महाराष्ट्र अभियांत्रिकी सेवा (स्थापत्य) (मुख्य) परीक्षा-2015
परीक्षा दिनांक - 9 व 10 जानेवारी, 2016

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2016

CODE : CO7

प्रश्नपुस्तिका क्रमांक
BOOKLET NO.

प्रश्नपुस्तिका-III

वेळ : 2 (दोन) तास

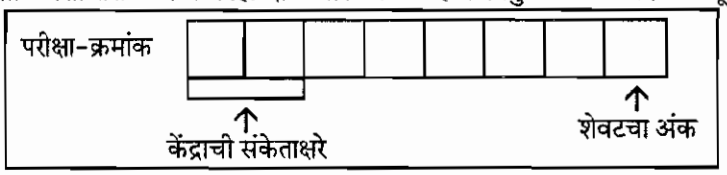
स्थापित्य अभियांत्रिकी पेपर-2

एकूण प्रश्न : 100
एकूण गुण : 200

सूचना

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

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



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

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

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

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

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

ताकीद

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

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरूद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

SEAL

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

1. The modern electronic Tacheometers are a combination of :

(a) An electronic theodolite

(b) An electronic data collector

(c) An Electric distance measurement

Answer options :

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

(3) (a) and (c) only (4) All of the above

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2. In chain surveying, perpendiculars to the chain line are set out by :

(1) a theodolite (2) a prismatic compass

(3) a clinometer (4) an optical square

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3. Least count of a levelling staff is :

(1) 1 cm (2) 5 mm

(3) 1 mm (4) None of the above

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4. The backsight reading on a B.M. = R.L. of 150 m was (-2.250 m). The erected staff reading on the top of workshop floor was 1.450 m. The R.L. of the top of workshop floor is :

(1) 154.300 m (2) 146.300 m (3) 150.800 m (4) 145.800 m

---

5. If 'n' is the number of sides of a traverse, while theodolite traversing the sum of the interior included angles should be :

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

---

6. What will be the curvature correction for staff reading, in levelling for a distance of 1000 m. ?

(1) 0.0673 m (2) 0.0785 m (3) 78.50 m (4) 6.73 m

---

7. Spire test is carried out for the permanent adjustment of :

(1) Dumpy level (2) Auto level (3) Tilting level (4) None of these

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8. The lines joining the points of equal elevations on the surface of the earth are known as :

(1) isohyets (2) isogonics (3) agonics (4) contours

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

9. What is the magnetic declination at a place if the magnetic bearing of the sun at noon at that place is 186° ?

(1) 6° W (2) 6° E (3) 0° W (4) 0° E

10. The process of locating the instrument station occupied by plane table from stations whose positions have already been plotted on plan is known as :

(1) Orientation (2) Radiation (3) Intersection (4) Resection

11. Salvage value is defined as :

(1) value of dismantled materials of a property at the end of its utility period

(2) estimated value of a built up property at the end of its useful life without being dismantled

(3) value of the property shown in the account book in that particular year

(4) present value of a property considering it to be replaced at the current market rates

12. The rights and privileges which an owner of a property enjoys through or over the property of another is known as :

(1) Property right (2) Lease right (3) Legal right (4) Easement

13. For a contract to be valid :

(a) Parties to the contract should be competent

(b) Proper proposal and its acceptance

(c) Free consent of parties involved in the agreement

(d) Lawful consideration

Answer options :

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

(3) (a), (b) and (d) (4) All of the above

14. The unit of measurement for earthwork in surface excavation exceeding 1.5 m in width as well as 10 sqm on plan but not exceeding 30 cm in depth, is in :

(1) cu. m (2) sq. m (3) 10 sq.m (4) Rmt

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

15. A tender is said to be informal :

(a) When it is not submitted in the form sold by the department

(b) When the tender is not properly filled in or signed by the contractor

(c) When the tender is made conditional by way of adding indefinite an l uncertain liabilities of usual character to it.

(d) When it is not supported by the requisite earnest money in the manner prescribed for the purpose in PWD form :

Answer options :

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

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16. At what change of price level is a revised estimate prepared ?

(1) 2.0% (2) 2.5% (3) 4.0% (4) 5.0%

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17. Which committee recommended that an allowance of 10% of the prime cost as the contractor's profit would be reasonable ?

(1) The Rates and Costs Committee, 1957 (2) MPWD Committee, 1940

(3) CPWD Committee, 1950 (4) MPSC Committee, 2010

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18. The capitalised value of a property fetching a net annual rent of ₹ 1000 with highest rate of interest prevailing being 5%, would be :

(1) ₹ 800 (2) ₹ 1000 (3) ₹ 10,000 (4) ₹ 20,000

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19. While submitting a tender, the contractor is required to deposit some amount with the department, as guarantee of the tender, known as :

(1) Bank Guarantee (2) EMD. (3) S.D. (4) F.D.

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20. If the porosity of a soil sample is 40%, its void ratio is :

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

---

21. A cube of soil specimen having dimensions 2 cm × 2 cm × 2 cm weighs 16 gm when it is fully saturated. If void ratio of the specimen is 1.0, the dry density of the specimen will be :

(1) 2000 kg/m^3 (2) 1500 kg/m^3 (3) 1200 kg/m^3 (4) 1600 kg/m^3

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

22. **Statement (A)** : In Boussinesq's theory of stress computations, soil is considered to be un-stressed before application of the load.

Statement (B) : The contact pressure distribution under a rigid footing in cohesionless soil, is uniform throughout the width of the footing.

(1) Both the statements **(A)** and **(B)** are correct.

(2) Statement **(A)** is correct but **(B)** is wrong.

(3) Statement **(A)** is wrong but **(B)** is correct.

(4) Both the statements **(A)** and **(B)** are wrong.

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23. A sample of dry sand was tested in direct shear test apparatus under a normal load of 72 kg. The shear load required to fail the sample was found to be 36 kg. The angle of internal friction (ϕ) will be :

(1) $\tan^{-1}\left(\frac{72+36}{36}\right)$ (2) $\tan^{-1}\left(\frac{72+36}{72}\right)$

(3) $\tan^{-1}\left(\frac{36}{72}\right)$ (4) $\tan^{-1}\left(\frac{72}{36}\right)$

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24. A point load exerts a maximum vertical stress at a radial distance of 1 m and at a depth of :

(1) 0.817 (2) 0.477 (3) 1.00 (4) 1.225

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25. **Statement (A)** : Coffer-dam is a structure to be constructed in standing water condition prior to the construction of bridge foundations.

Statement (B) : Cutting edge and steining are the two essential component parts of the coffer-dam.

(1) Both the statements **(A)** and **(B)** are true.

(2) Both the statements **(A)** and **(B)** are false.

(3) Statement **(A)** is true but **(B)** is false.

(4) Statement **(B)** is true but **(A)** is false.

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26. From the following statements, select the most appropriate statement :

Westergaard's analysis for stress computation within soil mass assumes.

(1) Point load at the surface and soil being homogeneous and isotropic

(2) Line load at the surface and soil being homogeneous and non-isotropic

(3) Point load at the surface and soil being homogeneous and non-isotropic

(4) Line load at the surface and soil being non-homogeneous and isotropic

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कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

27. An all-around RCC peripheral retaining wall is constructed for a basement to retain soil on the other side. The retaining wall has RCC floor slab constructed at the top. The earth pressure on retaining wall will be analyzed in :

(1) Passive condition

(2) Active condition

(3) At rest condition

(4) Partially active and partially passive condition

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28. Match the pairs :

(a)	Compaction	(i)	Expulsion of water
(b)	Swelling	(ii)	Sudden volume decrease
(c)	Consolidation	(iii)	Increase in volume
(d)	Collapse	(iv)	Expulsion of air

Answer options :

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

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29. The specific speed of turbine is defined as :

(1) $\frac{H^{\frac{5}{4}}}{N\sqrt{P}}$ (2) $\frac{NP^{\frac{5}{4}}}{\sqrt{H}}$ (3) $\frac{N\sqrt{P}}{H^{\frac{5}{4}}}$ (4) $\frac{N^{\frac{5}{4}}P}{\sqrt{H}}$

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30. Muschel curves belong to the category of :

(1) main characteristic curves of a turbine

(2) operating characteristic curves of a turbine

(3) constant efficiency curves of a turbine

(4) operating characteristics of a pump

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31. Pathlines refer to the motion of identified fluid particles of elements and therefore constitute a feature of the :

(1) Lagrangian Approach (2) Eulerian Approach

(3) Rayleigh's Approach (4) None of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

32. The separation of a boundary layer occurs when :

(1) the flow is accelerated past a boundary

(2) the boundary layer comes to rest

(3) any adverse pressure is encountered

(4) the fluid is ideal

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33. Choose the **correct** match :

(a)	Inertial force to surface tensile force	(i)	Reynold's No.
(b)	Inertial force to viscous force	(ii)	Euler No.
(c)	Inertial force to pressure force	(iii)	Mach No.
(d)	Inertial force to elastic force	(iv)	Weber No.
		(v)	Froude No.

Answer options :

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

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34. The centre of pressure will coincide with the centre of gravity if a plane surface is :

(1) Vertical (2) Horizontal

(3) Immersed in a gas (4) None of the above

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35. A horizontal pipe line conveys a constant rate of flow which is measured by venturimeter installed on it. When the pipe is inclined upwards in the direction of flow, the reading of level difference on a differential U-tube manometer :

(1) will increase (2) will remain same

(3) will decrease (4) may fluctuate with time

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36. A surge tank is provided in hydropower schemes to :

(1) strengthen the penstocks

(2) reduce water hammer pressure

(3) reduce frictional losses in the system

(4) increase the net head

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

37. If three pipes of different diameters, lengths and friction factors are connected in series, then :

(1) $f=f_1+f_2+f_3$ (2) $hf_1=hf_2=hf_3$

(3) $Q=Q_1+Q_2+Q_3$ (4) $Q_1=Q_2=Q_3$

38. The difference between theoretical discharge and actual discharge of pump is known as :

(1) gap of discharge (2) differential discharge

(3) slip of pump (4) suction gap

39. A unit speed is obtained by which of the following equations with usual notations ?

(1) $N_u=\frac{N}{\sqrt{H}}$ (2) $N_u=\frac{\sqrt{N}}{H}$ (3) $N_u=\frac{\sqrt{N}}{\sqrt{H}}$ (4) $N_u=\frac{N^{\frac{2}{3}}}{H^{\frac{1}{5}}}$

40. 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

41. Operating characteristic curves of a turbine are :

(1) Varying speed curves (2) Constant efficiency curves

(3) Constant head curves (4) Constant speed curves

42. Overall efficiency of a pump is obtained by which of the following equations with usual notations ?

(1) $\eta_0=\eta_{man}\times\eta_{mech}$ (2) $\eta_0=\eta_{hy}\times\eta_{mech}$

(3) $\eta_0=\eta_{man}\times\eta_{hy}$ (4) $\eta_0=\eta_{vol}\times\eta_{min}$

43. To produce a high head multi-stage centrifugal pumps, the impellers are connected :

(1) in parallel (2) in series

(3) in parallel and in series both (4) none of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

44. The specific speed(N_s) of a pump is given by :

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

45. Number of buckets on a Pelton wheel are calculated by which equation with usual notations :

(1) $Z = 15 + \frac{D}{2d}$ (2) $Z = 15 + \frac{2D}{d}$

(3) $Z = 15 + 2\left(\frac{D}{d}\right)n$ (4) $Z = 15 + \frac{d}{D}$

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

(1) Pelton wheel is a reaction turbine

(2) Pelton wheel is a radial flow turbine

(3) Pelton wheel is an impulse turbine

(4) None of the above

47. When specific information about the density of snowfall is not available, the water equivalent of snowfall is taken as :

(1) 50% (2) 30% (3) 10% (4) 90%

48. The percentage of total quantity of fresh water in the world available in the liquid form is about :

(1) 30% (2) 70% (3) 11% (4) 51%

49. The precipitation in the form of water drops of sizes larger than 0.5 mm is known as :

(1) snow (2) drizzle (3) glaze (4) rainfall

50. The chemical that is found to be more suitable as water evaporation inhibitor is :

(1) ethyl alcohol (2) methyl alcohol (3) cetyl alcohol (4) bytyl alcohol

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

51. In a DAD analysis the maximum average depth of rainfall for an 18 hr storm was 28 cm in an area of size 10 km^2. For the same duration the maximum average depth in an area of 1000 km^2 can be expected to be :

(1) = 28 cm (2) < 28 cm

(3) > 28 cm (4) depends upon the type of rainfall

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52. The direct runoff is made up of :

(1) overland flow and infiltration

(2) surface runoff, prompt interflow and channel precipitation

(3) surface runoff, infiltration and evapotranspiration

(4) rainfall and evaporation

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53. Precipitation falling during the growing period of a crop that is available to meet the evapo-transpiration needs of the crop is known as :

(1) effective rainfall (2) transpiration

(3) conjuctive use (4) potential rainfall

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54. Evapotranspiration is confined to :

(1) daylight hours (2) night-time only

(3) land surfaces only (4) none of the above

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55. The prismoidal formula with usual notations is :

(1) $\Delta S = \text{storage} = \frac{\Delta h}{5}[A_1 + 4A_2 + A_3 ...]$

(2) $\Delta S = \text{storage} = \frac{\Delta h}{6}[A_1 + 4A_2 + A_3 ...]$

(3) $\Delta S = \text{storage} = \frac{\Delta h}{3}[A_1 + 4A_2 + A_3 ...]$

(4) $\Delta S = \text{storage} = \frac{\Delta h}{6}[A_1 + 3A_2 + 4A_3 ...]$

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

56. An aqueduct is a cross drainage work provided to carry canal over a natural drain when :

(1) canal bed is at the same level as the bed of the natural drain.

(2) canal bed is below the H.F.L. of the natural drain.

(3) canal bed is well above the H.F.L. of the natural drain.

(4) canal bed is below the bed of the natural drain.

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57. Open flume outlet is :

(1) an orifice (2) a weir

(3) a meter (4) none of the above

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58. In a saddle-siphon spillway, an air vent is provided at the level of the full reservoir surface to :

(1) break the siphonic action at that level

(2) initiate the siphonic action at that level

(3) prevent cavitation

(4) maintain ventilation inside the siphon

---

59. _____ is aligned along a watershed and runs for most of its length on a watershed.

(1) Ridge canal (2) Contour canal

(3) Side slope canal (4) None of the above

---

60. As per IS 10430-1982, the life of canal for concrete lining is assumed to be :

(1) 40 years (2) 60 years (3) 80 years (4) 99 years

---

61. _____ maintain a deep channel in front of the head regulator and dispose of heavy silt and a part of flood discharge on the down stream side of the barrage.

(1) Radial gates (2) Spillway (3) Stilling basin (4) Under sluice

---

62. In a syphon aqueduct, severe condition of maximum uplift on the floor occurs when :

(1) canal runs full, drain is dry but water table is at the stream bed.

(2) canal is dry and drain is passing the highest flood.

(3) canal runs dry and drain also runs dry.

(4) both canal and drain run full.

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63. In _____ the overflowing water is guided smoothly over the crest and profile of the spillway.

(1) Straight drop Spillway (2) Ogee Spillway

(3) Tunnel Spillway (4) Siphon Spillway

64. The ratio of rate of change of discharge of an outlet to the rate of change of the discharge of the distribution channel is known as _____.

(1) Flexibility (2) Setting (3) Sensitivity (4) Efficiency

65. Match the pairs for determination of thickness of flexible pavement by appropriate method.

(a) California Bearing Ratio Method (i) $T = \frac{K(TI)(90-R)}{C^{\frac{1}{5}}}$

(b) California Resistance Valve Method (ii) $T = K \log_{10}^{\frac{P}{S}}$

(c) Triaxial Method (iii) $T = \left[\frac{1.75P}{CBR} - \frac{A}{\pi}\right]^{\frac{1}{2}}$

(d) McLeod Method (iv) $T = \sqrt{\left(\frac{3PXY}{2\pi E_s \Delta}\right)^2 - a^2}$

Answer options :

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

66. The maximum width of expansion joint and maximum spacing between expansion joint for rough interface layer is :

(1) 2.5 cm and 160 m (2) 2.0 cm and 130 m

(3) 2.5 cm and 140 m (4) 2.5 cm and 100 m

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67. The total length of tie bar of 1 cm diameter embedded in a cement concrete pavement with allowable working stress in steel in tension equal to 1400 kg/cm^2 and allowable bond stress in deformed bars in concrete 24.6 kg/cm^2, is :

(1) 18.87 cm (2) 113.82 cm (3) 56.9 cm (4) 28.45 cm

68. The tests performed for detecting whether bitumen is cracked or not, is/are :

(a) Spot test (b) Solubility test

(c) Float test (d) Ductility test

Select the **correct** alternative out of the following :

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

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

69. The dowel bars are provided at :

(1) Expansion joint

(2) Contraction joint

(3) Both (1) and (2)

(4) Both (1) and (2) and Longitudinal joint

70. Failures in flexible pavements are due to the failure of :

(a) Sub grade

(b) Base course

(c) Wearing Course

Answer options :

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

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

71. Bitumen grade is specified as 80-100 or $\frac{80}{100}$ grade, this means :

(1) Bitumen content is between 80 to 100.

(2) Ductility of bitumen is between 80 to 100 mm.

(3) Penetration value of bitumen is between 80 to 100.

(4) Temperature of the bitumen is between 80 to 100°C

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72. The critical condition of stresses for combination of stresses in cement concrete pavement during summer is :

(1) load stress + warping stress − frictional stress

(2) load stress + warping stress

(3) load stress + warping stress + frictional stress

(4) load stress + frictional stress

---

73. Arrange the following layers of flexible pavement from top to bottom :

(a) Sub-base course (b) Base course

(c) Surface course (d) Sub-grade

Answer option :

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

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

---

74. A culvert can be defined as a crossing with a total length not exceeding _____ between the faces of the abutments :

(1) 6 m (2) 7 m (3) 8 m (4) 10 m

---

75. What should be the minimum width of foot path while designing a bridge for rural areas ?

(1) 1.5 m (2) 2.0 m (3) 2.5 m (4) 3.0 m

---

76. Maximum scour depth at a severe bend is :

(1) 1.25 D (2) 1.50 D (3) 1.75 D (4) 2.00 D

---

77. _____ can be defined as a rise of water level on the upstream side of a bridge.

(1) Scour (2) Afflux (3) HFL (4) Discharge

---

78. The area through which the water flows under a bridge superstructure is known as _____ of the bridge.

(1) stream (2) scour (3) waterway (4) afflux

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79. The type of bearing used on a bridge depends on :

(1) Extent of movement at the bridge ends

(2) Temperature Variations

(3) Load carried

(4) All of the above

80. The minimum vertical clearance for opening of high level bridges for discharge of 0.3-3.0 m^3 per second is :

(1) 150 mm (2) 250 mm (3) 350 mm (4) 450 mm

81. A bridge designed to allow normal floods to pass through its vents but allowed to be over topped during floods is called :

(1) Submersible bridge (2) Under bridge

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

82. Advantages of asphaltic concrete (Bituminous Concrete) are :

(a) Durability (b) Imperviousness

(c) Load spreading properly (d) Quickly openable to traffic

(e) Good skid Resistance

Answer options :

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

(3) (a), (b), (c) and (d) only. (4) All of the above.

83. Pick up the explosive used for tunnelling in soft rocks from the following :

(1) Special gelatine (2) Blasting gelatine

(3) Ammonia dynamite (4) Semi-gelatine

84. Which one of the following tunnelling methods is used for laying under ground sewers ?

(1) Needle beam method (2) German method

(3) Army method (4) English method

85. To attain the required shape of the tunnel we use :

(1) Cutholes (2) Chisels (3) Easers (4) Trimmers

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86. For initial surveys of tunnel, the following activities are involved :

(a) Marking portal points with concrete pillars on the ground.

(b) Marking tunnel obligatory points on the topographical maps.

(c) Driving lines between the fixed obligatory points.

(d) Preliminary setting of the tunnel on the topographical survey of Indian maps.

The **correct** sequence of the activities are :

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

87. If 'D' is a diameter of tunnel in meters, then the thickness of lining in mm as per the empirical formula is given by :

(1) 72 D (2) 82 D (3) 92 D (4) 102 D

88. The concentration of dust particles of the size 0.5 to 5 microns adjacent to the working face should not be more than :

(1) 450 particles/cm^3 (2) 350 particles/cm^3

(3) 250 particles/cm^3 (4) 150 particles/cm^3

89. For highways, tunnelling is preferred if the open cut exceeds :

(1) 10 m depth (2) 15 m depth (3) 20 m depth (4) 25 m depth

90. In compressed air tunnelling the volume of free air provided is :

(1) 10 cuft per seconds per sq.ft. of face area

(2) 10 m^3 per min. per m^2 of face area

(3) 20 cuft per min. per sq.ft. of face area

(4) 6 m^3 per hour per m^2 of face area

91. The length of the needle beam used in the needle beam method of tunnelling is usually :

(1) 2 m to 4 m (2) 1.5 m to 4.5 m (3) 6 m to 7 m (4) 5 m to 6 m

92. Indian municipal solid waste is not suitable for incineration due to :

(1) less moisture content (2) high moisture content

(3) high calorific value (4) Lesser organic content

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93. In waste water treatment plant secondary settling tanks are designed to remove :

(1) Organic settleable solids (2) Inorganic settleable solids

(3) Bioflocculated solids (4) Dissolved solids

94. During inversion condition :

(1) Air temperature decreases with altitude

(2) Air temperature increases with altitude

(3) Air temperature remains constant

(4) Air temperature is zero

95. As per Central Pollution Control Board (CPCB) Air Quality Index for satisfactory condition is in the range of :

(1) 301 to 400 (2) 201 to 300 (3) 101 to 200 (4) 51 to 100

96. When is a photo chemical smog formed ?

(1) Air stagnation

(2) High concentrations of hydrocarbon and nitrogen

(3) Both (1) and (2)

(4) None of these

97. For taking sewer line below road/canal/railway line, following type of sewer *appartenances* should be provided.

(1) Storm water relief work (2) Siphon spillways

(3) Jumping weir (4) Inverted syphon

98. Permanent hardness is removed by :

(a) Lime soda process

(b) Boiling

(c) Demineralisation process

(d) Base exchange process

Answer options :

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

(3) All of the above (4) (a), (c) and (d) only

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99. As per CPCB, ambient Air Quality Standards in respect of noise during day time and night time for residential area are :

(1) 75 dB and 70 dB respectively (2) 65 dB and 55 dB respectively

(3) 55 dB and 45 dB respectively (4) 50 dB and 40 dB respectively

---

100. What is the food to micro-organism ratio in an aeration tank having following data ?

Flow = 1 m/d, MLSS = 2000 mg/L

Influent BOD_5 = 200 mg/L

Volume of aeration tank = 500 m^3

(1) 0.20 (2) 5.00 (3) 0.80 (4) 1.25

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सूचना — (पृष्ठ 1 वरून पुढे....)

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

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

नमुना प्रश्न

Pick out the correct word to fill in the blank :

प्र. क्र. 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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