महाराष्ट्र स्थापत्य अभियांत्रिकी सेवा (मुख्य) परीक्षा- 2019
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A → संच क्रमांक

2019 **U13**

प्रश्नपुस्तिका क्रमांक
BOOKLET NO.

प्रश्नपुस्तिका - II

स्थापत्य अभियांत्रिकी पेपर - 2

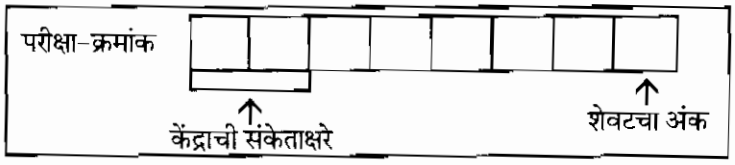
वेळ : 2 (दोन) तास

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 बॉल्पेनने** 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 बॉल्पेन 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 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 केलेल्ली 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 केलेल्ली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असल्ली तरीही अशा व्यक्तीविरुद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

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1. The areas enclosed by the contours in a lake are as follows :

Contour (m)	270	275	280	285	290
Area (m^2)	50	200	400	600	750

The volume of water between the contours 270 m and 290 m by trapezoidal formula is _____.

(1) 6400 m^3 (2) 8000 m^3 (3) 16000 m^3 (4) 24000 m^3

---

2. The R.L. of A is 98.75 m and the R.L. of B is 100.75 m. The horizontal distance between A and B is 10.0 m. If the contour interval is 0.25 m, the distance of 99.00 m contour line from A is _____.

(1) 0.25 m (2) 1.25 m (3) 2.0 m (4) 2.5 m

---

3. When the height of signal is not the same as that of the height of instrument, then a correction applied for measurement is known as :

(1) Curvature correction (2) Combined correction

(3) Axis signal correction (4) Refraction correction

---

4. If h is the height above datum of the object, H be the flying height above datum and r be the radial distance of the image of the object from principal point, then the relief displacement d is equal to :

(1) $d = \frac{r.h}{H}$ (2) $d = \frac{r.H}{h}$ (3) $d = \frac{H.h}{r}$ (4) $d = \frac{r}{H}$

---

5. In surveying optical square is used to setting out right angles. The horizon glass is placed at an angle of _____ with the horizon sight and index glass is placed at an angle of _____ with the index sight.

(1) 30° and 15° (2) 60° and 45° (3) 90° and 75° (4) 120° and 105°

---

6. If an upgrade of +1.4% joins another upgrade of +0.4% and rate of change of grade is 0.1% per 20 m chain, then the length of vertical curve is :

(1) 200 m (2) 360 m (3) 400 m (4) 80 m

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7. A rectangular plot of land of area 0.45 hectare is represented on a map by a similar rectangle of area 5 cm^2. Calculate R.F. of the scale of the map. Draw a scale to read upto a single metre from the map.

(1) 1 : 5000 (2) 1 : 8000 (3) 1 : 9000 (4) 1 : 3000

8. Two points A and B were fixed on opposite bank of a river. The level was setup near A and the staff readings on A and B were observed as 1.800 m and 1.300 m, respectively. Thereafter, level was setup near B and staff readings observed on B and A were found to be 0.350 m and 0.850 m, respectively. If the R.L. of A is 101.500 m, then R.L. of B is :

(1) 102.0 m (2) 101.0 m (3) 100.0 m (4) 100.450 m

9. The combined correction due to curvature and refraction in (m) for a distance of 2 kilometer is :

(1) 0.224 m (2) 0.1346 m (3) 0.1570 m (4) 0.1750 m

10. In tacheometric surveying :

(a) The intercept of the staff is maximum when the staff is normal to the line of sight.

(b) In the tangential system, the staff is kept normal to the line of sight.

(c) If a tacheometer is fitted with an anallatic lens, its additive constant is non zero.

(d) It is more convenient to hold the staff normal to the line of sight than to hold it vertical.

Select the **incorrect** statement/statements from the above.

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

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

11. Generally how much amount is provided in estimate as work charged establishment ?

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

12. In rate analysis procedure, by what % the wet volume of concrete is to be increased for determining dry volume ?

(1) 20% (2) 30% (3) 52% (4) 25%

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13. Capitalised value of a property fetching a net annual rent of ₹ 1,000 and highest rate of interest prevailing being 10% will be :

(1) 1,000 (2) 1,00,000 (3) 10,000 (4) 100

14. In the Centre Line Method of calculating quantities, the following rules for each item from foundation is applied. The total centre line length of each item is calculated and for cross walls, deductions are made as follows :

(1) ½ breadth of item at each junction (2) 1 full breadth of item at each junction

(3) 2 full breadth of item at each junction (4) no deductions

15. Which value is obtained by dismantling the building ?

(1) Book Value (2) Distress Value (3) Salvage Value (4) Scrap Value

16. The sanction of detailed estimate design calculation, quantities of work, rates and cost of the work by competent authority is called as :

(1) Administrative approval (2) Technical sanction

(3) Expenditure sanction (4) Official sanction

17. Determine the capital sum to be invested to receive annual income of ₹ 1 lakh, if the rate of interest is 5%.

(1) ₹ 50 lakh (2) ₹ 20 lakh (3) ₹ 100 lakh (4) ₹ 10 lakh

18. Which of the following methods is also called as out to out and in to in method ?

(1) Long wall and short wall method (2) Centre line method

(3) Plinth area method (4) Cubic content method

19. Detailed specification for an item of P.C.C. (1 : 2 : 4) should include following points :

(1) Quantity of material, cost of different materials, work condition.

(2) General specification, materials to be used, quality and proportion, construction method, items to include/exclude, and mode of measurement and payment.

(3) Work conditions at site, BIS requirements, labour requirement and its cost.

(4) Sources of materials, instructions by PWD, labour requirement.

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20. A load of 625 T is imposed on a footing of size 2 m × 2 m.

If it is to be assumed that, stress at depth "d" is spread out at an angle of 2 vertical to 1 horizontal, find out the depth 'd' at which the intensity of stress will be $\left(\frac{1}{9}\right)^{th}$ of the stress at ground level.

Choose **correct** depth in metres from the following :

(1) 2 m (2) 3 m (3) 4 m (4) 5 m

---

21. An embankment in clayey soil of 5 m height is to be constructed using factor of safety of 2.5. It is to be assumed that stability number is $\frac{1}{45}$ and unit weight of soil is 18 kN/m^3. Find the minimum cohesive strength (in kN/m^2) which the soil should have.

Choose **correct** answer from the following :

(1) 30 (2) 5 (3) 10 (4) 15

---

22. From the plate load test, the ultimate bearing capacity of plate of size 0.3 m × 0.3 m on sand deposit is observed to be 200 kN/m^2, the ultimate bearing capacity of a footing of size 1.5 m × 1.5 m will be :

(1) 200 kN/m^2 (2) 1000 kN/m^2 (3) 500 kN/m^2 (4) 2000 kN/m^2

---

23. In a rock core sampling method at site, the total length of drilling was 1.0 m in rocky strata. There were five intact pieces of rocks of lengths 150 mm, 200 mm, 75 mm, 50 mm, and 200 mm were collected. The value of Rock Quality Designation (RQD) for the rock sample is :

(1) 55.0% (2) 67.5% (3) 62.5% (4) 40.0%

---

24. Poisson's ratio of a soil sample is 0.4. Using theory of elasticity, the estimated value of the coefficient of lateral earth pressure at rest in the same soil is :

(1) 0.5 (2) 0.7 (3) 0.3 (4) 1.0

---

25. If a concentrated load Q produces a stress of 40 kN/m^2 at a depth of 1 m, then the stress at 2 m depth and same radial distance will be :

(1) 20 kN/m^2 (2) 80 kN/m^2 (3) 40 kN/m^2 (4) 10 kN/m^2

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26. Amount of compaction greatly affects :

(1) Water content and Maximum dry density

(2) Saturation of soil

(3) None of the above

(4) All of the above

---

27. A pile having a square cross-section of 0.5 m sides has length of 10 m. It is embedded in purely cohesive soil having uniform cohesion of 50 kN/sq. m upto 10 m depth. If adhesion factor = 0.5, the ultimate capacity of the pile considering only skin friction component will be :

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

---

28. During unconfined compression test a soil sample failed at 150 N. The cross-sectional area of sample at failure was 2000 mm^2, then the shear strength of soil will be :

(1) 75 kN/m^2 (2) 375 kN/m^2 (3) 133 kN/m^2 (4) 37.5 kN/m^2

---

29. Two reservoirs are connected by two pipes M and N of identical diameter and length, in parallel. If the friction factor of M is 04 times that of N, the ratio of discharge in M to that of N is :

(1) 0.50 (2) 0.25 (3) 2.0 (4) 4.0

---

30. Bernoulli's equation is derived making assumptions 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.

---

31. In a suppressed rectangular weir, the calculated discharge was found to be 3% in excess of the actual discharge. If this discrepancy was due to an error in reading the head, the measured head was :

(1) 3% excess (2) 2% less (3) 2% excess (4) 1.5% excess

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32. A uniform body 3 m long, 2 m wide and 1 m deep floats in water. If the depth of immersion is 0.60 m, then the weight of the body is :

(1) 3.53 kN (2) 33.5 kN (3) 35.31 kN (4) none of these

33. For a laminar flow through circular pipe, the maximum velocity is equal to _____.

(1) 1.5 times the average velocity (2) 2.0 times the average velocity

(3) 2.5 times the average velocity (4) None of the above

34. Coefficient of contraction is the ratio of :

(1) actual velocity of jet at Vena contracta to the theoretical velocity.

(2) loss of head in the orifice to the head of water available at the exit of the orifice.

(3) actual discharge through an orifice to the theoretical discharge.

(4) area of jet at Vena contracta to the area of orifice.

35. Model analysis of aeroplanes and projectile moving at supersonic speed is based on _____.

(1) Reynold Number (2) Froude Number

(3) Mach Number (4) Euler Number

36. A dimensionless group formed with variables :

ρ (mass density), μ (dynamic viscosity), g (gravitational acceleration) and D (characteristic length) is :

(1) $D^{3/2}/\rho\mu g$ (2) $\mu/\rho g^{1/2} D^{3/2}$ (3) $\mu/\rho g D^{3/2}$ (4) $\mu/\rho^{1/2} D g^{1/2}$

37. In a rectangular channel, carrying a certain discharge at a depth Y_o and Froude number F_o, then Y_c/Y_o=

(1) F_o (2) $F_o^{1/2}$ (3) $F_o^{3/2}$ (4) $F_o^{2/3}$

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38. In a reciprocating pump without air vessel, the friction head in the delivery pipe is maximum at the crank angle $\theta = ?$

(1) 0° (2) 90° (3) 135° (4) 180°

39. An air vessel in the delivery side of a reciprocating pump :

(1) maintains steady discharge output.

(2) prevents cavitation in the system.

(3) enables suction head to be increased.

(4) enables the pump to run at higher speed.

40. For double acting reciprocating pump, there will be no flow into or from the air valve, when the crank angle is :

(1) 39° 32' and 140° 28' (2) 39° 32 to 140° 28'

(3) 0° to 39° 32' (4) 18° 34' to 161° 26'

41. The specific speed of a centrifugal pump has the dimensions of :

(1) $L^{3/4} T^{-3/2}$ (2) $M^0 L^0 T^0$

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

42. The work saved by fitting an air vessel to a double acting reciprocating pump is :

(1) 39.2% (2) 84.8% (3) 48.8% (4) 92.3%

43. Match the pair :

(a)	Run of river plant	(i)	Large storage
(b)	Reservoir plant	(ii)	Water pumped back to the head water tank
(c)	Pumped storage plant	(iii)	Sea water
(d)	Tidal plant	(iv)	No storage

Answer Options :

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

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44. Kaplan turbine is a propeller turbine in which the vanes fixed on the hub are :

(1) non-adjustable (2) adjustable

(3) fixed (4) none of the above

45. The cylindrical bore diameter of a single acting reciprocating pump is 200 mm and its stroke is 400 mm. The pump runs at 60 rpm. The theoretical discharge for pump in litre per second is :

(1) 0.01256 (2) 12.56 (3) 1.256 (4) 0.1256

46. Which of the following statement is **correct** ?

(1) Centrifugal pump convert hydraulic energy into mechanical energy.

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

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

(4) Reciprocating pumps convert hydraulic energy into mechanical energy.

47. The design flood commonly adopted in India for spillways of major projects is the :

(1) Standard Project Flood. (2) Flood with a Return Period of 100 years.

(3) Probable Maximum Flood. (4) Flood with a Return Period of 10,000 years.

48. The Thiessen polygon is :

(1) a polygon obtained by joining adjoining raingauge station.

(2) a representative area used for weighing the observed station precipitation.

(3) an area used in the construction of depth-area curve.

(4) the descriptive term for the shape of hydrograph.

49. In a flow-mass curve study, the demand line drawn from a ridge in the curve did not intersect the mass curve again. This represents that :

(1) the reservoir was not full at the beginning.

(2) the storage was not adequate.

(3) the demand cannot be met by the inflow as the reservoir will not refill.

(4) the reservoir is wasting water by spill.

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50. An instantaneous unit hydrograph is a direct run-off hydrograph :

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

(2) that occurs instantaneously due to a unit rainfall excess of duration 'D' h.

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

(4) occurring at any instant in a long storm.

---

51. Evaporation losses from surface of a reservoir can be reduced by sprinkling :

(1) DDT (2) Acetyl alcohol

(3) Potassium permanganate (4) None of the above

---

52. Dalton's law is given as :

(1) $E_L = C[e_s + e_a]$ (2) $E_L = C[e_a - e_s]$

(3) $E_L = C[e_s - e_a]$ (4) $E_L = C[e_s + e_w]$

---

53. Direct run-off is made up of :

(1) Surface run-off, prompt interflow and channel precipitation.

(2) Surface run-off, infiltration and evapotranspiration.

(3) Overland flow only.

(4) Rainfall and Evaporation.

---

54. The Rainfall Intensity of Light Rain is :

(1) Upto 2.5 mm/Hz (2) Upto 3.0 mm/Hz

(3) Upto 5.00 mm/Hz (4) Upto 7.5 mm/Hz

---

55. A plot between rainfall intensity versus time is called as :

(1) hydrograph (2) mass curve (3) hyetograph (4) isohyet

---

56. Which of the following is known as 'feeding bottle technique' ?

(1) Drip Irrigation (2) Sprinkler Irrigation

(3) Furrow Method (4) None of the Above

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57. This type of dam requires strong abutment :

(1) Gravity (2) Buttress (3) Arch (4) All above

58. Given that the base period is 100 days and the duty of the canal is 1000 hectares per cumec, the depth of water will be :

(1) 0.864 cm (2) 8.64 cm (3) 86.4 cm (4) 864 cm

59. In Bligh Creep Theory [L/H] is called as :

(1) Creep Length (2) Hydraulic Gradient

(3) Coefficient of Creep (4) Percolation Coefficient

60. For the upstream face of an earthen dam, the most adverse condition for stability of slope is :

(1) sudden drawdown (2) steady seepage

(3) during construction (4) sloughing of slope

61. Mean Water Training means :

(1) Training for discharge (2) Training for depth

(3) Training for sediment (4) Traiming for flood

62. In spillway, when the tail water depth is less than the sequent depth and river bed is composed of stiff rock, which one of the following energy dissipation device is preferred ?

(1) Solid roller bucket (2) Slotted roller bucket

(3) Ski jump bucket (4) Stilling basin

63. The main cause of meandering is :

(1) presence of an excessive bed slope in the river.

(2) degradation.

(3) the extra turbulence generated by the excess of river sediment during floods.

(4) none of the above.

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64. Lacey gave V - Q - f relation as :

(1) $V = \left[\frac{Qf^2}{160}\right]^{1/4}$ (2) $V = \left[\frac{Qf^2}{140}\right]^{1/6}$

(3) $V = \left[\frac{fQ^2}{160}\right]^{1/4}$ (4) $V = \left[\frac{Qf}{140}\right]^{1/6}$

---

65. Which of the following method is recommended by I.R.C. for design of flexible pavement ?

(1) Group index method (2) Westergaard method

(3) CBR method (4) None of these

---

66. In case of pavement design :

Match the **List - I (Type of carriageway)** with **List - II (Lane distribution factor)** :

	List - I		**List - II**
(a)	Undivided roads with two lane carriageway	(i)	0.75
(b)	Undivided roads with single lane carriageway	(ii)	1.0
(c)	Divided carriageway with four lanes each	(iii)	0.45
(d)	Undivided roads with four lane carriageway	(iv)	0.40

Answer Options :

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

---

67. As per current Viscosity Graded (VG) bitumen specifications in India (IS 73 : 2006, Third revision) the Absolute Viscosity of bitumen using vacuum capillary tube viscometer is determined at _____ temperature.

(1) 135°C (2) 25°C (3) 27°C (4) 60°C

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68. The super-elevation is _____.

(1) directly proportional to the velocity of vehicles

(2) inversely proportional to the velocity of vehicles

(3) directly proportional to the width of pavement

(4) inversely proportional to the width of pavement

69. Match the pair :

(a)	Penetration test	(i)	Hardness property of stones
(b)	Plate bearing test	(ii)	Hardness or softness of bitumen
(c)	CBR test	(iii)	Penetration test for highway material
(d)	Abrasion test	(iv)	Modulus of subgrade reaction

Answer Options :

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

70. Which of the following statement is/are **correct** ?

(a) Penetration test on bitumen is carried out at 27°C.

(b) Ductility test on bitumen is carried out at 27°C.

(c) In softening point test on bitumen, rate of increase of temperature is 2°C per minute.

(d) The rate of pulling of standard briquette mould specimen in ductility test is 15 mm per minute.

Answer Options :

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

71. The free mean speed on a roadway is found to be 70 kmph. Under stopped condition the average spacing between vehicles is 5.0 m. The capacity flow is :

(1) 3500 vehicles/hour/lane (2) 3700 vehicles/hour/lane

(3) 3200 vehicles/hour/lane (4) 3000 vehicles/hour/lane

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72. If 'R' is the radius of curvature of a hill road, the maximum grade compensation (in percentage) is equal to :

(1) 65/R (2) 75/R (3) 85/R (4) 95/R

73. In a particular case, the design gradient is 1 in 25. If a horizontal curve of 100 m radius is to be introduced on this gradient, the compensated gradient on this curve is _____.

(1) 0.75% (2) 1.3% (3) 2.7% (4) 3.25%

74. In case of erection of multiple span truss bridges symmetrical about centre line, the erection is started from _____ until the centre is reached.

(1) Left end (2) Both ends

(3) Right end (4) None of the above

75. If the nature of river is at a moderate bent condition then maximum V depth of scour is taken as :

(1) 1.25 D (2) 1.75 D (3) 1.5 D (4) 2 D

76. The effective span for main girder in case of bridges is :

(1) the distance between centres of main girders.

(2) the distance between centres of cross girders.

(3) the distance between centres of road bearings.

(4) the distance between centres of bearing plates.

77. In which of the following type of Abutments, wing walls are not provided :

(1) Gravity Abutments (2) U - Abutments

(3) Tee - Abutments (4) Abutment Pier

78. While designing highway bridges, the wind load acting on any exposed moving live load will be assumed to act at a height of _____ above the roadway.

(1) 1.0 m (2) 1.2 m (3) 1.5 m (4) 1.75 m

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79. As per IRC recommendations the minimum straight length of approaches on either side of the bridge should be _____.

(1) 15 m (2) 20 m (3) 25 m (4) 30 m

80. For IRC Class A loading train, the nose to tail spacing between two successive trains shall not be less than _____.

(1) 12.5 m (2) 15.5 m (3) 17.5 m (4) 18.5 m

81. The width of carriageway is expressed in terms of traffic lanes, each lane meaning the width required to accommodate one train of _____ vehicles.

(1) Class A (2) Class B (3) Class C (4) Class 70 R

82. The effective linear waterway in meters is given by :

(1) $L = 0.75\ V^2$ (2) $L = C\sqrt{Q}$

(3) $L = 1.811\ C\sqrt{Q}$ (4) $L = CQ^2$

83. Which of the following is **not** a patented explosive available in the market for tunnelling operations ?

(1) PENT (2) RDX (3) TNT (4) NTT

84. Which shape of tunnel is suitable for the purpose of navigation ?

(1) Circular Shape (2) D Shape

(3) Horse-shoe Shape (4) Rectangular Shape

85. Which of the following method of tunnelling is being gradually replaced by compressed air tunnelling method ?

(1) Needle beam method (2) Belgian method

(3) Heading and Bench method (4) Forepoling method

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86. Which section of tunnel is also known as segmental root section tunnel ?

(1) D section (2) Egg Shaped Section

(3) Circular section (4) Rectangular Section

87. Which one of the following methods of tunnelling is used in hard rocks ?

(1) Fore poling method (2) Needle beam method

(3) Heading and Benching method (4) Shield tunnelling method

88. With reference to tunnelling which of the following factors, are to be considered for deciding the size of the shaft :

(1) System used for hoisting (2) Size of the muck car

(3) Quantity of muck to be lifted (4) Eventual use of the shaft

89. The tunnelling method that is **not** suitable in case of soft soil is :

(1) Needle beam method (2) Full face method

(3) Fore poling method (4) Liner plate method

90. The procedure of removal of rock protrusions by hammering immediately after the blasting is known as :

(1) Mucking (2) Skimming (3) Trimming (4) Scaling

91. Which one of the following Drift method is time consuming but provides good ventilation ?

(1) Top Drift Method (2) Bottom Drift Method

(3) Centre Drift Method (4) Side Drift Method

92. If the sewer is to be designed for the non-scouring velocity of 5 m/sec, which among the following material would you recommend ?

(1) Cast iron sewer (2) Glazed brick sewer

(3) Stone ware sewer (4) Cement concrete sewer

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93. Select the **incorrect** pair from the following pairs of treatment unit and impurities removed, in waste water treatment system :

(a) Grit chamber - Sand, silt

(b) Aeration tank - Suspended impurities

(c) Skimming tank - Fat and Grease

(d) Screen - Cloth, paper

Answer Options :

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

---

94. Carbon monoxide is considered as most poisonous gas in Urban areas because :

(1) It causes loss of sense of smell.

(2) It is carcinogenic in nature.

(3) It reduces oxygen carrying capacity of blood.

(4) It may cause conjunctivitis.

---

95. The ideal pathogenic indicator used for bacterial analysis of water is exhibited by the organism :

(1) Escherichia coli (2) Entamoeba histolytica

(3) Salmonella typhi (4) Vibro comma

---

96. In water treatment process, aeration of water is carried out to :

(1) remove hardness and chlorides from water.

(2) add calcium and magnesium to water.

(3) remove gases like carbon dioxide, hydrogen sulfide and to add oxygen to water.

(4) remove oxygen from water and to add carbon dioxide to impart test and odour to water.

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97. The unit in which both sedimentation and digestion take place simultaneously is the :

(1) Detritus tank (2) Imhoff tank

(3) Skimming tank (4) Clarifier

---

98. The sag in the dissolved oxygen curve results because of DO is a function of :

(1) Both addition and depletion of oxygen from the stream.

(2) The rate of addition of oxygen to the solution.

(3) The rate of addition of oxygen is linear, but not that of depletion.

(4) The rate of organic substances introduced in the process.

---

99. Alum as a coagulant is found to be effective between pH range of _____.

(1) 8.0 to 10.0 (2) 8.5 to 10.5 (3) 6.5 to 8.5 (4) 7.0 to 9.0

---

100. In an oxidation pond, the sewage is made non-putrescible primarily by :

(1) Algae bacteria symbiosis only.

(2) Bacterial oxidation only.

(3) Chemical oxidation only.

(4) Algae photosynthesis and algae bacteria symbiosis.

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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 परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.**

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Pick out the correct word to fill in the blank :

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(3) on (4) about

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प्र. क्र. 201. ① ② ● ④

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

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