परीक्षेचे नाव:- महाराष्ट्र स्थापत्य अभियांत्रिकी सेवा (मुख्य) परीक्षा-2020
परीक्षा दि. 18 डिसेंबर, 2021

प्रश्नपुस्तिका क्रमांक
BOOKLET No.

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N14 संच क्र. **A**

प्रश्नपुस्तिका - II

स्थापत्य अभियांत्रिकी पेपर - 2

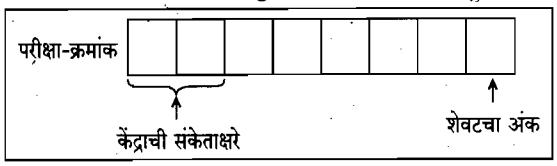
वेळ : 2 (दोन) तास

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 बॉलपेनने** लिहावा.



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

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

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

(6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही. एकापेक्षा जास्त उत्तरे नमूद केल्यास ते उत्तर चुकीचे धरले जाईल व त्या चुकीच्या उत्तराचे गुण वजा केले जातील.

(7) **प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवाराच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच "उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची दिलेल्या चार उत्तरांपैकी सर्वात योग्य उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चुकीच्या उत्तरांसाठी 25% किंवा 1/4 गुण वजा 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. The thickness of diffuse double layer in pure clay will be maximum for the following predominant clay mineral :

(1) Kaolinite (2) Montmorillonite

(3) Illite (4) Muscovite

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2. For a soil having $\gamma_{sat} = 22\ kN/m^3$, how much will γ_{sub} be ? (Take $\gamma_w = 10\ kN/m^3$)

(1) $21\ kN/m^3$ (2) $12\ kN/m^3$

(3) $22\ kN/m^3$ (4) None of the above

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3. If 's' is the shear strength, 'c' and 'ϕ' are shear strength parameters and 'σ_n' is the normal stress at failure, then Coulomb's equation for shear strength of the soil can be represented by _____ .

(1) $c = s + \sigma_n \tan \phi$ (2) $c = s - \sigma_n \tan \phi$

(3) $s = \sigma_n + c \tan \phi$ (4) $s = c - \sigma_n \tan \phi$

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4. A clay sample has a void ratio 0·54 in dry state. The specific gravity of soil solids is 2·7. What is the shrinkage limit of the soil ?

(1) 8·5% (2) 10·0% (3) 17·0% (4) 20·0%

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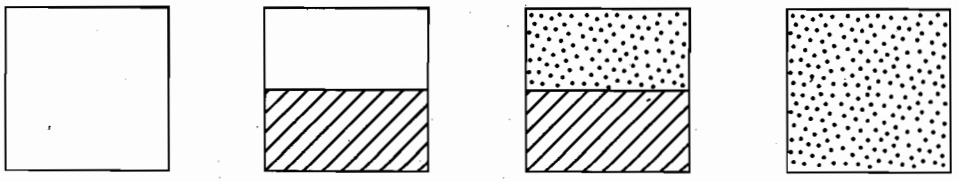
5. The given figure indicates the weights of different pycnometers.



Empty Pycnometer (W_1) | Pycnometer + Dry Soil (W_2) | Pycnometer + Soil + Water (W_3) | Pycnometer + Water (W_4)

For this, the specific gravity of the solids is given by

(1) $\dfrac{W_2}{W_4 - W_2}$ (2) $\dfrac{W_1 - W_2}{(W_3 - W_4) - (W_2 - W_1)}$

(3) $\dfrac{W_2}{W_3 - W_4}$ (4) $\dfrac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)}$

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6. A soil sample having specific gravity of 2·5 has OMC of 20%. Find out the theoretical maximum dry density assuming density of water as 1·0 gm/cc. Choose the correct answer from the following (in gm/cc) :

(1) $\frac{5}{3}$ (2) $\frac{7}{4}$ (3) $\frac{8}{5}$ (4) 1·5

7. A cohesive soil was tested in natural state and in remoulded state. If the cohesion of soil in natural state is 40 kN/m^2 and in remoulded state is 20 kN/m^2, then the sensitivity of the cohesive soil is _____.

(1) 0·5 (2) 1·0 (3) 2·0 (4) 3·0

8. An excavation is to be made in purely cohesive soil deposit having c = 20 kN/m^2 and unit weight = 16 kN/m^3. The depth to which the vertical sides of the excavation will remain stable without side supports will be :

(1) 1·25 m (2) 2·50 m (3) 5·00 m (4) 8·00 m

9. Behind a 6 m high retaining wall with vertical back, cohesionless backfill with angle of internal friction = 30° and dry unit weight = 15 kN/m^3 is in existence. The total force exerted on the wall per meter length of the wall in active and passive condition will be respectively :

(1) 90 and 810 kN (2) 810 and 90 kN
(3) 180 and 450 kN (4) 180 and 1620 kN

10. In a two-dimensional flow, u = cx and v = – cy where c = a constant. The streamlines are expressed by the equation :

(1) $\frac{x}{y}$ = constant (2) xy = constant
(3) x + y = constant (4) x – y = constant

11. The following results are obtained on shear stress (τ) and rate of deformation $\left(\frac{du}{dy}\right)$ at constant temperature for a fluid.

$\left(\frac{du}{dy}\right)$ (radians/sec)	0	0	1	2	3
τ (kPa)	0	10	20	30	40

The above fluid is classified as

(1) Newtonian (2) Non-Newtonian
(3) Ideal plastic (4) Thixotropic

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

12. Which of the following combination of pressure (ΔP), density (ρ), length (l), and discharge (Q) results into dimension $M^0L^2T^{-2}$?

(1) $\sqrt{\frac{\rho}{\Delta P}} \cdot \frac{Q}{l^2}$

(2) $\frac{\Delta P l Q}{\rho}$

(3) $\frac{\rho l}{\Delta P Q^2}$

(4) $\sqrt{\frac{\Delta P}{\rho}} \cdot \frac{Q}{l^2}$

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13. Consider the following statements As the pipe ages :

(i) The friction factor increases non-linearly with time.

(ii) The pipe becomes smoother with time.

(iii) The absolute roughness increases linearly with time.

Which of the above statements are correct ?

Answer options :

(1) (i) and (ii)

(2) (ii) and (iii)

(3) (i) and (iii)

(4) (i), (ii) and (iii)

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14. The velocity distribution in the boundary layer is given by $\frac{u}{U} = \left(\frac{y}{\delta}\right)^{1/7}$

$$\begin{bmatrix} u = \text{point velocity at dis tan ce } y \\ U = \text{free stream velocity} \\ \delta = \text{nominal thickness} \end{bmatrix}$$

What would be the displacement thickness (δ^*) ?

(1) $\frac{\delta}{5}$

(2) $\frac{\delta}{6}$

(3) $\frac{\delta}{7}$

(4) $\frac{\delta}{8}$

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15. A sudden closure of a valve at the downstream end of a pipe leading from a reservoir will cause water hammer. The length of this pipe is 'L' and speed of the pressure wave is 'a'. If time of closure of valve is 't_c', then valve closure is said to be rapid only when :

(1) $\frac{L}{2a} \geq t_c$ (2) $\frac{L}{a} \geq t_c$ (3) $\frac{2L}{a} = t_c$ (4) $\frac{2L}{a} \geq t_c$

16. Consider the following statements :

Pressure coefficient is the ratio of

(i) Pressure to dynamic pressure and is expressed as $\frac{\Delta P}{\left(\frac{\rho_w V^2}{2}\right)}$

(ii) Dynamic pressure to pressure and is expressed as $\frac{\left(\frac{\rho_w V^2}{2}\right)}{\Delta P}$

(iii) Pressure to dynamic pressure and is expressed as $\frac{\Delta P}{\gamma_w H}$

(iv) Dynamic pressure to pressure and is expressed as $\frac{\gamma_w H}{\Delta P}$

Which of the above statements are correct ?

Answer options :

(1) (i) and (iii) (2) (ii) and (iv) (3) Only (i) (4) Only (iii)

17. When a ship enters a sea from a river, one can expect it to :

(1) rise a little

(2) sink a little

(3) remain at the same level of draft

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

18. The valve closure is said to be gradual if the time required to close the valve is :

(1) $t = \frac{2L}{c}$ (2) $t \leq \frac{2L}{c}$ (3) $t < \frac{4L}{c}$ (4) $t > \frac{2L}{c}$

Where L = length of pipe, c = velocity of pressure wave

19. In all reaction turbines, the maximum efficiency is obtained, if

[Note : All the angles mentioned below are measured with respect to the direction of the peripheral velocity]

(1) the guide vane angle is 90°

(2) the blade angle of the runners is 90° at the inlet

(3) the blade angle of the runners is 90° at the outlet

(4) the angle of the absolute velocity vector at the outlet is 90°

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20. The cavitation damage in turbine runner occurs :

(1) near the inlet on the concave side of blades

(2) near the outlet on the convex side of blades

(3) near the inlet on the convex side of blades

(4) near the outlet on the concave side of blades

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21. In a centrifugal pump, the manometric head is (assuming the diameters of suction and delivery pipes to be the same) :

(1) the difference in elevation between the water surface in the high level reservoir and the water level in the sump

(2) the height to which water is lifted by the pump measured above the pump centre line

(3) the difference in the piezometric heads between the points on the delivery and suction pipes as close to the pump as possible

(4) the head developed by the pump

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22. If two pumps, identical in all respects and each capable of delivering a discharge 'Q' against a head 'H', are connected :

(1) in parallel, the resulting discharge is Q against a head of 2H.

(2) in series, the resulting discharge is 2Q against a head of 2H.

(3) in series, the resulting discharge is 2Q against a head of H.

(4) in parallel, the resulting discharge is 2Q against a head of H.

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23. The inward flow reaction turbine having radial discharge at outlet is known as :

(1) Francis turbine (2) Pelton turbine

(3) Axial flow reaction turbine (4) None of the above

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24. A single acting reciprocating pump has the plunger diameter of 20 cm and stroke of 30 cm. The pump discharges 0·53 m^3 of water per minute at 60 rpm. Find the theoretical discharge.

(1) 0·00742 m^3/sec (2) 0·00142 m^3/sec

(3) 0·00842 m^3/sec (4) 0·00942 m^3/sec

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25. Match List I with List II :

	List I		*List II*
A.	Francis turbine	I.	Axial flow
B.	Pelton wheel turbine	II.	Outward radial flow
C.	Kaplan turbine	III.	Mixed radial and axial flow
D.	Fourneyron turbine	IV.	Tangential flow

Answer options :

(1) A-II, B-I, C-III, D-IV (2) A-III, B-IV, C-I, D-II

(3) A-III, B-I, C-II, D-IV (4) A-III, B-II, C-I, D-IV

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26. When Pelton wheel turbine was tested, the head at the base of the nozzle was 50 m and discharge of the nozzle was 0·1 m^3/s. Then the power at the base of the nozzle should be :

(1) 49·05 kW (2) 490·5 kW (3) 4905 kW (4) 5 kW

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27. A run-off river hydroelectric power station is proposed across a river at a site where a net head is 30 m, discharge is 40 m^3/s and efficiency is 60%. Calculate the electric energy generated by the plant.

(1) 7163·2 kW (2) 7063·2 kW (3) 7263·2 kW (4) 7363·2 kW

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28. Identify the ***incorrect*** statement pertaining to evaporation.

(1) Evaporation is a cooling process

(2) Other factors remaining same, an increase in pressure increases evaporation

(3) When a solute is dissolved in water, there is a reduction in the rate of evaporation

(4) Seasonal evaporation rates depend upon the size of the water bodies

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29. The Probable Maximum Precipitation (PMP) at a station or a basin is the :

(1) rainfall of a given duration that can occur with a return period of 1000 years

(2) greatest rainfall for a given duration that is physically possible

(3) rainfall of given duration that has the maximum probability of occurrence

(4) an impossibly large rainfall of given duration

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30. 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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31. Due to the deposition of sediments by the inflowing water in a storage reservoir :

(1) only the dead storage capacity decreases with time

(2) only the live storage capacity decreases with time

(3) both the dead storage and live storage capacities decrease with time

(4) the total storage volume remains constant due to increase in valley storage

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32. Which of the following pairs of terms used in ground water hydrology are ***not*** synonymous ?

(1) Permeability and hydraulic conductivity

(2) Storage coefficient and storativity

(3) Actual velocity of flow and discharge velocity

(4) Water table aquifer and unconfined aquifer

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33. Raingauge station 'X' did not function for a part of month during which a storm occurred. The storm produced rainfall of 84, 70 and 96 mm at three surrounding stations A, B and C respectively. The normal annual rainfall at the stations X, A, B and C are respectively 770, 770, 770 and 770 mm. Estimate the missing storm rainfall at station 'X'.

(1) 83·33 mm (2) 82·33 mm (3) 84·33 mm (4) 81·33 mm

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34. If the total runoff is 1600 m^3/sec, drainage basin area is 104 km^2, time interval is 2 hours, then the depth of direct runoff is : (d = direct run off depth)

(1) 12·07 cm (2) 11·07 cm (3) 13·07 cm (4) 14·07 cm

35. The surface joining the static water levels in several wells penetrating a confined aquifer represents

(1) water table surface (2) capillary fringe

(3) piezometric surface of the aquifer (4) cone of depression

36. A triangular DRH due to a storm has a time base of 80 hrs and a peak flow of 50 m^3/s occurring at 20 hrs from the start. If the catchment area is 144 km^2, the rainfall excess in the storm was :

(1) 20 cm (2) 7·2 cm

(3) 5·0 cm (4) None of the above

37. _____ is best suited for situations where the canal bed level is lower than the drainage and also discharge of canal is smaller than the drainage.

(1) Aqueduct (2) Syphon aqueduct

(3) Canal syphon (4) Super passage

38. _____ are placed within the basin, across the basin floor, which help in breaking the flow and dissipate energy mostly by impact.

(1) Chute blocks (2) Sills

(3) Dentated sills (4) Baffle piers

39. Provision of drainage filters in an earthen dam reduce the _____ in the downstream portion of the dam.

(1) Earth pressure (2) Seepage

(3) Permeability (4) Pore pressure

40. Trap efficiency of a reservoir is a function of :

(1) Capacity/inflow ratio (2) Capacity/outflow ratio

(3) Outflow/inflow ratio (4) None of the above

41. The main function of a _____ is to regulate the supplies entering the off-take channels.

(1) Head regulator (2) Cross regulator

(3) Canal escape (4) Canal outlet

42. Match the pairs :

	Method		*Purpose*
A.	Khosla method	I.	Design of canal
B.	Kennedy's method	II.	Seepage analysis
C.	Laplace equation	III.	Design of hydraulic jump type stilling basin
D.	IS : 4997-1968	IV.	Design of wiers

Answer options :

(1) A-III, B-I, C-II, D-IV (2) A-III, B-II, C-I, D-IV

(3) A-IV, B-I, C-II, D-III (4) A-IV, B-III, C-II, D-I

43. If D is the depth of scour below original bed, then the width of launching apron is generally taken as

(1) 1·2 D (2) 1·5 D (3) 2·0 D (4) 2·5 D

44. Match the pairs for suitability of water for irrigation :

A.	Low salinity water	I.	Suitable for high salt tolerant plant
B.	Medium sodium water	II.	Unsuitable for irrigation
C.	High salinity water	III.	Unsuitable for fine textured soil
D.	Very high sodium water	IV.	All crops and all soils

Answer options :

(1) A-IV, B-III, C-I, D-II (2) A-I, B-IV, C-III, D-II

(3) A-IV, B-I, C-III, D-II (4) A-IV, B-II, C-III, D-I

45. If the jump height curve and tail water curve coincide, then the best protective measure will be _____.

(1) Providing cistern depressed below bed with sloping glacis upstream

(2) Simple horizontal apron

(3) Providing sharply upturned bucket

(4) Providing low secondary dam

46. Consider the following statements about grade compensation :

(i) Grade compensation is given up to maximum value of '75/R', where R is the radius of circular curve in metres.

(ii) According to Indian Roads Congress, grade compensation is not necessary for gradients flatter than 4 percent.

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

Answer options :

(1) Only (i) (2) Only (ii)

(3) Both (i) and (ii) (4) Neither (i) nor (ii)

---

47. 'Spot speed study' is useful in which of the (following) aspect/s of traffic engineering ?

(1) To study the traffic capacity

(2) To decide the speed trends

(3) To use in accident studies

(4) All of the above

---

48. As per Indian Roads Congress, the maximum width of a vehicle is standardised as _____.

(1) 3 metres (2) 2·5 metres (3) 3·5 metres (4) 4 metres

---

49. Which one of the following methods is used to design rigid pavement construction ?

(1) Westergaard's method

(2) Group Index method

(3) CBR method

(4) McLeod's method

---

50. The maximum value of exceptional gradient recommended by IRC for steep terrain having elevation more than 3000 m above the mean sea level is _____ .

(1) 6·0% (2) 6·7% (3) 7·0% (4) 8·0%

---

51. Match List I (Type of plan) with List II (Details collected during fact finding surveys are shown) and select the correct answer using the codes given below the lists.

	List I		*List II*
A.	Plan I	I.	Location of places with their respective quantities of productivity
B.	Plan II	II.	General area plan
C.	Plan III	III.	Distribution of population groups
D.	Plan IV	IV.	Existing road networks with traffic flow and desire line diagram

Answer options :

(1) A-III, B-II, C-I, D-IV (2) A-II, B-III, C-I, D-IV

(3) A-IV, B-II, C-III, D-I (4) A-I, B-II, C-III, D-IV

---

52. If stopping sight distance for two-way traffic on a two-lane road is 60 m, then for two-way traffic on a single lane will be

(1) 30 m (2) 60 m (3) 90 m (4) 120 m

---

53. For a particular highway, safe non-passing sight distance is 89 m and overtaking sight distance is 289 m. What is the intermediate sight distance ?

(1) 200 m (2) 187 m (3) 178 m (4) 289 m

---

54. As per MORTH specifications, the minimum Marshall stability value of specimen prepared for Bituminous Concrete (BC) shall be _____.

(1) 1050 kg (2) 900 kg (3) 1000 kg (4) 950 kg

---

55. Consider the following statements about strengthening of bridges :

(i) During inspection of existing bridges accurate measurement of the size and location of each type of deterioration is required.

(ii) Such measurement helps in selection of method of strengthening and working out quantities involved in repair.

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

Answer options :

(1) Only (i) (2) Only (ii)

(3) Both (i) and (ii) (4) Neither (i) nor (ii)

---

56. For an IRC Class AA loading train, the nose to tail spacing between successive tracked vehicles shall not be less than _____.

(1) 18·4 m (2) 22·4 m (3) 60 m (4) 90 m

---

57. Which of the following bridge types is most suitable for a span more than 800 metres ?

(1) Cable stayed bridge (2) Suspension bridge

(3) Arch bridge (4) None of the above

---

58. While designing highway bridges, when the wind velocity at deck level exceeds _____ km per hour, no live load needs to be considered to be acting on the bridge.

(1) 100 (2) 115 (3) 130 (4) 145

---

59. The hollow girder bridges are economical for spans between _____.

(1) 5 m to 10 m (2) 10 m to 15 m

(3) 15 m to 17 m (4) 25 m to 30 m

---

60. Consider the following statements with respect to determination of design discharge.

Statement I : Design discharge may be taken as the maximum value obtained from at least two of the methods of determining the discharge viz. Empirical, Rational and/or Area-Velocity method.

Statement II : If the value so obtained exceeds the next high value by more than 50%, then the maximum design discharge is limited to 2·5 times the lower estimates.

Select the correct answer from the following :

Answer options :

(1) Both statements I and II are true

(2) Statement I is false and statement II is true

(3) Statement I is true and statement II is false

(4) Both statements I and II are false

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61. Consider the following statements about the characteristics of an ideal site for bridge location across a river :

(i) There should be straight reach of the stream.

(ii) The flow of water at the bridge site should be in steady regime condition with whirls and cross currents.

(iii) There should be no confluence of large tributaries at bridge site.

(iv) Sufficiently wide stream with firm banks.

Which of the statements given above is/are correct ?

Answer options :

(1) Only (i). (2) (i) and (iii) only

(3) (ii) and (iv) only (4) (i), (iii) and (iv)

---

62. The most reliable method based on hydraulic characteristics of a stream, among the methods for determining the flood discharge is _____.

(1) Unit hydrograph method

(2) Area-velocity method

(3) Estimation from empirical formulae

(4) Estimation from flood marks

---

63. Which from the following is/are the movable bridge/s ?

(1) Bascule bridge (2) Swinging bridge

(3) Lift bridge (4) All of the above

---

64. Match the following :

List-1 *Shape of tunnel*		*List-2* *Common use*
A.	Circular section	I. Subway
B.	Horse shoe section	II. Carrying water
C.	Egg-shaped section	III. Traffic purpose
D.	Segmental section	IV. Carrying sewage

Answer options :

(1) A-IV, B-III, C-II, D-I (2) A-I, B-II, C-III, D-IV

(3) A-II, B-III, C-IV, D-I (4) A-II, B-III, C-I, D-IV

---

65. Consider the following statements with reference to adoption of circular cross-section for tunnels driven by shield method :

(i) The circular cross-section provides maximum cross-sectional area with the minimum perimeter.

(ii) Circular cross-section does not afford protection to the primary lining.

(iii) Circular cross-section offers the least resistance to the easy rotation of shield.

(iv) Circular cross-section is not ideally suitable for resisting the semi fluid pressure.

Which of the above statements are ***incorrect*** ?

Answer options :

(1) (i) and (iii) (2) (ii) and (iv)

(3) (i) and (ii) (4) (i), (iii) and (iv)

---

66. Which of the following is ***not*** a method of tunnelling in rocks ?

(1) Liner plate method

(2) Heading and Bench method

(3) Cantilever car dump method

(4) Drift method

---

67. Consider the following statements about the choice of tunnelling method in soft strata ?

(i) It depends on nature and type of soil.

(ii) It is independent of size of tunnel.

(iii) It depends on availability of equipment.

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

Answer options :

(1) Only (i) (2) (i) and (iii) only

(3) (ii) and (iii) only (4) (i), (ii) and (iii)

---

68. Consider the following statements with respect to various methods of tunnelling :

(i) Drift method is extremely costly and is generally recommended for ground conditions which are difficult to solve.

(ii) Heading and bench method involves the driving of top portion in advance of the bottom portion

(iii) Full face method is suitable for tunnels of small cross-sectional areas through stable rock.

Which of the statements is/are correct ?

Answer options :

(1) (i) and (iii)

(2) (i), (ii) and (iii)

(3) (ii) and (iii)

(4) (i) and (ii)

---

69. Which of the following statements is/are ***incorrect*** ?

(i) Normally shafts are laid in horizontal direction only

(ii) Usually 90 cm high wall round the edge of the shaft opening is constructed

(iii) The ideal site for the shaft would be a valley

(iv) During sinking of shaft in soft soils, deflection of sheets should be prevented

Answer options :

(1) Only (i)

(2) Only (ii) and (iii)

(3) Only (ii), (iii) and (iv)

(4) All of the above

70. In which of the following type of soft strata, is the 'compressed air tunnelling' the most suitable method ?

(1) Gravel

(2) Silt

(3) Clay

(4) Sand

---

71. Which one of the following methods of tunnelling is suitable for water bearing soils ?

(1) Full face method

(2) Compressed air method

(3) Heading and bench method

(4) Drift method

---

72. Which of the following statements is/are ***incorrect*** while driving tunnels through soft soil ?

(i) The use of explosives is not required.

(ii) The progress of work is very fast.

(iii) For excavations of materials, heavy and costly equipment are required.

(iv) It requires support to the section which is excavated.

Answer options :

(1) Only (i)

(2) (ii) and (iii)

(3) (i), (ii) and (iii)

(4) All of the above

---

73. The water supply to a house begins with the connection of the service pipe with the municipal water mains. The connection comprises of :

(i) Stop-cock

(ii) Goose neck

(iii) Ferrule

(iv) Water meter

The correct sequence of these connections is :

Answer options :

(1) (i), (ii), (iii), (iv)

(2) (iii), (i), (ii), (iv)

(3) (iii), (ii), (i), (iv)

(4) (i), (ii), (iv), (iii)

---

74. Generally, a dose of 2 to 3 ppm beyond break point is adopted in case of

(1) Super chlorination

(2) Double chlorination

(3) Pre-chlorination

(4) Post-chlorination

---

75. Sewer is running half full. When Manning's coefficient is increased from 0·011 to 0·022, the slope of sewer to carry the same flow at the same velocity running half full will be

(1) increased by 2 times

(2) decreased by 2 times

(3) increased by 4 times

(4) decreased by 4 times

---

76. Which of the following pairs is ***not*** correctly matched?

(1) BOD_5 – Temperature dependent

(2) Ultimate BOD – Independent of temperature

(3) COD – Total organic matter

(4) BOD_5/COD – Greater than one

---

77. The composition of clean dry air (major gases) at ground level is

(1) Nitrogen = 78·09% by volume
Oxygen = 20·95% by volume

(2) Nitrogen = 50% by volume
Oxygen = 40% by volume

(3) Nitrogen = 70% by volume
Oxygen = 10% by volume

(4) Nitrogen = 21% by volume
Oxygen = 78% by volume

78. Bacteria–Algae symbiotic relationship is an important phenomena for BOD reduction in following treatment system :

(1) Aerobic pond

(2) Anaerobic pond

(3) Anaerobic lagoon

(4) Aerated lagoon

79. As per IS : 10500-2012, for drinking water, in the absence of alternate source of water, the permissible limit for fluorides is

(1) 1·0 mg/L

(2) 1·5 mg/L

(3) 2·0 mg/L

(4) 2·5 mg/L

80. Noise intensity is measured with which of the following measuring unit ?

(1) Hertz (Hz)

(2) Decibel (dB)

(3) Dynes

(4) meter/second

81. In surface water treatment, correct sequence of unit operation is

(i) Clariflocculation

(ii) Aeration

(iii) Filtration

(iv) Disinfection

Answer options :

(1) (i), (ii), (iii), (iv)

(2) (ii), (i), (iii), (iv)

(3) (iii), (i), (ii), (iv)

(4) (ii), (iii), (iv), (i)

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82. While taking levels from a fixed station if staff is shifted at 5 points, then 'change points' are _____.

(1) Zero (2) 05

(3) 04 (4) None of the above

---

83. A level instrument at a height of 1·320 m has been placed at a station having a RL of 115·385 m. The instrument reads – 2·835 on levelling staff held at the bottom of bridge deck. The RL of the bottom of the bridge deck is _____ m.

(1) 111·230 (2) 113·870 (3) 119·540 (4) 116·900

---

84. A reverse curve consists of _____.

(1) a single curve of a circle connecting two straights

(2) two arcs of different radii bending in the same direction

(3) two arcs of equal radii bending in the same direction

(4) two arcs of equal or different radii bending in the opposite direction

---

85. Gale's method of traversing consists of plotting the points by :

(1) Independent coordinates (2) Consecutive coordinates

(3) Both (1) and (2) (4) Chords

---

86. The correction for sag is _____.

(1) always additive

(2) always subtractive

(3) always zero

(4) sometimes additive and sometimes subtractive

---

87. Match List I with List II :

List I		*List II*
A.	Vertical cliff	I. Contour lines unite at one place to form a single line
B.	Steep slope	II. Contour lines of different elevations cross one another
C.	Hill	III. Contour lines are closely spaced
D.	Overhanging cliff	IV. Closed contour lines with higher values inside

Answer options :

(1) A-IV, B-III, C-I, D-II (2) A-I, B-III, C-IV, D-II

(3) A-I, B-II, C-IV, D-III (4) A-IV, B-II, C-I, D-III

---

88. The shape of vertical curve is :

(1) Circular (2) Parabolic (3) Spiral (4) Elliptical

89. If the WCB of a line is 170° 40′, the quadrantal bearing is

(1) S 9° 20′ E (2) N 10° 40′ W (3) S 9° 20′ W (4) N 9° 30′ E

90. The following are the instrumental methods used for setting out horizontal circular curve.

(i) Rankine's method of tangential angle

(ii) Two theodolite method

(iii) Tacheometric method

The sequence of these methods from the least accurate to the most accurate is

Answer options :

(1) (i), (ii), (iii) (2) (ii), (iii), (i)

(3) (iii), (i), (ii) (4) (i), (iii), (ii)

91. The purpose of making a hydrographic survey is :

(1) to determine the quantities of subaqueous excavations

(2) to measure areas subjected to souring and silting in harbours

(3) to measure soundings and preparing navigation charts

(4) All of the above

92. Anushka's father, for her marriage, published in a marriage magazine, "To marry with my daughter, the candidate must have been placed through MPSC Examinations". It's an example of _____ .

(1) Specification (2) Tender

(3) Contract (4) None of the above

93. Same type of work under different conditions and nature shall be measured :

(1) under the same item (2) separately under the same item

(3) separately under separate item (4) None of the above

94. Pick up the measurement which is ***not*** made in square meters for payment.

(1) Timbering or planking and strutting for protecting the sides of trench up to 1·5 m depth.

(2) Surface dressing up to 15 cm depth.

(3) Surface excavation up to 30 cm depth.

(4) Clay puddle work placing in layer of 15 cm.

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95. The quantity of stone grit required for tar and bitumen road should be measured in :

(1) cum per sq.m (2) kg per sq.m

(3) kg per cum (4) quintal per sq.m

---

96. If a large piece of land is required to be divided into plots after providing roads, parks, etc., which method of valuation is suitable ?

(1) Valuation based on cost

(2) Valuation based on profit

(3) Belting method of valuation

(4) Development method of valuation

---

97. Revised Estimate is prepared when the :

(1) Original sanctioned estimate exceeds by 10%

(2) Revision of work is up to 7%

(3) Original sanctioned estimate exceeds by 1%

(4) Original sanctioned estimate exceeds by 5%

---

98. Which document does ***not*** contain engineering contract documents ?

(1) Tender notice (2) Security deposit receipt

(3) Specifications (4) Schedule B

---

99. Which are the main sources from which information regarding specifications of civil engineering works can be obtained ?

(1) Contract drawings (2) Previous specifications

(3) Site investigations (4) All of the above

---

100. Coefficient of annual sinking fund (I_c) can be determined by

(1) $I_c = \frac{i}{(1+i)-1}$ (2) $I_c = \frac{i^n}{(1+i)^n - 1}$

(3) $I_c = \frac{i}{(1+i)^n - 1}$ (4) $I_c = \frac{i}{(1+i)^n}$

सूचना — (पृष्ठ 1 वरून पुढे.....)

(8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82" यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

(9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वत:बरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. **मात्र परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.**

नमुना प्रश्न

Pick out the correct word to fill in the 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 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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