\frac{1}{2} \cdot \sigma_{cbc} \cdot b \cdot d \cdot (1 - x/3)$ (4) $\frac{1}{2} \cdot \sigma_{cbc} \cdot b \cdot x \cdot (d - x/3)$

---

60. The compressive strength requirements of 53 grade O.P.C. cement as per IS 12269 – 1989 @ 3, 7 and 28 days in N/mm^2 are

(1) 33, 43, 53 (2) 27, 37, 53 (3) 33, 47, 53 (4) 27, 45, 53

---

61. In a rectangular beam of section b × d, subjected to ultimate torsional moment Tu, equivalent ultimate shear can be given as

(1) $Vu + 1{\cdot}6 \cdot \frac{Tu}{b}$ (2) $Vu + 1{\cdot}6 \cdot \frac{Tu}{bd}$

(3) $Vu + 2 \cdot \frac{Tu}{b}$ (4) $Vu + \frac{Tu}{2b}$

---

62. Area of footing of an axially loaded column subjected to working load of 1000 kN and safe bearing capacity of soil 250 kN/m^2, is

(1) 4·0 m^2 (2) 4·4 m^2 (3) 6·0 m^2 (4) 5·5 m^2

---

63. Minimum depth of foundation is calculated using Rankine's formula in which ϕ is the angle of repose, q_0 is the safe bearing capacity and γ is the unit weight of soil. The value is

(1) $\frac{q_0}{\gamma}\left(\frac{1 + \sin\phi}{1 - \sin\phi}\right)^2$ (2) $\frac{q_0}{\gamma}\left(\frac{1 - \cos\phi}{1 + \cos\phi}\right)^2$

(3) $\frac{q_0}{\gamma}\left(\frac{1 - \sin\phi}{1 + \sin\phi}\right)^2$ (4) $\frac{q_0}{\gamma}\left(\frac{1 + \cos\phi}{1 - \cos\phi}\right)^2$

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64. If a retaining wall is to be constructed to retain water of height 'H' and 'w' ... weight of water, then water pressure acting on retaining wall will be

(1) $K_a wH^2/2$ (2) $K_p wH^2/2$

(3) $wH^2/2$ (4) wH^2

---

65. As per IS 456 : 2000, maximum bending moment at a support next to end support of a three span continuous beam having each span 'L' subjected to U.D.L. in the form of dead load (W_d) and live load (W_L) is given by

(1) $\frac{1}{10} W_d L^2 + \frac{1}{9} W_L L^2$ (2) $\frac{1}{9} W_d L^2 + \frac{1}{10} W_L L^2$

(3) $\frac{1}{10} W_d L^2 + \frac{1}{16} W_L L^2$ (4) $\frac{1}{12} W_d L^2 + \frac{1}{16} W_L L^2$

---

66. Area of torsional reinforcement provided in a two-way slab at corners where both adjacent edges are continuous is

(1) $\frac{3}{4} A_{st} x^+$ (2) $\frac{3}{4} A_{st} y^+$ (3) $\frac{3}{8} A_{st} x^+$ (4) 0

---

67. A singly reinforced rectangular section, b × d is effective c/s, f_{ck} and f_y are the characteristic strengths of concrete and steel respectively. The depth of neutral axis is calculated as

(1) $\frac{0{\cdot}85 f_{ck}\, bd}{f_y}$ (2) $\frac{0{\cdot}87 f_y A_{st}}{0{\cdot}36 f_{ck}\, bd}$ (3) $\frac{0{\cdot}87 f_y A_{st}}{0{\cdot}36 f_{ck}\, bd^2}$ (4) $\frac{0{\cdot}87 f_y A_{st}}{0{\cdot}36 f_{ck} . b}$

---

68. The maximum strain in steel at failure in limit state method of design is considered as

(1) $\frac{f_y}{1{\cdot}15 E_s} + 0{\cdot}002$ (2) $\frac{f_y}{1{\cdot}15 E_s} + 0{\cdot}0035$

(3) $\frac{f_y}{1{\cdot}5 E_s} + 0{\cdot}0035$ (4) $\frac{1{\cdot}5 f_y}{E_s} + 0{\cdot}002$

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69. In case of simply supported beam subjected to U.D.L. w throughout the s develops maximum B.M. at the mid-span, the cracks formed during the fa beam at mid-span are

(1) horizontal (2) inclined at 45°

(3) inclined at 60° (4) vertical

---

70. In a slab cast monolithically with cantilever beam, the beam is above the slab so as to give plain soffit. Then the beam is designed as

(1) Rectangular section (2) Flanged section

(3) Doubly reinforced section (4) None of the above

---

71. The load carrying capacity of a circular column with helical reinforcement is how much % more than that of column with lateral ties ?

(1) 5% (2) 10% (3) 15% (4) 20%

---

72. For the design of a staircase, if R is the riser, T is the tread and D is the thickness of waist slab, then the load of waist slab per m width of stair in plan will be

(1) $25\ D \times \left(\frac{T}{\sqrt{T^2 + R^2}} \right)$ (2) $25\ D \times \left(\frac{\sqrt{T^2 + R^2}}{T} \right)$

(3) $25\ D \times \left(\frac{R}{\sqrt{T^2 + R^2}} \right)$ (4) $25\ D \times \left(\frac{\sqrt{T^2 + R^2}}{R} \right)$

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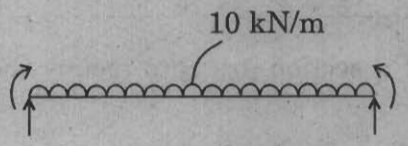
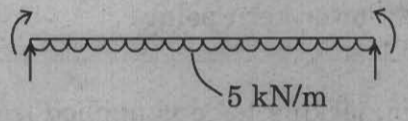
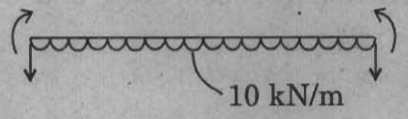
73. There is a post-tensioned prestressed concrete beam with effective simply suppo span of 8 m. This beam with rectangular cross section is prestressed with paraboli cable with 200 kN force, having eccentricity 200 mm above neutral axis at mid-span and 200 mm below it at support. The cable can be replaced by an equivalent effect as

(1) 

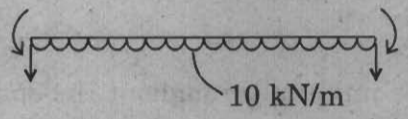
40 kN-m

(2) 

40 kN-m

(3) 

40 kN-m

(4) 

40 kN-m

---

74. Principal tensile stresses at any section and at any fiber in a prestressed concrete beam are influenced by

(1) Horizontal prestress in concrete (2) Vertical prestress in concrete
(3) Shear stress in concrete (4) All of the above

---

75. Effeciency of a rectangular prestressed concrete section with dimensions b = 0·5 d is

(1) bd (2) 0·5 bd (3) 0·5 (4) 0·333

---

76. Which of the following statements is/are true with reference to a load balancing cable ?

Statement I : The flexural stresses are uniform at any section throughout the span at service stage.

Statement II : The flexural stresses are zero in the extreme fibers at any section throughout the span at service stage.

Statement III : The shear stresses are zero at any section throughout the span at service stage.

(1) I only (2) I and III only
(3) II and III only (4) None of these

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77. As per IS 1343 – 1980, loss of prestress in steel due to shrinkage in conc pre-tension beam is _____, if $E_s = 2 \times 10^5$ MPa.

(1) 60 MPa (2) 200 MPa

(3) 20 MPa (4) 0·02 f_s MPa

78. The net resultant stresses at bottom fiber of a section are zero means the resultant thrust must be passing from

(1) extreme top fiber (2) neutral axis

(3) upper kern point (4) lower kern point

79. In a post-tensioned prestressed concrete beam, jacking force is applied from one end only. The loss of stresses in steel due to friction between steel and surrounding material will be maximum at

(1) Jacking end

(2) Mid span

(3) Anchored end

(4) Loss of stresses in steel due to friction is uniform throughout the span

80. Minimum strength of concrete at transfer (f_{ci}), to avoid cracking of extreme fiber at a prestressed concrete beam with reference to limit state of servicability, maximum compression in flexure should be

(1) $0{\cdot}7\sqrt{f_{ck}}$ (2) $0{\cdot}5\, f_{ck}$

(3) $0{\cdot}24\sqrt{f_{ck}}$ (4) f_{ck}

81. Vertical limits within which cable is to be provided in a post-tensioned prestressed concrete element is called as

(1) Anchorage zone (2) End block

(3) Transmission length zone (4) Safe cable zone

82. Minimum grade of concrete to be used for pre- and post-tension prestressed concrete construction are

(1) M30 and M40 respectively (2) M30 in both cases

(3) M40 in both cases (4) M40 and M30 respectively

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83. The resist bursting tension, designed reinforcement is distributed in the zo _____ from the loaded face of the end block, where $2y_0$ is depth of equivalent pris

(1) $0y_0$ to $2y_0$ (2) $0y_0$ to y_0

(3) $0{\cdot}2y_0$ to $2y_0$ (4) $0{\cdot}2y_0$ to y_0

84. What is the correct order of increase in ultimate moment of resistance of

I. Pre-tension section

II. Post-tension bonded section

III. Post-tension unbonded section,

keeping all other parameters same.

(1) I, II and III (2) III, II and I

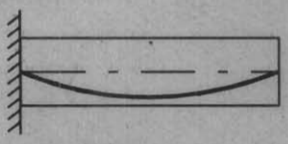
(3) II, III and I (4) All sections will have same UMR

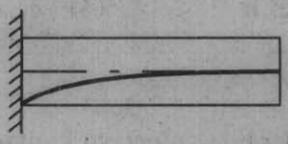
85. Deflection of a simply supported prestressed concrete beam of span 'l' and flexural rigidity 'EI', due to a straight cable carrying prestressing force 'P' and eccentricity 'e' below the neutral axis is

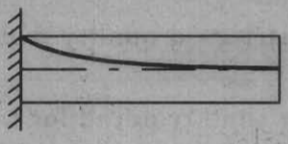
(1) $\frac{5Pel^2}{48EI}\uparrow$ (2) $\frac{Pel^2}{8EI}\downarrow$

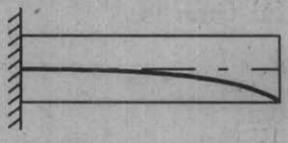
(3) $\frac{Pel^2}{8EI}\uparrow$ (4) $\left(\frac{Pel^2}{8EI}+\frac{5Pel^2}{48EI}\right)\uparrow$

86. A cantilever beam of span 'L' is supporting a udl of intensity 'w'. Most suitable cable profile will be

(1)  parabolic cable profile

(2)  parabolic cable profile

(3)  parabolic cable profile

(4)  parabolic cable profile

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87. The shortcoming of bar chart is
(1) lack of degree of details (2) activity inter-relationship
(3) does not show progress of work (4) All the above

88. Among the following, who is considered as the father of scientific management ?
(1) Max Weber (2) Henry Fayol
(3) F.W. Taylor (4) Elton Mayo

89. Program Evaluation and Review Technique is used when
(1) repetitive type of work exists
(2) time estimation is uncertain
(3) time estimation is very easy
(4) cost optimization is of prime importance

90. Which of the following is the main contribution of scientific management ?
(1) A rational approach to solve organisation problem
(2) Development of principles of management
(3) Correlation between improved working conditions and high production
(4) All of the above

91. The sequence to be followed while developing the network diagram is
a. defining objectives
b. sequencing the activities
c. breaking down the structure
d. developing the relation between events
(1) a, c, b, d (2) a, b, c, d (3) a, d, c, b (4) c, a, b, d

92. In what way does ABC analysis help the manager ?
(1) To purchase material at low price (2) To exercise selective control
(3) To purchase material very fast (4) To select good quality material

93. The optimistic time, pessimistic time and most likely time required for completion of activity is 4, 11 and 6 days respectively. The expected time is
(1) 5 days (2) 6 days
(3) 5·5 days (4) 6·5 days

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94. Which of the following is the formula for Economic Order Quantity if M is ann demand, C_o is ordering cost, C_c is inventory carrying cost and S is unit price of a item ?

(1) $EOQ = \sqrt{\frac{2MC_o}{SC_c}}$ (2) $EOQ = \sqrt{\frac{MC_oC_c}{2S}}$

(3) $EOQ = \sqrt{\frac{MC_c}{SC_o}}$ (4) $EOQ = \sqrt{\frac{2MS}{C_oC_c}}$

95. The optimistic time, pessimistic time and most likely time required for completion of an activity is 4, 8 and 6 days respectively. The variance of time estimate is

(1) 0·4356 (2) 0·450 (3) 0·400 (4) 0·500

96. Which of the following Acts specially covers safety legislation of construction industry in India ?

(1) Contract Labour Act
(2) Workmen's Compensation Act
(3) Inter State Migrant Workers Act
(4) There is no safety legislation oriented to construction industry

97. Most of the accidents in construction industry happen due to

(1) lack of education and training (2) negligence and ignorance
(3) Both (1) and (2) (4) None of the above

98. CPM network is

(1) Activity oriented (2) Event oriented
(3) Labour oriented (4) Money oriented

99. The fire safety requirements of the building are designed as per

(1) IS 1645 – 1960 (2) IS 1256 – 1967
(3) IS 1647 – 1960 (4) IS 1646 – 1960

100. Optimum duration of project corresponds to which of the following ?

(1) Direct project cost (2) Indirect project cost
(3) Crash project cost (4) Total project cost

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सूचना - (पृष्ठ 1 वरुन 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 स्वतः बरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. **मात्र परीक्षा कक्षाबाहेर 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** प्र.क्र. **201** समोरील उत्तर-क्रमांक "③" हे वर्तुळ पूर्णपणे छायांकित करून दाखविणे आवश्यक आहे.

प्रश्न 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

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