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(Paper 2)

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स्थापत्य अभियांत्रिकी पेपर - 2

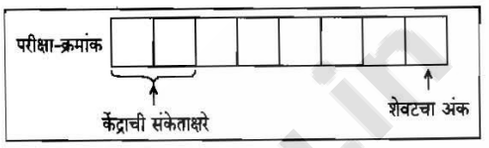
वेळ : 2 (दोन) तास

एकूण प्रश्न : 100
एकूण गुण : 200

सूचना

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

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



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

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

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

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

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

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

ताकीद

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

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा 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 finding out time 't_2' required to achieve 50% consolidation of 1 m thick clayey strata resting on impermeable rock at bottom and sandy soil at top, a laboratory consolidation test was carried out, using 1 cm thick sample obtained from the same strata. Time "t_1" was taken by it to achieve 25% consolidation, under double drainage condition, in the laboratory.

Choose the correct value of ratio of $\left(\frac{t_2}{t_1}\right)$ from the following :

(1) 4,00,000 (2) 16,000 (3) 1,60,000 (4) None of the above

2. The distance 'D' between centers of piles with top diameter 'd' should ***not*** be less than (from practical consideration)

(1) 2d (2) 3d (3) 4d (4) 5d

3. Match List I and List II and select the correct answer using the codes given below :

	List I (Construction Type)	**List II (Suitable Cofferdam Type)**
(a)	Cut-off trench of a dam to be constructed across flowing river	(i) Cellular sheetpile cofferdam
(b)	Shallow foundation of a bridge pier	(ii) Embankment type cofferdam
(c)	Sequential repetition of underwater foundation work	(iii) Single wall sheetpile cofferdam
(d)	Control of groundwater to prevent entry into deep excavation	(iv) Floating steel cylinder cofferdam

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

4. The void ratio and porosity of a soil sample having equal volume of solids and volume of voids are

	Void ratio	Porosity
(1)	1·0	100%
(2)	0·5	50%
(3)	1·0	50%
(4)	0·5	100%

5. Let E_2 and E_1 represent compaction energy deployed for compacting soil as per modified compaction test and standard compaction test, as per IS.

Choose from the following correct ratio of $\left(\frac{E_2}{E_1}\right)$:

(1) About $4\frac{1}{2}$ times (2) About $3\frac{1}{2}$ times

(3) About 2 times (4) None of the above

6. On the same soil sample, both Standard and Modified Proctor compaction tests are conducted in the laboratory. The values of Optimum Moisture Content (OMC) and Maximum Dry Density (MDD) for modified test compared to those for standard compaction test will respectively

(1) Increase, Increase (2) Decrease, Increase

(3) Increase, Decrease (4) No change, Increase

7. If the permeability, shrinkage and swelling of a compacted soil having same density on dry side of optimum moisture content is compared with compaction on wet side of optimum, the variation in these properties will be

(1) more, less, higher (2) more, more, higher

(3) more, more, less (4) less, less, higher

8. An embankment has a slope of 30° which was constructed with soil having $C = 30\ kN/m^2$, $\phi = 20°$ and $\gamma = 15\ kN/m^3$. The height of embankment is 20 m. Using Taylor's stability no. $\frac{1}{40}$, the factor of safety with respect to cohesion is

(1) 0·25 (2) 2

(3) 4 (4) 1·5

9. The degree of consolidation depends upon

(1) thickness of clay layer

(2) coefficient of permeability

(3) co-efficient of consolidation

(4) All the above

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

10. The loss of head due to sudden expansion of a pipe is given by

(1) $h_L = \frac{V_1^2 - V_2^2}{2g}$ (2) $h_L = \frac{0{\cdot}5\, V^2}{2g}$

(3) $h_L = \frac{(V_1 - V_2)^2}{2g}$ (4) None of the above

11. Bernoulli's equation is derived making assumption that

(1) the flow is uniform and incompressible

(2) the flow is non-viscous, uniform and steady

(3) the flow is steady, non-viscous, incompressible and irrotational

(4) None of the above

12. For the laminar flow through a circular pipe

(1) the maximum velocity = 1·5 times the average velocity

(2) the maximum velocity = 2·0 times the average velocity

(3) the maximum velocity = 2·5 times the average velocity

(4) None of the above

13. Depth at which specific energy is minimum is known as

(1) Critical depth (2) Conjugate depth

(3) Alternate depth (4) Normal depth

14. In a rectangular channel section, if the channel depth is 2·0 m, the specific energy at critical depth is

(1) 3·0 m (2) 1·33 m (3) 2·5 m (4) 1·5 m

15. Which of the following statements is correct ?

(1) Centrifugal pumps convert mechanical energy into hydraulic energy by thrust of piston

(2) Reciprocating pumps convert mechanical energy into hydraulic energy by means of centrifugal forces

(3) Centrifugal pumps convert mechanical energy into hydraulic energy by means of centrifugal force

(4) Reciprocating pumps convert hydraulic energy into mechanical energy

16. Dynamic viscosity (μ) has the dimensions as

(1) MLT^{-2} (2) $ML^{-1}T^{-1}$ (3) $ML^{-1}T^{-2}$ (4) $M^{-1}L^{-1}T^{-1}$

17. The submerged body will be in stable equilibrium if

(1) The centre of buoyancy B is below the centre of gravity G
(2) The centre of buoyancy B coincides with G
(3) The centre of buoyancy B is above the metacentre M
(4) The centre of buoyancy B is above G

18. Continuity equation deals with the law of conservation of

(1) mass (2) momentum
(3) energy (4) None of the above

19. The discharge through a single-acting reciprocating pump is

(1) $Q = \frac{ALN}{60}$ (2) $Q = \frac{2ALN}{60}$ (3) $Q = ALN$ (4) $Q = 2ALN$

where A = cross-sectional area of cylinder or piston
L = length of stroke
N = r.p.m. of the crank

20. A turbine is called impulse if at the inlet of the turbine

(1) total energy is only kinetic energy
(2) total energy is only pressure energy
(3) total energy is the sum of kinetic energy and pressure energy
(4) None of the above

21. During suction stroke of a reciprocating pump, the separation may take place

(1) at the end of suction stroke
(2) in the middle of suction stroke
(3) at the beginning of suction stroke
(4) None of the above

22. The specific speed (N_s) of a pump is given by the expression

(1) $N_s = \frac{N\sqrt{Q}}{H_m^{5/4}}$ (2) $N_s = \frac{N\sqrt{P}}{H_m^{3/4}}$

(3) $N_s = \frac{N\sqrt{Q}}{H_m^{3/4}}$ (4) $N_s = \frac{N\sqrt{P}}{H_m^{5/4}}$

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23. Kaplan turbine is a/an

(1) impulse turbine (2) radial flow impulse turbine

(3) axial flow reaction turbine (4) radial flow reaction turbine

24. A turbine is a device which converts

(1) Hydraulic energy into mechanical energy

(2) Mechanical energy into hydraulic energy

(3) Kinetic energy into mechanical energy

(4) Electrical energy into mechanical energy

25. In the inlet part of the jet impinging on a Pelton bucket, the velocity of whirl V_{w1} is equal to

(1) absolute velocity of jet at inlet V_1 (2) relative velocity of jet at inlet V_{r1}

(3) zero (4) None of the above

26. If the turbine has kinetic energy and pressure energy of water at its inlet, then such turbine is known as

(1) impulse turbine (2) reaction turbine

(3) Pelton wheel turbine (4) low head turbine

27. Which component is ***not*** provided to Pelton wheel turbine ?

(1) Penstock (2) Jet (3) Casing (4) Draft tube

28. The artesian aquifer is one where

(1) water surface under the ground is at atmospheric pressure

(2) water table serves as upper surface of zone of saturation

(3) water is under pressure between two impervious strata

(4) None of the above

29. Lysimeter is used to measure

(1) Infiltration (2) Evaporation

(3) Evapotranspiration (4) Vapour pressure

30. Horton's infiltration capacity is given as

(1) $f = f_o + [f_c - f_o]\, e^{-kt}$ (2) $f = f_o - [f_c + f_o]\, e^{-kt}$

(3) $f = f_o - [f_c - f_o]\, e^{-kt}$ (4) $f = f_c + [f_o - f_c]\, e^{-kt}$

31. Weibull formula is

(1) $P = \left(\frac{m}{N+1}\right)$ (2) $P = \left(\frac{m}{N-1}\right)$

(3) $P = \left(\frac{N+1}{m}\right)$ (4) $P = \left(\frac{N-1}{m}\right)$

(where m is order number and N is number of years of record)

32. The term base flow denotes

(1) delayed groundwater flow reaching a stream

(2) delayed groundwater and snowmelt reaching a stream

(3) delayed groundwater and interflow

(4) the annual minimum flow in a stream

33. Following is ***not*** the method of apportionment of total cost of multipurpose reservoir :

(1) Remaining benefit method (2) Use of facilities method

(3) Equal apportionment (4) Direct method

34. Owing to the storage effect, the peak of the outflow hydrograph will be smaller than that of the inflow hydrograph. This reduction in peak value is known as

(1) Lag (2) Attenuation

(3) Routing (4) Prism storage

35. An IUH is a direct runoff hydrograph

(1) of one cm magnitude due to rainfall excess of 1-h duration

(2) that occurs instantaneously due to a rainfall excess of 1-h duration

(3) of unit rainfall excess precipitating instantaneously over the catchment

(4) occurring at any instant in long duration

36. The example of aquifuge is

(1) Clay layer (2) Sandy layer

(3) Solid granite rocks (4) Silty clay layer

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

37. The ratio of the quantity of water stored in the root zone of the crops to the quantity of water actually delivered in the field is
(1) Water conveyance efficiency (2) Water application efficiency
(3) Water use efficiency (4) None of the above

38. In border strip method of irrigation, the width of strip is
(1) 5 – 10 m (2) 10 – 20 m (3) 20 – 30 m (4) 25 – 30 m

39. The duty of irrigation water for a given crop is maximum
(1) on the field (2) at the head of main canal
(3) at the head of water course (4) near the distributary

40. A channel designed by Lacey's theory has a mean velocity of one m/s. The silt factor is unity. The hydraulic mean radius will be
(1) 2·5 m (2) 2·0 m (3) 1·0 m (4) 0·5 m

41. In design of spillway when $H_e = H_d$, the value of 'C' is
(1) 1·00 (2) 1·33 (3) 2·00 (4) 2·20

42. Hygroscopic water is defined as the
(1) readily available water for the use of plants.
(2) water which is adsorbed by the particles of the dry soil from the atmosphere.
(3) total water content of the soil when all pores are filled with water.
(4) water held by the soil under capillary action.

43. In case of non-availability of space due to topography, the most suitable spillway is
(1) Straight drop spillway (2) Shaft spillway
(3) Chute spillway (4) Ogee spillway

44. The channel after obtaining its section and longitudinal slope will be said to be in
(1) Initial regime (2) Permanent regime
(3) Final regime (4) Absolute regime

45. The silt load in the stream does ***not*** depend upon
(1) nature of the soil in the catchment area
(2) topography of the catchment area
(3) intensity of rainfall
(4) alignment of dam

46. Match the design speed recommended for various roads by IRC 86 : 1983

	List I		**List II**
(a)	Collector roads	(i)	30 kmph
(b)	Local roads	(ii)	80 kmph
(c)	Arterial roads	(iii)	60 kmph
(d)	Sub-arterial roads	(iv)	50 kmph

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

47. IRC recommended % values of camber for different types of road surface can be arranged in descending order of following roads :

a. Water bound macadam road
b. Thin bituminous surface road
c. Cement-concrete road
d. Earth road

Answer Options :

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

48. The expression for the length of a transition curve (L_s) in meters is

(1) $L_s = \frac{V^3}{CR}$ (2) $L_s = \frac{V^3}{16\,CR}$

(3) $L_s = \frac{V^3}{24\,CR}$ (4) $L_s = \frac{V^3}{46{\cdot}5\,CR}$

where

C = Rate of change of radial acceleration in m/s^3

R = Radius of the circular curve in metres, and

V = Speed of vehicle in kmph

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49. The design speed adopted for design of rotaries in urban areas of India is

(1) 30 kmph (2) 40 kmph (3) 50 kmph (4) 60 kmph

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50. Match the following :

	List I		List II
(a)	Stop signs	(i)	Circular in shape
(b)	Give way signs	(ii)	Equilateral triangle with its apex pointing upwards
(c)	Speed limit signs	(iii)	Octagonal shape
(d)	Warning signs	(iv)	Inverted triangle with its apex pointing downwards

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

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51. The dowel bars are used in rigid pavements for

(1) resisting tensile stresses
(2) resisting bending stresses
(3) resisting shear stresses
(4) transferring load from one portion to another

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52. Group index method of designing flexible pavement is based on

a. Plasticity index
b. Shear strength
c. CBR value
d. Percent fines

Answer Options :

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

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53. Grade separation

a. is for crossing traffic
b. is to minimize delay and hazard
c. a cheaper option
d. increases discomfort and inconvenience

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

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54. Consider the following statements :

Collision diagram is used to

a. study accident patterns
b. eliminate accidents
c. determine remedial measures
d. make statistical analysis of accidents

Answer Options :

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

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55. A bridge has a linear waterway of 150 metres constructed across a stream whose natural linear waterway is 200 metres. If the average flood depth is 3 metres and average flood discharge is 1200 m^3/sec, the velocity of approach is

(1) 2·0 m/sec (2) 2·66 m/sec (3) 6·0 m/sec (4) 8·0 m/sec

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56. The width of carriageway required will depend on the intensity and volume of traffic anticipated to use the bridge.

a. Except on minor village roads all bridges must provide for at least two lane width
b. The minimum width of carriageway is 4·25 m for one lane bridge
c. The minimum width of carriageway is 3·75 m for one lane bridge
d. The minimum width of carriageway is 7·5 m for two lane bridge

Which of the statements given above is/are ***incorrect*** ?

(1) Only a (2) Only a and c (3) Only a, c and d (4) Only c

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57. Which of the following shall be considered while designing high level bridges for buoyancy effect ?

(1) Full buoyancy for the superstructure
(2) Full buoyancy for the abutments
(3) Buoyancy forces due to submerged part of the substructure and foundation
(4) Partial buoyancy for superstructure

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58. The normal depth of scour for alluvial rivers is determined by Lacey's formula

(1) $\sqrt{0{\cdot}475}\left(\frac{f}{Q}\right)$ (2) $0{\cdot}475\left(\frac{Q}{f}\right)^3$

(3) $0{\cdot}475^3\sqrt{\frac{f}{Q}}$ (4) $0{\cdot}475^3\sqrt{\frac{Q}{f}}$

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59. Roller bearings are used in bridges for the span of
(1) 18 to 24 m (2) 12 to 18 m (3) 6 to 12 m (4) Up to 6 m

60. The maximum scour depth dm for condition of flow at noses of piers is
(1) 1·50 d (2) 1·75 d (3) 2·00 d (4) 2·75 d

61. For high level bridges, the freeboard should ***not*** be less than
(1) 200 mm (2) 400 mm (3) 600 mm (4) 800 mm

62. As per IRC specifications, the minimum cement content in concrete is _____ for major bridges.
(1) 340 kg/m^3 (2) 350 kg/m^3
(3) 360 kg/m^3 (4) 370 kg/m^3

63. For IRC class A and B loading, the impact factor, for R.C.C. bridges having spans more than 45 metres, is taken as
(1) 0·078 (2) 0·088 (3) 0·098 (4) 0·154

64. Which pattern of the drilling is ***not*** used for shafts ?
(1) Central wedge cut (2) End wedge cut
(3) Vertical wedge cut (4) Alternate wedge cut

65. From the economy point of view, tunnelling is advisable when the depth of open cut is more than
(1) 6 m (2) 12 m (3) 18 m (4) 24 m

66. Match the following :

	List I		List II
(a)	Firm ground	(i)	Needing instant support all round
(b)	Running ground	(ii)	Needing instant support for roof
(c)	Self-supporting ground	(iii)	No need of instant support for roof
(d)	Soft ground	(iv)	Soil stands supported for short period and short length

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

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67. Which of the following methods is suitable for the construction of large-sized railway or highway tunnels ?

(1) Forepoling method (2) American method

(3) Case method (4) Full face method

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68. Match the List I (Shape of Tunnel) with List II (Characteristics) :

	List I		List II
(a)	Circular section	(i)	Provides more working space
(b)	Horseshoe section	(ii)	Provides greatest cross-sectional area for least perimeter
(c)	Egg shape	(iii)	Vertical sides with flat floor
(d)	Segmental cross-section	(iv)	Provides least cross-section area at the bottom

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

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69. In order to maintain the desired shape of the tunnel, the cross section of the tunnel must be checked at a regular interval of

(1) 2 m to 3 m (2) 4 m to 6 m (3) 5 m to 7 m (4) 8 m to 15 m

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70. *Assertion (A) :* Faces for attacking the excavation and construction of tunnels are opened by constructing pilot tunnels.

Reasoning (R) : Pilot tunnels are suitable at locations when horizontal approach to the centre line of tunnel is shorter than deep vertical shafts.

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

(2) (A) is true and (R) is false

(3) (A) is false and (R) is true

(4) Both (A) and (R) are false

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71. Which of the following methods is generally considered the most efficient system for ventilation of tunnels ?

(1) Driving a shaft through the tunnel

(2) Driving a drift through the top portion

(3) Blow in method

(4) Combination of blowing and exhausting

72. In case of long tunnels, the drainage system consists of sump wells which are located at regular intervals of about

(1) 50 m to 100 m (2) 100 m to 200 m

(3) 200 m to 300 m (4) 300 m to 500 m

73. Air valves or Air-relief valves are provided at

(1) Summits (2) Valleys

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

74. Which of the following treatments reduces salinity of water ?

a. Alum coagulation, flocculation and settling

b. Carbon filtration

c. Reverse osmosis

d. Electro dialysis

Answer Options :

(1) Only a and b

(2) Only b and c

(3) Only c and d

(4) Only b, c and d

75. The minimum velocity of flow in a sewer should be ideally

(1) equal to self-cleansing velocity

(2) equal to non-scouring velocity

(3) less than self-cleansing velocity

(4) more than non-scouring velocity

76. Sewer lines having difference of more than 600 mm in the water lines and invert level of two sewers are connected with a

(1) Siphon (2) Manhole

(3) Inspection chamber (4) Drop manhole

---

77. Generally the period chosen for a standard B.O.D. test is

(1) 1 day (2) 5 days

(3) 8 days (4) 20 days

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78. For rapid sand filter, sand should have the following specifications :

(1) Effective size 0·1 – 0·5 mm
Uniformity co-efficient = 2 to 4

(2) Effective size 0·2 – 0·5 mm
Uniformity co-efficient = 2 to 3

(3) Effective size 0·45 – 0·7 mm
Uniformity co-efficient = 1·3 to 1·7

(4) Effective size 0·7 – 0·9 mm
Uniformity co-efficient = 1 to 5

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79. If waste water is disposed off into a natural stream, the maximum dissolved oxygen depletion occurs in the zone of

(1) degradation (2) active decomposition

(3) clearer water (4) recovery

---

80. In a sedimentation tank design, surface overflow rate (S.O.R.) is calculated as

(1) Surface area/velocity of water Q/V/V

(2) Discharge/plan area Q/B×L

(3) Volume of tank/discharge V/Q

(4) Surface area/settling velocity of the particle A/V_s

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81. The waste water treatment unit which is installed to remove floating substances like grease, oil, fats, waxes, etc. is

(1) skimming tank (2) detritus tank

(3) sedimentation tank (4) None of the above

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82. An alidade in which one edge is bevelled is called as

(1) Soft edge (2) Fiducial edge

(3) Telescopic edge (4) Swivel edge

83. Contour interval is the

(1) vertical distance between two consecutive contours

(2) horizontal distance between two consecutive contours

(3) vertical distance between two points on the same contour

(4) horizontal distance between two points on the same contour

84. The length of a simple circular curve of radices R metres and intersection angle D degrees will be

(1) $R \cdot \frac{D}{2}$ (2) $\frac{\pi}{180} \cdot R \cdot \frac{D}{2}$

(3) $\frac{\pi}{180} \cdot R \cdot \frac{D}{4}$ (4) $\frac{\pi}{180} \cdot R \cdot D$

85. The height of an instrument is the

(1) Height of the instrument above the ground

(2) Height between ground and telescope

(3) Elevation of the plane of sight

(4) Reduced level of station

86. If a tachometer is fitted with an anallactic lens, then,

(1) Additive constant is 100 and multiplying constant is zero

(2) Multiplying constant is 100 and additive constant is zero

(3) Both additive and multiplying constants are 100

(4) Both multiplying and additive constants are 50

87. Following is constant for a contour map :

(1) Horizontal equivalent

(2) Benchmark

(3) Contour interval

(4) Topography

88. The combined correction due to curvature and refraction is given by

(1) $0{\cdot}095\ d^2$ (2) $0{\cdot}01122\ d^2$

(3) $0{\cdot}06735\ d^2$ (4) $0{\cdot}572\ d^2$

(where d is in km)

---

89. Reiteration method is also called as

(1) Method of series (2) Repetition method

(3) Direction method (4) Both (1) and (3)

---

90. The expression for sensitivity of the bubble tube (α) can be taken as, _____

where n = No. of divisions

s = Net staff reading

d = Distance

R = Radius of curvature

l = Length of one division

(1) $\alpha = \frac{s}{nd} \times 206265$ seconds (2) $\alpha = \frac{d}{ns} \times 206265$ seconds

(3) $\alpha = \frac{nlD}{R}$ radians (4) $\alpha = \frac{s}{nR} \cdot \frac{l}{D}$

---

91. Closing error in theodolite traverse survey is given as

(1) $e = \sqrt{(\Sigma L^2 + \Sigma D^2)^2}$ (2) $e = \sqrt{(\Sigma L)^2 + (\Sigma D)^2}$

(3) $e = \sqrt{\Sigma L + \Sigma D}$ (4) $e = \sqrt{(\Sigma L)^2 - (\Sigma D)^2}$

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92. If the length of 16 mm diameter bar is 10 m, then its weight is

(1) 16·5 kg (2) 16·9 kg

(3) 15·8 kg (4) 16·2 kg

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93. Security deposit is

(1) deposited at the time of filling tender

(2) deposited by the contractor whose tender is accepted

(3) deposited at the time of opening tenders

(4) deposited for fair competition

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94. In order to compute the quantities of R.C.C. beams, lengths of beams are measured to the

(1) nearest millimetre (2) nearest half centimetre

(3) nearest centimetre (4) nearest inch

---

95. In case of which type of contract, unbalanced tender is ***not*** possible ?

(1) Open tender (2) Item rate contract

(3) Percentage rate contract (4) Unit price contract

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96. Which of the following types of contract is used for execution of large works financed by public bodies or the government ?

(1) Item rate contract (2) Percentage rate contract

(3) Cost plus type contract (4) Target contract

---

97. *Assertion (A) :* Earnest money deposit is usually 1% to 2% of the total estimated cost of the work.

Reasoning (R) : Earnest money deposit prevents unnecessary and unhealthy competition.

(1) Both (A) and (R) are true (2) Both (A) and (R) are false

(3) (A) is true and (R) is false (4) (A) is false and (R) is true

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98. Equation for cement requirement in tonnes for four-storey R.C.C. framed building (super structure) recommended by C.B.R.I. is

(1) $0{\cdot}153\ A + 0{\cdot}57$ (2) $0{\cdot}145\ A + 0{\cdot}54$

(3) $0{\cdot}182\ A - 0{\cdot}35$ (4) $2{\cdot}26\ A + 66{\cdot}8$

(where A is plinth area in sq. mt)

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99. While submitting tender by three envelope method, which envelope contains rates/amount offered by the tenderer ?

(1) Envelop : 3 (2) Envelope nos : 1 and 2

(3) Envelope : 1 (4) None of the above

---

100. The length of L-bend for Tor steel to be provided at each end of the reinforcing bars is

(1) 12 times diameter (2) 6 times diameter

(3) 3 times diameter (4) 150 mm

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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