महाराष्ट्र अभियांत्रिकी (स्थापत्य) सेवा (मुख्य) परीक्षा - 2015
परीक्षा दिनांक : 25 ऑक्टोबर, 2015

A

CODE : **SO6**

2015

प्रश्नपुस्तिका क्रमांक
BOOKLET NO.

प्रश्नपुस्तिका
स्थापत्य अभियांत्रिकी

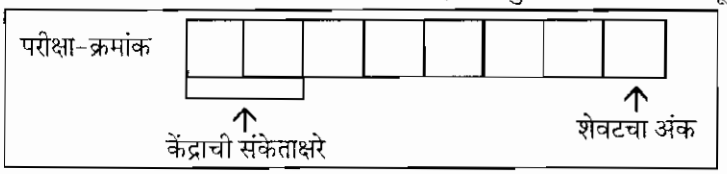
वेळ : 2 (दोन) तास

एकूण प्रश्न : 100
एकूण गुण : 100

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 दिलेल्या चार पर्यायपैकी 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 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. The rank of the following matrix is :

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$$

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

---

2. Investigate the values of λ and μ so that the following equations have an infinite number of solutions :

$2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$2x + 3y + \lambda z = \mu$

(1) $\lambda = 5,\ \mu = 9$ (2) $\lambda = 5,\ \mu = 0$ (3) $\lambda = 0,\ \mu = 9$ (4) $\lambda = 0,\ \mu = 0$

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3. Laplace transform of e^{at} Cos*h*(bt) if S > a is :

(1) $\dfrac{b}{(S-a)^2 + b^2}$ (2) $\dfrac{S-a}{(S-a)^2 + b^2}$

(3) $\dfrac{S-a}{(S-a)^2 - b^2}$ (4) $\dfrac{b}{(S-a)^2 - b^2}$

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4. The differential equation of $xy = Ae^x + Be^{-x}$ is :

(1) $x\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + xy = 0$ (2) $x\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} - xy = 0$

(3) $x\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + xy = 0$ (4) $x\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} - xy = 0$

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5. Evaluate upto three digits using Trapezoidal rule taking $h = \dfrac{1}{4}$

$$I = \int_0^1 \frac{dx}{1 + x^2}$$

(1) 0.783 (2) 0.875 (3) 0.578 (4) 0.857

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

6. The gradient of $f(x, y, z) = x^3 - xy^2 - z$ at $P_0(1, 1, 0)$ is :

(1) $2i + 2j + k$ (2) $2i - 2j - k$ (3) $2i + 2j - k$ (4) $-2i - 2j + k$

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7. Match the **List - I** (functions) with **List - II** (Laplace transforms) and select the correct answer :

	List - I		**List - II**
(a)	$\int_0^t f(t)\,dt$	(i)	$\frac{a}{S^2 - a^2}$
(b)	Sinhat	(ii)	$\frac{e^{-aS}}{S}$
(c)	$U(t-a)$	(iii)	$\frac{F(S)}{S}$
(d)	$\delta(t-a)$	(iv)	e^{-aS}

Answer Options :

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

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8. Two non-zero vectors $\bar{a}$ and $\bar{b}$ are parallel if :

(1) $\bar{a} \times \bar{b} = \bar{0}$ (2) $|\bar{a} \times \bar{b}| = 1$ (3) $\bar{a} \cdot \bar{b} = 0$ (4) $|\bar{A}| = |\bar{B}|$

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9. A simply supported beam of span 'l' is carrying a uniformly distributed load of 'ω' per unit run over the whole span. The magnitude of deflection at mid span is

(EI – flexural rigidity)

(1) $5\,\omega l^4/384\ EI$ (2) $\omega l^3/48\ EI$

(3) $\omega l^3/3\ EI$ (4) $\omega l^4/8\ EI$

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

10. Web of ISMB 300 (secondary beam) is transferring reaction to web of another ISMB 300 (main beam). Which of the following connections is most suitable ? Consider the top flange of beams are maintained at the same level.

(1) Bracket plate connection (2) Stiffened seat connection

(3) Unstiffened seat connection (4) Frame connection

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11. Two shafts 'A' and 'B' are used to transmit power. Shaft A is solid with diameter 'd', whereas shaft 'B' is hollow with external diameter 'd' and internal diameter '$\frac{d}{2}$'. Material, length, maximum shear stresses and speed being the same, what is percentage reduction in power transmission if 'A' is replaced by 'B' ?

(1) No change in power transmission

(2) 50% reduction

(3) 6.25% reduction

(4) 93.75% reduction

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12. Which of the following is/are true about a load balancing cable in a prestressed concrete beam ?

(a) Bending moment due to working load is counteracted completely.

(b) Shear force due to working load is counteracted completely.

(c) Pressure line will pass from neutral axis throughout the span.

(d) Stresses will be uniform throughout the span and will be equal to direct axial compressive stresses.

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

(3) Only (c) and (d) (4) All (a), (b), (c) and (d)

---

13. Web crippling in a steel beam, occurs due to :

(1) column action of compressive flange

(2) failure of web under concentrated load

(3) failure of web under excessive B.M.

(4) secondary bending moment

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

14. A cylindrical vessel whose ends are closed by means of rigid flange plates, is made of steel plate 3 mm thick. The internal length and diameter of vessel are 50 cm and 25 cm respectively. The longitudinal stress of 62.5 MN/m^2 and circumferential stress of 125 MN/m^2 is developed in the cylindrical shell due to internal fluid pressure. Taking Poisson's ratio = 0.3 and E = 200 GN/m^2, the change in length of cylinder shall be :

(1) 0.000531 mm (2) 0.000125 mm

(3) 0.133 mm (4) 0.0625 mm

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15. For a plate girder with effective depth of 1500 mm, the connection of vertical stiffner to the web of plate girder, having 10 mm thickness of web and out stand width of stiffner of 50 mm are designed for :

(1) Shear force = 0.04 kN/mm (2) Shear force = 0.4 kN/mm

(3) Bending moment = 0.04 kN-mm (4) Bending moment = 0.4 kN-mm

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16. (a) Battens are designed to carry longitudinal shear

(b) Battens are designed to carry moment.

(c) Lacings are designed to carry axial tension.

(d) Lacings are designed to carry axial compression.

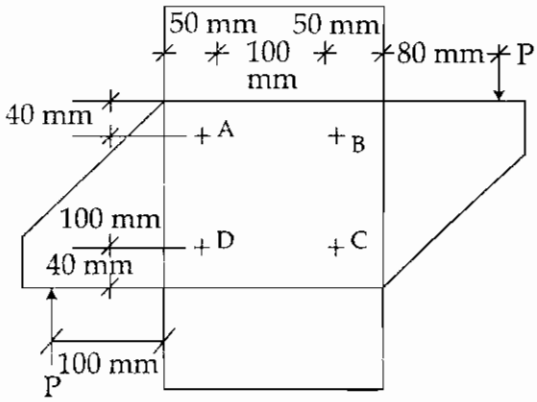
(e) Lacings are designed to carry moment.

Which of the above statements are correct ?

(1) (a), (b) and (c) only (2) (a), (b) and (e) only

(3) (a), (b), (c) and (d) only (4) (b), (c) and (e) only

17.

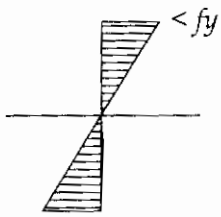


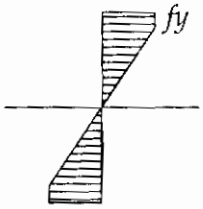
If all bolts are equal in diameter, which bolts are critical ?

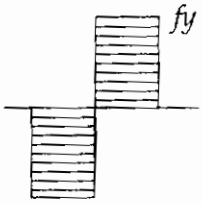
(1) (A) and (B) only (2) (A), (B), (C) and (D) all are equally critical

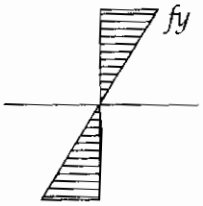
(3) (A) and (D) (4) (B) and (C)

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

18. (a) Slender section (i) 

(b) Semicompact section (ii) 

(c) Compact section (iii) 

(d) Plastic section (iv) 

Correct match is :

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

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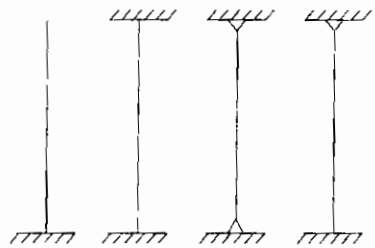
19. A perfect pin jointed frame should satisfy the equation (where m = number of members and j = number of joints)

(1) $m = 2j - 4$ (2) $m = 3j - 3$ (3) $m = 3j - 2$ (4) $m = 2j - 3$

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

20. Keeping all other parameters the same, the end condition of four different columns are as shown.



[Same height and cross-section]

Relation for buckling load will be

(1) $P_a = P_b = P_c = P_d$

(2) $P_b > P_d > P_c > P_a$

(3) $P_a > P_b > P_c > P_d$

(4) $P_a > P_c > P_d > P_b$

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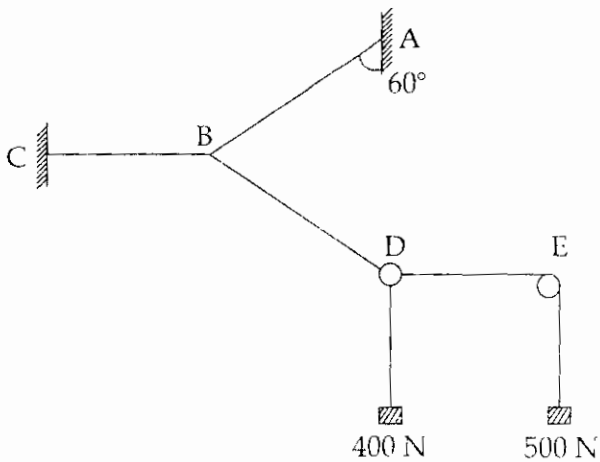
21. As per IS 456 : 2000, the vertical deflection limits for a cantilever may generally be assumed to be satisfied provided the effective span to effective depth ratio is not greater than :

(1) 7 (2) 20 (3) 26 (4) 10/span

22.

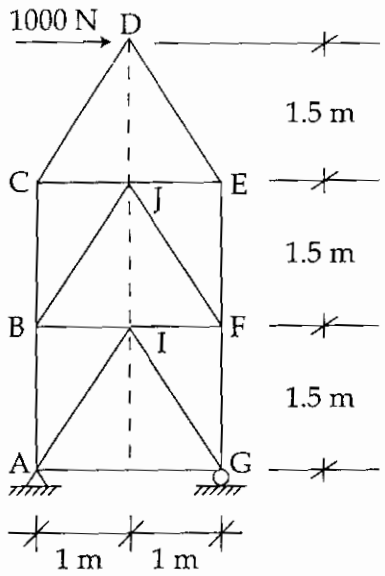


'D' is a weightless ring 'E' is a frictionless pulley. Calculate tension cable AB

(1) $200\sqrt{3}$ N (2) $900\sqrt{2}$ N (3) 800 N (4) 1800 N

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

23. Determine force in member 'AB' of truss :



(1) 666.67 N (T) (2) 1500 N (T)

(3) 1000 $\sqrt{2}$ N (T) (4) Zero

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24. A symmetric I-section is used as a cantilever beam. It has to carry a point load at cantilever end in addition to its own wt. Which of the following statements are correct ?

(a) Flexural tensile stresses will act at bottom fibre and flexural compressive stresses will act at top fibre of the section.

(b) Flexural tensile stresses will act at top fibre and flexural compressive stresses will act at bottom fibre of the section.

(c) Maximum shear stresses will act at junction of flange and web, and zero at neutral axis of the section.

(d) Maximum shear stresses will act at neutral axis of the section.

(1) (a) and (c) (2) (b) and (c) (3) (a) and (d) (4) (b) and (d)

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

25. Consider that a steel bar of diameter 'd' is embedded in a large concrete block. If length of bar embedded in concrete is 'L' and bond strength between concrete and bar is τ_{bd}, what maximum force can be applied on the bar ?

(1) Maximum of $0.87\,fy.\frac{\pi}{4}d^2$ and $\tau_{bd}.\pi dL$

(2) Maximum of $\tau_{bd}.\frac{\pi}{4}d^2$ and $0.87\,fy\,\pi dL$

(3) Minimum of $0.87\,fy.\frac{\pi}{4}d^2$ and $\tau_{bd}.\pi dL$

(4) Minimum of $\tau_{bd}.\frac{\pi}{4}d^2$ and $0.87\,fy.\pi dL$

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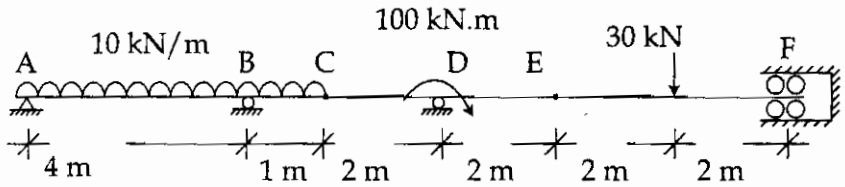
26. A RCC beam of width 300 mm and effective depth 600 mm is made up of concrete with $\tau_{cmax} = 2$ MPa. For reinforcement provided and grade of concrete used $\tau_c = 0.7$ MPa. Factored shear force acting on the beam is 400 kN. Shear reinforcement shall be designed for _____.

(1) 360 kN (2) 274 kN

(3) 400 kN (4) Section needs to be redesigned

27.



C and E are internal hinges.

Calculate reaction at D.

(1) 80 kN (2) 50 kN (3) 130 kN (4) 48.76 kN

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28. A two way slab is defined as :

(1) Supported on all four edges and $\frac{ly}{lx} > 2$

(2) Supported on all four edges and $\frac{ly}{lx} < 2$

(3) $\frac{ly}{lx} < 2$

(4) $\frac{ly}{lx} > 2$

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

29. For a simply supported two way slab with corners held down, area of steel required in short direction for maximum B.M. is 400 mm^2 and in long direction 300 mm^2. The torsion steel required at the corners shall be :

(1) 300 mm^2 both ways at top and bottom

(2) 225 mm^2 both ways at top and bottom

(3) 100 mm^2 both ways at top and bottom

(4) none of the above

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30. An element has a tensile stress of 6 MPa and a compressive stress of 4 MPa acting on two mutually perpendicular planes with two equal shear stresses of $\sqrt{11}$ MPa. What is the principal tensile stress acting ?

(1) 7 MPa (2) 4 MPa

(3) $\left(10+\sqrt{11}\right)$ MPa (4) 10 MPa

---

31. The equation of a three hinged parabolic arch with origin at its left support is $y = x - (x^2/40)$. The span of the arch is 48 m. The arch is carrying a uniformly distributed load of 20 kN/m over left half of the span. The horizontal reaction at the support :

(1) 120 kN (2) 360 kN (3) 300 kN (4) 383.41 kN

---

32. Consistent displacement or compatibility condition means :

(1) displacements caused by redundant forces

(2) displacements caused by the forces other than redundant forces

(3) displacements caused by the redundant and applied forces

(4) displacements caused by redundant and applied forces satisfying boundary conditions

---

33. A column carrying axial load of 1000 kN is to be designed for effective length of 4.50 m and cross-section 300 × 600 mm. As per IS 456-2000 the column should be designed as :

(1) axially loaded column (2) eccentrically loaded column

(3) short column (4) none of above

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34. Isochrone depicts :

(1) Pore pressure (U_e) versus depth (z)

(2) Pore pressure (U_e) versus time (t)

(3) Pore pressure (U_e) time factor of consolidation (T_v)

(4) All of the above

---

35. A saturated sand becomes "quick" or "alive" when the hydraulic gradient is approximately equal to :

(1) zero (0) (2) minus one (−1) (3) one (1) (4) Infinity (∞)

---

36. Terzaghi demonstrated the spring analogy theory to understand the mechanics of :

(1) Compaction (2) Consolidation (3) Seepage (4) Permeability

---

37. Static penetration test is covered under which IS code ?

(1) IS 1888 : 1982 (2) IS 4968 (P3) 1987

(3) IS 2131 : 1981 (4) IS 2720 (P4) 1985

---

38. A pile foundation is used when :

(1) The loads are heavy (2) Soil stratum near ground surface is weak

(3) Both (1) and (2) (4) Neither (1) nor (2)

---

39. Clay mineral kaolinite is formed due to chemical weathering of :

(1) Garnet (2) Quartz (3) Feld spar (4) Sillimanite

---

40. As per Indian standard compaction test, which are the respective values of weight of rammer and its falling height for heavy compaction ?

(1) 26 N and 310 mm (2) 30.3 N and 350 mm

(3) 48.9 N and 450 mm (4) 60 N and 400 mm

---

41. As per Terzaghi theory, N_c, N_q and N_r are known as :

(1) Shear strength factors (2) Earth pressure coefficients

(3) Bearing capacity factors (4) Compaction factors

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42. For obtaining allowable load from single pile load test (dop : IS 2911-P1-1964) data , which of the following criteria is applicable :

(1) 50% of ultimate load at which total settlement amounts to one tenth of the file diameter

(2) $\frac{2}{3}$ of the load which causes total settlement of 12 mm ·

(3) $\frac{2}{3}$ of the load which causes total settlement of 6 mm

(4) All of the above

---

43. The degree of disturbance of sample which is measured in terms of Area ratio 'Ar' is defined as :

(1) $Ar = \frac{Ao - Ai}{Ai} \times 100$ (2) $Ar = \frac{Ao + Ai}{Ai} \times 100$

(3) $Ar = \frac{Ao \times Ai}{Ai} \times 100$ (4) None of the above

---

44. Match **List - I** with **List - II,** and select correct answer using codes given below :

	List - I		**List - II**
(a)	Pycnometer	(i)	Classification of fine grained soil
(b)	Core cutter	(ii)	Grain size analysis
(c)	Plasticity chart	(iii)	Field density
(d)	Mechanical sieve analysis	(iv)	Specific gravity

Codes :

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

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45. A group of 4 piles with two piles in a row were driven into a soft clay extending from ground level to a great depth. The piles were placed 90 cm c/c with a pile diameter 30 cm and length 8 m. The UCS (Unconfined Compressive Strength) of soft clay is 60 kPa. Compute allowable load on pile group (Assuming block failure) for a factor of safety 2 - 5 ?

(1) 1280 kN (2) 1180 kN (3) 1380 kN (4) 1420 kN

46. Site A and site B had the same soil with single drainage. 8 m thick clay layer of site A took 1 year to achieve 50% degree of consolidation. To achieve the same degree of consolidation at site B having 16 m thick layer, the time required is :

(1) 4 yr (2) 1 yr (3) 16 yr (4) 2 yr

47. The maximum shear stress under the centre of a continuous strip occurs at what depth beneath the centre ? (If 'B' is width of the strip)

(1) B (2) $\frac{B}{2}$ (3) $\frac{3}{4}B$ (4) 2B

48. The standard penetration test is useful to measure :

(1) consolidation characteristics of soft clays

(2) shear strength of sands

(3) consistency of clays

(4) none of the above

49. The shape of the hydrograph of runoff is affected by :

(1) The intensity of the storm (2) The duration of the storm

(3) The real distribution of the storm (4) All the above

50. The uplift pressure on the face of a drainage gallery in a dam is equal to :

(1) hydrostatic pressure at toe

(2) hydrostatic pressure at heel

(3) two-third of hydrostatic pressure at heel plus one-third of hydrostatic pressure at heel

(4) none of the above

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51. The method of estimating high flood discharge is :

(1) By empirical formulae developed for the region

(2) By applying rational formulae

(3) By flood frequency studies

(4) All of the above

---

52. The flow-mass curve is a graphical representation of :

(1) Cumulative discharge and time

(2) Discharge and percentage probability of flow being equalled or exceeded

(3) Cumulative discharge, volume and time in chronological order

(4) Discharge and time in chronological order

---

53. What does the Gumbel's distribution method require of the annual flood series to estimate the magnitude of a flood with a return period of T years ?

(1) mean value (2) length of record

(3) standard deviation (4) all of the above

---

54. The percentage of the total sediment flow depositing in the reservoir is called its :

(1) Capacity inflow ratio (2) Sediment coefficient

(3) Trap efficiency (4) Displacement efficiency

---

55. The relation between duty D in hectares/cu.m. depth of water Δ in mt. and base period in days is given by :

(1) $\Delta = 8.64\ B/D$ (2) $\Delta = 8.64\ D/B$

(3) $\Delta = 8.64\ B$ (4) None of the above

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56. Trap efficiency of a storage reservoir is defined as ratio of :

(1) $\frac{\text{Total annual sediment inflow}}{\text{Reservoir capacity}}$

(2) $\frac{\text{Total sediment deposited in a given period}}{\text{Total sediment inflow in that period}}$

(3) $\frac{\text{Total annual sediment deposited in the reservoir}}{\text{Dead storage capacity of the reservoir}}$

(4) None of the above

---

57. Match the **List - I** with **List - II**

	List - I		**List - II**
(a)	Inglis formula	(i)	North and central India
(b)	Dicken's formula	(ii)	Maharashtra state
(c)	Ryvis formula	(iii)	USA
(d)	Greager's formula	(iv)	South India

Codes :

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

---

58. For high ogee spillway He ≈ Hd and Cd is found to be :

(1) 1.00 (2) 2.00 (3) 2.20 (4) 1.33

---

59. Presence of tail water in a gravity dam :

(a) increases the principal stress (b) decreases the principal stress

(c) increases the shear stress (d) decreases the shear stress

The correct answer is :

(1) (a) and (c) (2) (a) and (d) (3) (b) and (c) (4) (b) and (d)

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60. What affects the shape of the hydrograph ?

(1) non-uniform areal distribution of rainfall

(2) varying rainfall intensity

(3) shape of the basin

(4) all the above factors

---

61. When a ship enters sea from a river one can expect it :

(1) to rise a little

(2) to sink a little

(3) to remain at the same level of draft

(4) to rise or fall depending on whether it is of wood or steel

---

62. An Acquifer confined at the bottom but open at the top is known as :

(1) acquiclude (2) unconfined acquifer

(3) semi confined acquifer (4) none of the above

---

63. Which of the following pollutant gases is produced due to anaerobic decomposition of organic matter in biological waste product ?

(1) Carbon-di-oxide (CO_2) (2) Sulphur-di-oxide (SO_2)

(3) Carbon-mono-oxide (CO) (4) Hydrogen sulphide (H_2S)

---

64. The chemical characterization of solid waste includes :

(1) Proximate and ultimate analysis (2) Density

(3) Moisture content (4) None of the above

---

65. When, Iron and Manganese are present in combination with organic matter in water; they shall be removed by :

(a) Aeration (b) Coagulation

(c) Addition of lime (d) Addition of chlorine

(1) (a) only (2) (b) only (3) (a) and (b) (4) (c) and (d)

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66. The colour of water for domestic supplies on standard platinum cobalt scale should not exceed :

(1) 0 - 5 PPM (2) 5 - 10 PPM (3) 10 - 20 PPM (4) 20 - 50 PPM

---

67. A sedimentation tank is to be designed for a given capacity. The velocity of flow is 0.2 m/min and a detention period of 6 hours is to be considered. The length of the tank should be :

(1) 12 m (2) 32 m (3) 72 m (4) 82 m

---

68. Acceptable noise level for residential and business urban areas as per IS 4954-1968 is :

(1) 25 - 35 dB (2) 40 - 50 dB (3) 50 - 60 dB (4) 70 - 80 dB

---

69. Following instruments are used to measure Turbidity characteristics of water :

(a) Jackson's Turbidimeter (b) Baylis Turbidimeter

(c) Nephelometer (d) Ratio Turbidimeter

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

(3) (c) only (4) All (a), (b), (c) and (d)

---

70. Dechlorination of water is achieved by adding :

(a) Sodium thiosulphate (b) Sodium sulphite

(c) Sodium hexametaphosphate (d) Sodium bisulphate

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

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

---

71. The solubility of oxygen in sewage when compared to its solubility in distilled water is :

(1) 85% (2) 95% (3) 99% (4) 99.9%

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72. Pollutant Standard Index (PSI) value greater than 100 upto 199, denotes the air quality as :

(1) Good (2) Moderate (3) Unhealthful (4) Hazardous

---

73. The chemical compounds which are responsible for production of photochemical smog are :

(1) Hydrocarbons (2) Nitrogen oxide

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

---

74. A 50 μm size particle is removed from gas by :

(1) Gravity settling chamber (2) Centrifugal collector

(3) Wet scrubber (4) Fabric filter

---

75. BOD (Bio-chemical Oxygen Demand) test is carried out for 5 days at a constant temperature of :

(1) 10°C (2) 37°C (3) 25°C (4) 20°C

---

76. Slow sand filter removes bacteria to as much as :

(1) 80 - 90% (2) 90 - 95%

(3) 98 - 99% (4) None of the above

---

77. The unit for measuring the frequency of sound is :

(1) decibel (dB) (2) hertz (Hz)

(3) doboson unit (Du) (4) none of the above

---

78. Desire lines are plotted in :

(1) Accident studies (2) Speed studies

(3) Origin and destination studies (4) Traffic volume studies

---

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79. Where 'p' is the pressure sustained in $\frac{kg}{cm^2}$ and 'Δ' is deflection in cm, then with reference to rigid pavement the modulus of subgrade reaction is given by :

(1) $\frac{p}{\Delta}$ (2) $\frac{2p}{\Delta}$ (3) $\frac{\Delta}{p}$ (4) None of these

---

80. Maximum equivalent single wheel load as per IRC is :

(1) 8160 kg (2) 4080 kg (3) 2040 kg (4) 1020 kg

---

81. In traffic design, PCU means :

(1) Passenger Class Unit (2) Passenger Category Unit

(3) Passenger Car Unit (4) none of the above

---

82. On a right angled road intersection with two-way traffic, the total number of conflict points are :

(1) 22 (2) 24 (3) 26 (4) 28

---

83. Compared to a level road, on a descending grade the stopping sight distance is :

(1) Less (2) More

(3) Same (4) Depending on a speed

---

84. 'Stop' sign is a :

(1) Warning sign (2) Informatory sign

(3) Regulatory sign (4) None of these

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85. Which of the following shapes is preferred in valley curve ?

(1) Spiral (2) Lemniscate

(3) Cubic parabola (4) Simple parabola

---

86. Map is a graphical representation of the features on small scale as projected on a :

(1) horizontal plane (2) horizontal line

(3) plane parallel to feature (4) in any plane

---

87. If N is number of sides of a closed traverse, then the sum of included angles should be :

(1) $(2N+4)\times 90°$ (2) $(2N-4)\times 90°$ (3) $360°$ (4) $(2N\pm 4)\times 90°$

---

88. The tension at which the effect of pull is neutralised by the effect of sag is known as :

(1) appropriate tension (2) neutral tension

(3) equal tension (4) normal tension

---

89. A chain of nominal length 30m is found to be 0.30m too long. If the area of the field measured with this defective chain is 300 hectares, the correct area of the field is :

(1) 294.03 hectares (2) 300.03 hectares (3) 306.03 hectares (4) 300 hectares

---

90. The R.L. of the ground level is 100m. The levelling staff reading on the ground surface is 1.355m. The staff reading 2.355m is recorded when the levelling staff is held inverted touching its bottom to the base of chajja. The height of chajja from the ground will be :

(1) 103.071 m (2) 1.0 m (3) 101.00 m (4) 3.71 m

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91. If R is the radius of the circular curve and ϕ is the deflection angle, then tangent length of the curve is given by :

(1) R tan $\phi/2$ (2) R tan ϕ (3) R tan $\phi/4$ (4) R tan $\phi/8$

---

92. Precision represents repeatability of a measurement and is concerned with only :

(1) Natural errors (2) Instrumental errors

(3) Personal errors (4) Random errors

---

93. Terpentine Oil is used in paints as a :

(1) Base (2) Carrier (3) Thinner (4) Pigment

---

94. The four essential constituents of ordinary portland cement are in order of decreasing proportions :

(1) Lime, Silica, Alumina and Iron oxides

(2) Silica, Alumina, Iron oxides and Lime

(3) Alumina, Silica, Lime and Iron oxides

(4) Iron oxides, Alumina, Lime and Silica

---

95. **Assertion (A) :** National building code of India recommends a minimum frontage of 6m on any road.

Reasoning (R_1) : It prevents the formation of blind corners at the intersection of the streets and prevents accidents.

Reasoning (R_2) : It prevents the building from dust and noise of the street.

Which of the following statements is **correct** ?

(1) **A**, R_1 and R_2 are true. R_1 is incorrect explanation and R_2 is correct explanation of **A**.

(2) **A** is true. R_1 and R_2 are incorrect.

(3) **A**, R_1 and R_2 are true. But R_1 and R_2 are not correct explanations of **A**.

(4) **A**, R_1 and R_2 are true. R_1 and R_2 are correct explanations of **A**.

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96. Quantities of wood work are computed generally in terms of :

(1) Numbers (2) Numbers and sizes

(3) Area in square meters (4) Volume in cubic meters

---

97. The average water absorption as an acceptance criteria for bricks higher than class 12.5 shall be limited to :

(1) 20% (2) 10% (3) 15% (4) 8%

---

98. Final setting time of Ordinary Portland cement is not more than :

(1) 60 minutes (2) 600 minutes (3) 30 minutes (4) 300 minutes

---

99. The durability and gloss of a paint is :

(1) Not related to PVCN (2) Directly proportional to PVCN

(3) Inversely proportional to PVCN (4) Balanced when PVCN = 0

---

100. What is the ideal temperature for the promotion of alkali aggregate reaction ?

(1) 20°C - 40°C (2) 25°C - 50°C (3) 10°C - 38°C (4) 18°C - 38°C

- o O o -

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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 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 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.**

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