JAMMU AND KASHMIR PUBLIC SERVICE COMMISSION

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Subject: Written Examination for the post of Assistant Engineer (Civil) in Jal Shakti Department, 2023 - Provisional Answer Key.

Notification No. PSC/Exam/S/2023/56
Dated: 02.10.2023

In pursuance of Rule 10 (c) of the Jammu & Kashmir Public Service Commission (Conduct of Examination) Rules, 2022, as amended upto date, the Provisional Answer Key of **Question Booklet (Series A)** pertaining to the Written Examination for the post of **Assistant Engineer (Civil) in Jal Shakti Department, 2023 held on 02.10.2023**, is hereby notified for seeking the objections from candidates.

Provisional Answer Key Assistant Engineer (Civil)

Test Booklet Question No. (Series A)		Test Booklet Question No. (Series A)		Test Booklet Question No. (Series A)	
Q1	A	Q27	B	Q53	A
Q2	B	Q28	C	Q54	D
Q3	B	Q29	A	Q55	C
Q4	C	Q30	D	Q56	A
Q5	B	Q31	C	Q57	C
Q6	A	Q32	B	Q58	B
Q7	D	Q33	B	Q59	B
Q8	B	Q34	B	Q60	C
Q9	B	Q35	C	Q61	B
Q10	C	Q36	D	Q62	C
Q11	A	Q37	A	Q63	B
Q12	C	Q38	C	Q64	A
Q13	D	Q39	B	Q65	C
Q14	D	Q40	A	Q66	C
Q15	C	Q41	D	Q67	D
Q16	B	Q42	D	Q68	D
Q17	B	Q43	A	Q69	B
Q18	D	Q44	A	Q70	D
Q19	C	Q45	A	Q71	A
Q20	B	Q46	C	Q72	A
Q21	B	Q47	A	Q73	D
Q22	A	Q48	B	Q74	A
Q23	A	Q49	C	Q75	A
Q24	C	Q50	C	Q76	A
Q25	A	Q51	A	Q77	B
Q26	C	Q52	B	Q78	A

Test Booklet Question No. (Series A)		Test Booklet Question No. (Series A)		Test Booklet Question No. (Series A)	
Q79	B	Q93	B	Q107	A
Q80	C	Q94	D	Q108	A
Q81	D	Q95	C	Q109	B
Q82	B	Q96	A	Q110	D
Q83	B	Q97	A	Q111	C
Q84	D	Q98	C	Q112	B
Q85	C	Q99	D	Q113	D
Q86	B	Q100	B	Q114	A
Q87	A	Q101	B	Q115	C
Q88	B	Q102	D	Q116	D
Q89	D	Q103	C	Q117	D
Q90	A	Q104	A	Q118	C
Q91	A	Q105	C	Q119	C
Q92	B	Q106	B	Q120	A

The candidates are advised to refer to **Question Booklet (Series A)** to match the corresponding question(s) in their respective Question Booklet Series and if any candidate feels that the key to any of the question(s) is/are wrong, he/she may represent on prescribed format/proforma annexed as **Annexure-A** along with the documentary proof/evidence **(hard copies only)** and fee of Rs.500/- per question in the form of Demand Draft drawn in favour of **COE** (refundable in case of genuine/correct representation) to the Controller of Examinations, Jammu & Kashmir Public Service Commission, from Tuesday i.e. 03.10.2023 to 05.10.2023. **The candidates are further advised to clearly mention the question(s) objected to with reference to its serial number as it exists in the Series A of the provisional key.**

The Commission shall not entertain any such representation(s) after the expiry of the stipulated period i.e. after 05.10.2023 (Thursday), 05.00 pm.

The provisional key is also available on the website of the Commission http://www.jkpsc.nic.in.

(Anil Sharma), JKAS
Controller of Examinations
J&K Public Service Commission

No. PSC/Ex-Secy/2023/55
Dated: 02.10.2023

Copy to the: -
1. Director, Information and Public Relation, Department of Information and Public Relations, Government of Union Territory of J&K for publication of the notice in all leading newspapers published from Jammu/Srinagar.
2. P.S. to Hon'ble Chairman, J&K Public Service Commission for information of the Hon'ble Chairman.
3. P.S. to Hon'ble Member, Shri _____ for information of the Hon'ble Member.
4. P. A. to Secretary, J&K Public Service Commission for information of the Secretary.
5. Main file/Stock file/Notice Board.

Annexure-A

Representation regarding objection(s) to any Question/Answer pertaining to the Written Test conducted for the post of Assistant Engineer (Civil) in Jal Shakti Department, 2023 on 02.10.2023

(NOTE: USE SEPARATE FORMS FOR SEPARATE QUESTIONS)

Name of the Applicant : _____

Roll No.   :_____

Correspondence Address :_____

Contact/Mobile No. :_____

Date of Application:_____.10.2023

Demand Draft No. date :_____

Candidates Account No.(16 digit) & IFSC Code :_____

Question No. & Series	Details of the Objection	Resource Material (copy to be enclosed)	Details of the Website (if any)

Correct Answer/Option as per candidate :

Signature of the Candidate

Note : Application for each question/answer shall be made on separate page in the given format, otherwise the first question entered in the format shall only be considered.

Booklet Serial No. **115361**

TEST BOOKLET
ASSISTANT ENGINEER CIVIL
Written Test - 2023
(20)

A

| *Time Allowed: Two Hours* | *Maximum Marks: 120* |

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET *DOES NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.

2. **Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.**

3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. *DO NOT* write *anything else* on the Test Booklet.

4. This Test booklet contains **120** items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose *ONLY ONE* response for each item.

5. You have to mark all your responses *ONLY* on the separate Answer /Response Sheet provided. *See directions in the Response Sheet.*

6. *All* items carry equal marks.

7. Before you proceed to mark in the Answer /Response Sheet, the response to various items in the Test Booklet, you have to fill in some particulars in the Answer /Response Sheet as per instructions sent to you with your Admission Certificate.

8. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator *only the Answer /Response Sheet*. You are permitted to take away with you the Test Booklet and *Candidate's Copy of the Response Sheet*.

9. Sheets for rough work are appended in the Test Booklet at the end.

10. While writing Centre, Subject and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN"**.

11. **Penalty for wrong answers:**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **(0.25)** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.

    (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.
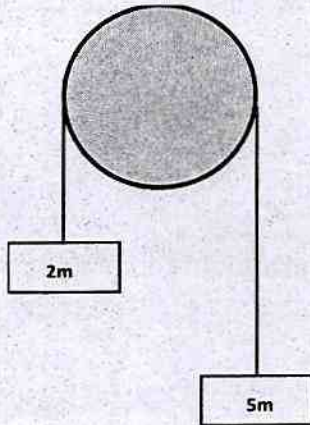
1. Two bodies of masses m1 and m2 are hung from the ends of a rope, passing over a frictionless pulley as shown in Fig. below. The acceleration of the string will be:


A) 3/7 g

B) 4/7 g

C) 7/2 g

D) 2/7 g

2. A steel wire of 20 mm diameter is bent into a circular shape of 10m radius. If the modulus of elasticity is 2×10^6 kg/cm^2, then the maximum stress induced in the wire is:

A) 10^3 kg/cm2

B) 2*10^3 kg/cm2

C) 4*10^3 kg/cm2

D) 6*10^3 kg/cm2

3. The shear force diagram of a beam is shown in the figure. The absolute maximum bending moment in the beam is: (Assume moment at A is equal to zero)
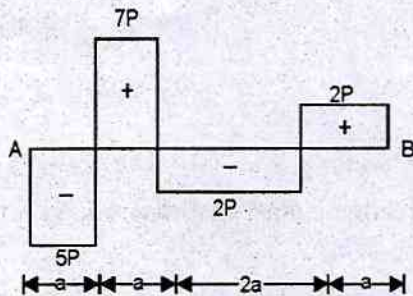
A) 4Pa

B) 5Pa

C) 6Pa

D) 7Pa

4. What is the correct expression of bulk modulus (K), Modulus of rigidity (G) and Poisson's ratio :

   A) $\mu=(3K-4G)/(6K+4G)$

   B) $\mu=(3K+4G)/(6K-4G)$

   C) $\mu=(3K-2G)/(6K+2G)$

   D) $\mu=(3K+2G)/(6K-4G)$

5. When a cantilever beam, is loaded at its free end, the maximum compressive stress shall develop at:

   A) Top fibre

   B) Bottom fibre

   C) Neutral axis

   D) Centre of gravity

6. A shaft of 60 mm diameter is subjected to torsion has a shear strain of 0.0006. The rate of twist will be equal to

   A) 0.00002

   B) 0.00025

   C) 0.0036

   D) 0.00001

7. A mild steel bar of uniform cross-section A and length 2L is subjected to an axial load P. The total energy stored in the bar would be:

   A) PL/AE

   B) $(P^2 L)/2AE$

   C) PL/2AE

   D) $(P^2 L)/AE$

8. The number of independent elastic constant for a linear elastic isotropic and homogeneous material is

   A) 1

   B) 2

   C) 3

   D) 4

(20) (A)   (4)

9. In a plane strain in the xy plane, normal strain in x and y directions are equal to zero and shear strain is equal to 3×10^{-6}. What is the value of diameter of Mohr's circle of strain for these strain values?

A) 6×10^{-6}
B) 3×10^{-6}
C) 2×10^{-6}
D) 9×10^{-6}

10. Considering the following:

Major principal stress $\sigma1 = 150$ N/mm² (tensile)

Major principal stress $\sigma2$ is compressive.

What would be the value of $\sigma2$ in N/mm² at which yielding will commence according to maximum shear stress theory, if the uni-axial tensile yield stress is 230 N/mm² ?

A) 50 Compressive
B) 40 Tension
C) 80 Compression
D) 60 Tension

11. Which of the following conditions is satisfied both in plastic and elastic analysis

A) Equilibrium condition
B) Yield condition
C) Mechanism condition
D) Plastic moment

12. A brass bar of solid section is encased in a steel tube shown in figure. The coefficient of expansion of steel is 11.2×10^{-6} per °C and the coefficient of expansion of brass is 16.5×10^{-6} per °C. The composite bar is heated through 60 °C. Now consider the following statements:
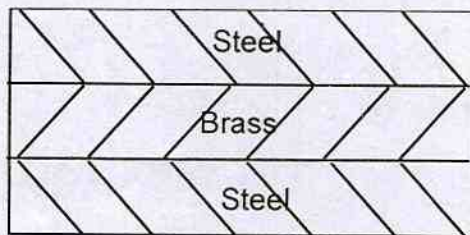

The stress in the brass will be tensile

i. The stress in the steel will be tensile
ii. The stress in the brass will be compressive
iii. The stress in the steel will be compressive

Which of the statements given above are correct?

A) i and ii
B) i and iii
C) ii and iv
D) ii and iii

13. Castigliano's theorem comes under which one of the following method :

A) Equilibrium method

B) Displacement method

C) Stiffness method

D) Force method

14. The section modulus of a circular section about an axis through the centre of the C.G, is

A) $(\pi d^2)/4$

B) $(\pi d^2)/16$

C) $(\pi d^3)/16$

D) $(\pi d^3)/32$

15. The given figure shows a portal frame with one end fixed and other hinged. The ratio of fixed end moments M_{BA}/M_{CD} due to side sway will be :

A) 2

B) 3

C) 1
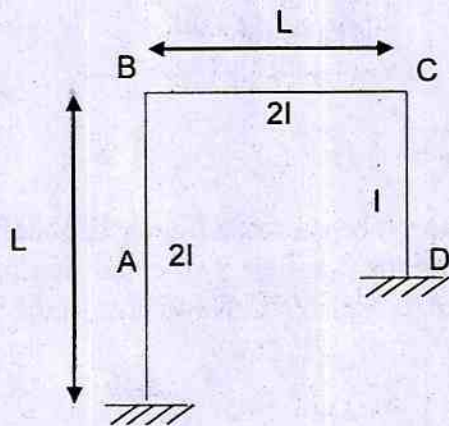
D) 4

16. According to IS 2212:1991 the nominal thickness of 11/2 modular brick wall is:

A) 19 cm

B) 29 cm

C) 30 cm

D) 40 cm

17. A steel rod of 20mm diameter has been used as a tie bracing system, but may be subjected to possible reversal of stress due to wind. What is the maximum permitted length of the member?
   A) 1650 mm
   B) 1750 mm
   C) 1850 mm
   D) 1550 mm

18. According to IS 1077:1992 the common burnt clay bricks are classified on the basis of:
   A) Dimensions
   B) Marking
   C) Type of bond
   D) Average compressive strength

19. A rectangular steel section of width 'b' and depth 'h' has been stressed up to yield point (σy) up to depth of h/4 from both the top and bottom face under the action of a moment 'M'. The magnitude of the moment 'M' is
   A) $10/24bh^2\sigma y$
   B) $1/4bh^2\sigma y$
   C) $11/48bh^2\sigma y$
   D) $13/36bh^2\sigma y$

20. According to IS 3370-2:2009 the permissible stress in M30 grade of concrete under direct compression (N/mm^2) :
   A) 10
   B) 8
   C) 9
   D) 11.5

21. Additional tensile force developed in a bolt as a result of the flexing of a connection component such as a beam end plate or leg of an angle.
   A) Shear leg force
   B) Prying force
   C) Shear force
   D) Bending force on bolt

22. A concrete mix is to be designed for a strength of 35 MPa, such that there is a 5% probability that an individual cube strength test result will fall below 35 MPa by more than 5 Mpa. Determine target mean strength, (Consider standard deviation for mix as 4 Mpa):
   A) 36.6 Mpa
   B) 23.4 Mpa
   C) 34 Mpa
   D) 26 Mpa

23. Physical properties of structural steel irrespective of its grade may be taken as:
    1. Unit mass of steel $\rho = 7850$ kg/m3
    2. Modulus of elasticity $E = 2.0 \times 105$ N/mm^2 (mpa)
    3. Poisson ratio $= 0.3$
    4. Modulus of rigidity $G = 0.769 \times 10^5$ N/mm^2 (mpa)
    5. Co-efficient of thermal expansion $\alpha = 12 \times 10^6/$ °C
    Choose correct option from the codes given below
    A) Only 1,2,3 and 4 are correct
    B) Only 2,4 and 5 are correct
    C) All of the above
    D) None of the above

24. The maximum value of effective slenderness ratio (As per IS 800 : 2007) for a tension member in which a reversal of direct stress occurs due to loads other than wind or seismic force is
    A) 350   B) 250
    C) 180   D) 400

25. In working stress design of reinforced concrete structures the modular ratio is given by the expression:
    A) $280/(3\sigma\_cb)$
    B) $280/(3\sigma\_cc)$
    C) $280/(3\sigma\_cu)$
    D) $280/\sigma\_cc$
    Note: Here σ_cb and σ_cc is the compressive stress in bending and direct compression respectively and σ_cu is the ultimate compressive strength.

26. According to IS 456:2000 the minimum grade of concrete in case of severe exposure condition for reinforced concrete:
    A) M20   B) M25
   C) M30   D) M40

27. Consider the following statement regarding the Lacing bars
    1. In bolted/riveted construction, the minimum width of lacing bars shall be four times the nominal diameter of the end bolt rivet.
    2. The thickness of flat lacing bars shall not be less than one-fortieth of its effective length for single lacings and one-sixtieth of the effective length for double lacings.
    3. Rolled sections or tubes of equivalent strength may be permitted instead of flats, for lacings
    4. Lacing bars, whether in double or single systems, shall be inclined at an angle not less than 40° nor more than 70° to the axis of the built-up member.
    Choose correct option from the codes given below
    A) 1,2 and 3 are correct   B) 2,3 and 4 are correct
    C) 1,3 and 4 are correct   D) All are correct

(20) (A)   (8)

28. Determine the depth of neutral axis for the section shown in figure. Assume $\sigma ck = 25$ Mpa, $\sigma y = 415$ Mpa and cover 40mm.
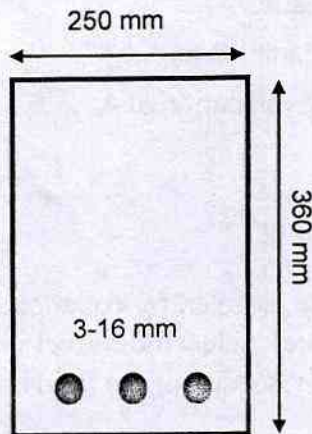
A)   100mm
B)   90mm
C)   96.8mm
D)   320mm

29. Gantry girders are design to resist:
1.   Lateral loads
2.   Longitudinal loads
3.   Vertical loads
A)   1, 2 and 3
B)   1 and 2
C)   1 and 3
D)   2 and 3

30. If ϕ is the dia of the plain bar in compression and σ st is the stress in the bar. Determine the development length of the bar, bond strength of concrete is τ bd.

A) $\dfrac{\phi.\sigma_{st}}{4\tau_{bd}}$

B) $\dfrac{\phi.\sigma_{st}}{8\tau_{bd}}$

C) $\dfrac{\phi.\sigma_{st}}{6.4\tau_{bd}}$

D) $\dfrac{\phi.\sigma_{st}}{5\tau_{bd}}$

31. **Assertion:** At the standard temperature, the value of the Kinematic viscosity of water comes out to be lower than that of air at similar temperature.

Reasoning: At the standard temperature, the value of the dynamic viscosity of water comes out to be lower than of air at similar temperature.

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

B) Both A and R are true but R is not the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

32. Velocity distribution of fluid flow over a flat plate is given by equation $3+ 0.5y -y^2$ (where y is the vertical distance from the plate surface). Select the correct value of shear stress at a vertical distance of 0.2 m if the dynamic viscosity of the fluid is 0.7 N-s/m²

A) $0.14 \ N/m^2$

B) $0.07 \ N/m^2$

C) $0.1 \ N/m^2$

D) $0.28 \ N/m^2$

33. An air bubble (diameter 50 mm) inside a water bucket have pressure 4.5 N/m² more than the surrounding pressure. Then the force inhibiting the bubble from bursting is given by?

A) 0.028 N/m

B) 0.056 N/m

C) 0.0625 N/m

D) 0.1 N/m

34. A Newtonian fluid of relative density 0.45 is held back by a vertical gate of dimension (6×6) m with free surface of fluid at its top. Find the moment of the force exerted by the fluid with respect to the bottom edge of the gate (z is the specific weight of water):

A) 72 z

B) 97.2 z

C) 216 z

D) 16.4 z

35. Velocity potential function for a fluid flow condition is given as $3x^2 +4y^2$, calculate the magnitude of velocity at (1,1)?

A) 7 units

B) 100 units

C) 10 units

D) 25 units

(20) (A)   (10)

36. Which of the following statements are considered in Bernoulli's assumptions:
    1. Flow is irrotational
    2. Flow is incompressible
    3. Viscous force is ignored
    4. Flow is considered steady
    A) 2 ,3 and 4
    B) 2 and 4
    C) 1, 2 and 4
    D) 1,2,3 and 4

37. Find the stagnation point for a fluid flow condition where velocity in X direction (u) is $x + y + 3$ while velocity in Y direction (v) is $2x - y - 9$?
    A) (2,-5)
    B) (-2,-5)
    C) (-2,5)
    D) (2,5)

38. From the options given below the select the type of fluid flow which will be observed when bath tub is emptied through a central opening:
    A) Rotational vortex
    B) Rankine vortex
    C) Free vortex flow
    D) Forced vortex flow

39. Two reservoirs with different water levels are connected by two pipes A and B in parallel. Diameter of pipe A is twice than that of pipe B. The ratio of frictional loss in pipe B than that of pipe A comes out to be?
    A) 2
    B) 1
    C) 4
    D) 32

40. Which one of the following statements are correct regarding the cavitation process:
    1. Cavitation occurs where local pressure level drops below the vapour pressure due to increase in local velocity.
    2. Cavitation takes place in turbine blades and runner of pumps
    3. Cavitation can be prevented by increasing the ambient pressure by raising the elevation level of the section under consideration.
    4. The impact of cavitation can be reduced by providing covering of stainless steel and rubber etc.
    A) 1, 2 and 4
    B) 1, 2 and 3
    C) 2, 3 and 4
    D) 1 and 4

41. If m = total number of variables and n = number of fundamental dimensions involved then number of π terms in Buckingham's π method would be:

A) m+n

B) (m-n) +1

C) m×n

D) m-n

42. Which one of the following statements is incorrect:

A) Dynamic similarity between a model and prototype can be verified by equating Reynolds number in a viscous flow.

B) Mach number achieves significance when the velocity of fluid approaches or exceeds the sonic velocity.

C) Distorted models are always exaggerated on a vertical scale.

D) Models are always smaller than the prototypes when compared in size.

43. Consider a subcritical flow condition in a rectangular open channel, when the width of section is suddenly increased then what will be the impact on the water level in the channel (assume no choke condition)?

A) Water level will increase as compared to the previous value

B) Water level will remain same

C) Water level will drop as compared to the previous value

D) Water level will increase first then it will decrease

44. A spillway having a discharge of $7 * 10^5$ m³/sec is to be modelled in a laboratory on a scale of 1:100. The discharge required in the model would be?

A) 7 m³/s

B) 10 m³/s

C) 70m³/s

D) 1 m³/s

45. Match the following:

	List -I (Type of turbine)		List- II (Characteristics)
a.	Pelton turbine	1.	Inward flow reaction
b.	Kaplan turbine	2.	Tangential flow impulse
c.	Propellor turbine	3.	Axial flow reaction with adjustable vanes
d.	Francis turbine	4.	Axial flow reaction with fixed vanes

A) a-2 b-3 c-4 d-1

B) a-1 b-2 c-4 d-3

C) a-3 b-2 c-4 d-1

D) a-1 b-2 c-3 d-4

46. The Unified soil classification system (USCS) for the soil classification is based on

A) Grain shape

B) Grain texture

C) Gradation

D) Grain length

47. The void ratio (e) and porosity (n) of soil is

A) $0 < n < 1, e > 0$

B) $n > 0, e > 0$

C) $n < 1, e < 1$

D) $n < 1, e < 0$

48. The saturated unit weight of soil is 20 kN/m³, rw of water is 10 kN/m³ and the specific gravity (Gs) of soil is 2.65. The void ratio of soil is

A) 0.85

B) 0.65

C) 0.25

D) 0.45

49. The void ratio at densest, loosest and insitu field condition are 0.2, 0.9 and 0.5 respectively. The relative density of soil deposit at field is

A) 45 %

B) 65.3 %

C) 57.1 %

D) 83.7 %

50. Match list - I and list - II and select the correct answer:

	List - I		List - II
a.	Casagrande apparatus	1.	Specific gravity
b.	Pycnometer test	2.	Maximum dry density and optimum moisture content
c.	Direct shear test	3.	Liquid limit
d.	Proctor test	4.	Cohesion and angle of internal friction

Codes:

	a	b	c	d
A)	4	3	2	1
B)	4	2	3	1
C)	3	1	4	2
D)	3	4	2	1

51. For a saturated soil deposit with void ratio 0.7 and specific gravity 2.7, the critical hydraulic gradient is:

A) 1

B) 0.5

C) 0.7

D) 0.98

52. The time for a clay layer to achieve 90 % consolidation is 20 years. The time required to achieve 90% consolidation in the clay layer of half thickness is

A) 20 years

B) 5 years

C) 10 years

D) 7.5 years

53. The surcharge loading required to be placed on the horizontal backfill of a smooth vertical retaining wall to completely eliminate tensile crack is

A) $2c/\sqrt{k_a}$

B) $2c\sqrt{k_a}$

C) $2c$

D) $2ck_a$

54. Choose the correct statements from the following

i. In the capillary zone water is under tension

ii. Constant head permeability test is used to determine permeability in clayey soils

iii. A soil having lesser permeability gives higher discharge

iv. The effective stress increases due to capillary zone

A) i and iii

B) ii and iii

C) ii and iv

D) i and iv

55. In a 3 layered soil deposit the permeability ratio is 1:2:4. The soil deposit is of uniform thickness. What is the ratio of average permeability in horizontal to vertical stratification of layers?

A) 8/7

B) 12/15

C) 49/36

D) 7/15

56. A square concrete pile 0.5 × 0.5 m is driven into homogenous clay soil having undrained cohesion 50 kPa. The ultimate capacity of pile is 1000 kN. The adhesion factor is 0.5. Determine the length of pile (N_c=9)
   A)   17.75 m
   B)   8.32 m
   C)   10.5 m
   D)   22.56 m

57. The unconfined compressive strength of a clayey soil is 80 kPa, the undrained shear strength of clayey soil is
   A)   80 kPa
   B)   20 kPa
   C)   40 kPa
   D)   160 kPa

58. The liquid limit and plastic limit of a soil sample are 60 % and 20 % respectively. Given the percentage of clay fraction is 10 %. The plasticity index and activity of clay is
   A)   30 and 5
   B)   40 and 4
   C)   50 and 6
   D)   30 and 3

59. Pick the odd one out
   A)   Geonet
   B)   Geogrout
   C)   Geocell
   D)   Geogrid

60. Match the following
   a.   Mechanical Method   1.   Prefabricated vertical drains
   b.   Grouting   2.   Vibrocompaction
   c.   Hydraulic modification   3.   Geogrid
   d.   Reinforcement   4.   Cement
   Codes:

	a	b	c	d
A)	1	3	2	4
B)	4	2	3	1
C)	2	4	1	3
D)	2	4	3	1

61. The strength of concrete in hardened existing structure can be determined by which of the following tests
    A) Cone penetration test
    B) Rebound hammer test
    C) Bullet test
    D) Kelly ball test

62. Which of the following statements is wrong
    A) Quartz has a greasy lusture.
    B) Feldspar is a silicate of aluminium with varying amounts of potash, soda or lime.
    C) A stone with large percentage of quartz is very soft
    D) All of the above

63. The water absorption (by weight) of first class brick after immersing in cold water for 24 hours
    A) 30%
    B) 20%
    C) 25%
    D) 15%

64. The effective length of masonry wall stiffened by buttresses on both ends and continuing beyond these buttresses at both ends is (L is the c/c length of the wall between successive buttresses)
    A) 0.8 L
    B) 0.9 L
    C) 2.0 L
    D) 1.0 L

65. Which defect is caused by due to uncontrolled and non-uniform loss of moisture in wood
    A) Knot
    B) Cross grain
    C) Warping
    D) Shake

66. For high rise buildings, which types of crane are used
    A) Derrick crane
    B) Overhead gantry crane
    C) Tower crane
    D) Traveller crane

67. What is the duration by which the completion time of any activity can be delayed without affecting the start of any succeeding activities?
   A) Zero float
   B) Minimum float
   C) Maximum float
   D) Free float

68. In case of research and development type of activity which of the following technique is most suitable?
   A) Bar chart
   B) Graphical evaluation and review technique
   C) Research evaluation and review technique
   D) Project evaluation and review technique

69. Which of the following pairs are correctly matched?
   A) Grading : Maximizes cement content
   B) Particle size and texture : Affects workability
   C) Absorption and surface moisture : Affects mix proportions
   D) Bulk density : Significant for stability

70. Which property of concrete is considered while doing the mix design for pavement concrete?
   A) Characteristic compressive strength
   B) Shear strength
   C) Bond strength
   D) Flexural strength

71. The specific gravity of sandstone is
   A) 2.65 to 2.95
   B) 1.1 to 1.8
   C) 1.8 to 2.65
   D) 2.95 to 3.4

72. According to IS456:2000, the theoretical value of effective length of a compression member effectively held in position and restrained against rotation at one end, and at the other end restrained against rotation but not held in position?
   A) 0.70 l
   B) 2.0 l
   C) 1.0 l
   D) 0.50 l

73. How is the fineness of cement measured?
   A) Volume/Mass
   B) Mass/Volume
   C) Mass/Area
   D) Area/Mass

74. Consider the following strengths of concrete
   1. Cube strength
   2. Cylinder strength
   3. Split-tensile strength
   4. Modulus of rupture
   What is the correct sequence in increasing order of these strengths?
   A) 3,4,2,1
   B) 3,4,1,2
   C) 4,3,2,1
   D) 4,3,1,2

75. The area under β-distribution curve is divided into two equal halves by vertical ordinate through
   A) Expected time
   B) Optimistic time
   C) Most likely time
   D) Pessimistic time

76. A survey which is done for fixing the property lines is known as
   A) Cadastral survey
   B) Topographical survey
   C) City survey
   D) Engineering survey

77. What is the true bearing of line AB. If magnetic bearing of 39°25' and magnetic declination is 4°21' E?
   A) 35°4'
   B) 43°46'
   C) 30°43'
   D) 48°7'

78. A surveyor measured distance between 2 points on the plan drawn to scale of 1 cm=25m and the result was 500 m. Later he discovered that he used a scale of 1 cm = 50m. Find the true distance between the points.

A) 250m

B) 500m

C) 750m

D) 1000m

79. The combined correction for curvature and refraction for distance of 2.1 km (in meters).

A) 0.049

B) 0.296

C) 0.112

D) 0.483

80. RL of a floor is 200.49m. Staff reading on floor is 1.695 m, reading on staff held upside down against the bottom of roof is 3.305. The height of ceiling is.

A) 6 m

B) 3.305 m

C) 5 m

D) 4.49 m

81. For a well-conditioned triangle

i. Angles are <30° and >120°

ii. Angles are <120° and base angles equal to 46°14'

iii. Angles are >30° and <120°

iv. Base angles equal to 56°14'

Which of the above statements are correct.

A) Only iii

B) i and iv

C) Only ii

D) iii and iv

82. The departure of 12 m long AB line is 6 m. What is the reduced bearing of line AB in NE quadrant.
    A)   N 60° E
    B)   N 30° E
    C)   N 45° E
    D)   N 15° E

83. For a staff reading, the correction of curvature (C_c) is given by. (d is horizontal distance between station and point along line of site and R is radius of earth)

    A) $C_C = \frac{1}{7}\left(\frac{d^2}{2R}\right)(+ve)$

    B) $C_C = \left(\frac{d^2}{2R}\right)(-ve)$

    C) $C_C = \left(\frac{d^2}{2R}\right)(+ve)$

    D) $C_C = \frac{1}{7}\left(\frac{d^2}{2R}\right)(-ve)$

84. Road pattern opted for Nagpur Road Plan (Ist 20-year Road Development Plan) is.
    A)   Star and block pattern
    B)   Rectangular / block pattern
    C)   Star and circular pattern
    D)   Star and grid pattern

85. If the UI (Unevenness index) of pavement surface is measured to be 352 cm/km, then the pavement is.
    A)   Comfortable
    B)   Just satisfactory even at higher speeds (100 kmph)
    C)   Not satisfactory and cause discomfort even at 50 kmph
    D)   None of these

86. The coefficient of friction in longitudinal direction of a highway is given as 0.4. The breaking distance for car moving at a speed of 90 km/h is. (take g =10 m/s²)
    A)   62.5 m
    B)   78.125 m
    C)   60 m
    D)   70.7 m

87. The vehicle is safe from overturning. The vehicle will skid not overturn.

    i. $\dfrac{P}{w} \geq \dfrac{b}{2h}$

    ii. $f < \dfrac{b}{2h}$

    iii. $\dfrac{P}{w} < \dfrac{b}{2h}$

    iv. $f > \dfrac{b}{2h}$

    Among the above-mentioned two different condition(s), choose correct option.
    A) ii and iii
    B) i and iv
    C) Only ii
    D) None

88. If the extra-widening required for 2 lane highway at horizontal curve of 225 m radius is 0.91 m, considering wheelbase of 8 m and what is the design speed of vehicle in km/h.
    A) 100
    B) 90
    C) 85
    D) 95

89. If the ruling gradient is 1 in 120 on a particular section of broad gauge and at same time a curve of 4° is situated on this ruling gradient. What should be the allowable ruling gradient.
    A) 1 in 196
    B) 1 in 174
    C) 1 in 163
    D) 1 in 149

90. Following is not a mode of failure in concrete pavement
    A) Pumping failure
    B) Curling failure
    C) Reflection cracking failure
    D) Temperature stresses induced failure

91. Given that, the volume of atmospheric moisture is 13,000 km^3 and the flow rate of moisture from the atmosphere as precipitation is 600,000 km^3/y. What approximately is the value of residence time of global atmospheric moisture?

A) 8 days

B) 4 days

C) 16 days

D) 12 days

92. If f_0 is the initial infiltration rate and f_c is the constant rate of infiltration after time 't'. According to Horton's equation the decrease in rate of infiltration from f_0 to f_c is,

A) Cubic

B) Exponential

C) Logarithmic

D) Linear

93. Which one of the following is an assumption that is not inherent to unit hydrograph model?

A) The excess rainfall has a constant intensity within the effective duration.

B) The excess rainfall is not uniformly distributed throughout the whole drainage area.

C) For a given watershed, the hydrograph resulting from a given excess rainfall reflects the unchanging characteristics of the watershed.

D) The base time of the direct runoff hydrograph resulting from an excess rainfall of given duration is constant.

94. According to Muskingum method which is used for handling a variable discharge-storage relationship, if two of its routing equation coefficients are given by, $C_1 = 0.44$, $C_3 = 0.18$. What is the value of C_2?

A) 0.28

B) 0.62

C) 0.31

D) 0.38

95. The probability that the maximum discharge in a tributary of Narmada River will equal or exceed 8,000 m^3/s in any year is approximately 0.195. What is the probability that the maximum discharge will exceed 8,000 m^3/s at least once during the next three years?

A) 0.80

B) 0.27

C) 0.48

D) 0.55

96. In a confined aquifer where the flow rate to a well is 1000 m³/day, and observation wells at distances of 100 and 200 metres from the pumping well have depths to the water table of 100-m and 90-m, respectively. The upper surface of the aquifer is 150 m below ground and the aquifer is 50 m in depth. Assuming datum at 200 metres below ground surface, Calculate transmissivity of the confined aquifer. [ln (2) = 0.69]

    A)   11 m²/day

    B)   15 m²/day

    C)   9 m²/day

    D)   18 m²/day

97. Reference evapotranspiration is 8 mm/day in summer. Calculate the evaporation per day in summer from a 300 m long, 2 m wide canal.

    A)   4.8 m³/day

    B)   6 m³/day

    C)   2.4 m³/day

    D)   0.24 m³/day

98. For a channel having parabolic channel section with top width = T and depth = y. The Hydraulic Radius (R) is given by,

    A) $(8T^2 + 3y^2) / (2T^2y)$

    B) $(2T^2y) / (8T^2 + 3y^2)$

    C) $(2T^2y) / (3T^2 + 8y^2)$

    D) $(3T^2 + 8y^2) / (2T^2y)$

99. Given that the standard deviation (σ) and mean (μ) of rainfall values at existing rain gauge stations is 28 and 110 cm respectively. If the maximum tolerable error in measurements is 5%, calculate the coefficient of variation (C_v) and total no. of rain gauges required.

    A)   24.85, 26 gauges

    B)   25.45, 16 gauges

    C)   24.85, 16 gauges

    D)   25.45, 26 gauges

100. Among the streams listed below, which one receives no input from the base flow?

    A)   Intermittent streams

    B)   Ephemeral streams

    C)   Perennial streams

    D)   Meandering streams

101. Which one of the following soils has the highest water application efficiency (Irrigation efficiency)?

A) Sand

B) Heavy Clay

C) Sandy loam

D) Loam

102. A 120 ha aquifer is affected by drought due to which the water table has dropped by 4.0 m. Assuming porosity and specific retention of the aquifer material to be 35 per cent and 20 percent, respectively, determine the reduction in ground water storage.

A) $64 \times 10^4 \, m^3$

B) $48 \times 10^4 \, m^3$

C) $60 \times 10^4 \, m^3$

D) $72 \times 10^4 \, m^3$

103. Match the following,

a.	Free overfall spillway	1.	The spillway discharge flows in an open channel right from the reservoir to the downstream river
b.	Ogee spillway	2.	Hydraulic drop is less than about 6 m
c.	Cascade spillway	3.	Advised in case of very high dams, when the kinetic energy at the toe of the dam is very high.
d.	Chute spillway	4.	The upper part of the spillway surface matches closely with the profile of the lower nappe of a ventilated sheet of water falling freely from a sharp-crested weir.

A) a-2, b-3, c-1, d-4

B) a-2, b-1, c-3, d-4

C) a-2, b-4, c-3, d-1

D) a-2, b-4, c-1, d-3

104. Assuming the relative density of a sand particle as 2.5 and dry unit weight of a cubic metre of sediment as 970 kg, estimate the weight of 1 m³ of deposited sediment in the reservoir bed.

    A)   1582 kg

    B)   1428 kg

    C)   1762 kg

    D)   1728 kg

105. Arrange in ascending order of distance from the river.

    A)   Watercourse<Minor Distributaries<Major Distributaries<Branch Canal<Main Canal

    B)   Watercourse<Minor Distributaries<Major Distributaries<Main Canal< Branch Canal

    C)   Main Canal<Branch Canal<Major Distributaries<Minor Distributaries < Water course

    D)   Main Canal<Watercourse<Major Distributaries<Minor Distributaries< Branch Canal

106. Which of the following statement is correct?

    A)   The substance used for disinfection of water is known as coagulant

    B)   Chlorine can be applied in the form of chloramines.

    C)   Pre-chlorination increases the bacterial load on filters.

    D)   All of the above

107. If 500 mg/L and 200 mg/L ($CaCO_3$ scale) are the total hardness and alkalinity of a sample of water respectively, then find non-carbonate and carbonate hardness will be respectively

    A)   300 and 200

    B)   200 and 700

    C)   700 and 200

    D)   Zero and 500

108. The overflow rate for plain sedimentation tanks is about

A) 500 to 750 litres/hr/m²

B) 1000 to 1250 litres/hr/m²

C) 1250 to 1500 litres/hr/m²

D) 1500 to 2000 litres/hr /m²

109. Match List-I (Purpose) with List II (Fixture)

	List-I		List-II
a.	To stop flow in reverse direction	1.	Surge arrester
b.	To stop or regulate the flow especially in large size conduits	2.	Butterfly valve
c.	Control of water hammer	3.	Scour valve
d.	To empty or drain the pipeline section	4.	Check valve

A) a-1 b-2 c-4 d-3

B) a-4 b-2 c-1 d-3

C) a-1 b-4 c-2 d-3

D) a-3 b-4 c-2 d-1

110. Alkalinity in natural waters is due to

A) Salts of weak bases strong acids

B) Drainages from abandoned mines

C) Industrial wastes from rayon mills and steel mills

D) Photosynthesis of algae in water

111. In order to determine only the presence of fecal coliform organisms and no other microorganisms, the test to be carried out is

i. Presumptive coliform test

ii. Confirmed coliform test

iii. Completed coliform test

A) Only (i)

B) Both (i) and (ii)

C) Only (ii)

D) All (i), (ii) and (iii)

112. Many house sewers discharge is combined into one sewer, which is referred to as

    A) House sewer

    B) Lateral sewer

    C) Intercepting sewer

    D) Submain sewer

113. 12.0m × 1.50 m × 0.80 m are the dimensions of a grit chamber has a flow of 864 m³/hr. Its surface loading rate and detention time are, respectively

    A) 4800 m³/hr/m² and 4 minute

    B) 48000 litres/hr/m² and 10 minutes

    C) 48 m³/hr/m² and 40 minutes

    D) 48000 litres/hr/m² and 1 minutes

114. Which of the following is incorrectly matched

    A) Mohr method –Ph

    B) Winkler method – Dissolved Oxygen

    C) Orthotolidine test – Chlorine

    D) EDTA method – Hardness

115. Activated carbon is used for

    A) Disinfection

    B) Removing hardness

    C) Removing odour

    D) Removing corrosiveness

116. For which of the available dilution factor sewage may be disposed of without treatment into a water body

    A) Less than 150

    B) More than 150

    C) More than 300

    D) More than 500

(20) (A) (27) [P.T.O.

117. When lead is present in water, it

    A) Changes odour

    B) Changes colour

    C) Changes Taste

    D) None of the above

118. Match List-I with List - II

	List - I		List - II
a.	Hardy Cross method	1.	Long and narrow pipe
b.	Equivalent Pipe method	2.	Establishes analysis between flow fluid and flow of current
c.	Circle method	3.	Algebraic sum of head loss in any closed loop is zero.
d.	Electrical Analysis method	4.	Domestic supply is neglected and fire demand is considered

    A) a-3, b-4, c-2, d-1

    B) a-2, b-3, c-4, d-1

    C) a-3, b-1, c-4, d-2

    D) a-3, b-4, c-1, d-2

119. Disinfection is the process of

    A) Killing all the bacteria

    B) Killing only pathogenic bacteria

    C) Removal of causative organism for disease

    D) Complete destruction of life

120. Statement (I): In super-rate trickling filters, plastic media of 25 to 100 mm size are employed for treatment of waste-water having a very high BOD.

Statement (II): Hydraulic loading rate and organic loading rate for a plastic media are 30 to 90 $m^3/d/m^2$ and 1000 to 2000 $g/d/m^3$ respectively, which are much higher than in stone media trickling filter.

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

    B) Both A and R are true but R is not a correct explanation of A

    C) A is true but R is false

    D) A is false but R is true

ROUGH WORK

ROUGH WORK

ROUGH WORK

ROUGH WORK

(20) (A)   (32)