

(A)

PUBLIC WORKS DEPARTMENT
WRITTEN EXAMINATION FOR THE
POST OF JUNIOR ENGINEER (CIVIL)
UNDER PWD
2020

PAPER III
(200 MARKS)

Signature of Invigilator _____

CODE NO.

(For Official use)

MARKS TABULATION			
Subject	Marks carried by each question	No. of correct answers	Marks
Building Materials, Soil Mechanics & Foundation Engineering, Hydrology & Rain Water Harvesting, Design of RCC Building Members & RCC Water Tank, Protective Works, Slope Stability & Land	2		
Total Marks obtained:			

Signature of Examiner _____

Signature of Scrutiniser _____

(A)

PUBLIC WORKS DEPARTMENT
WRITTEN EXAMINATION FOR THE
POST OF JUNIOR ENGINEER (CIVIL)
UNDER PWD
2020

PAPER III
(200 MARKS)

Roll No. _____

Signature of Invigilator _____

CODE NO.

(For Official use)

**PUBLIC WORKS DEPARTMENT
EXAMINATION FOR RECRUITMENT TO THE POST OF
JUNIOR ENGINEER (CIVIL) : 2020**

PAPER-III

Time Allowed : 3:00 Hrs

Full Marks : 200

(Attempt all questions. Each question carries 2 marks)
Put a tick (✓) mark against the correct answer in the bracket ()

1. Water absorption for 1st class bricks should not be more than
(a) 12% () (b) 15% ()
(c) 20% () (d) 25% ()

2. For hidden masonry works the bricks used should be
(a) 1st class () (b) 2nd class ()
(c) 3rd class () (d) 4th class ()

3. The volume of one bag of cement is
(a) 0.0347 Cum () (b) 0.0357 Cum ()
(c) 0.0337 Cum () (d) 0.0367 Cum ()

4. Stone is placed along its natural bed so that the applied load is
(a) Parallel to it () (b) Normal to it ()
(c) At 45° to it () (d) At 30° to it ()

5. The compressive strength of cement concrete
(a) Increases as specimen size is increased ()
(b) Decreases as specimen size is increased ()
(c) Increases as specimen size is decreased ()
(d) None of these ()

6. The age of trees can be predicted by
(a) Length of medulary rays ()
(b) Counting number of rings ()
(c) By measuring the diameter of pith ()
(d) By the thickness of bark ()

7. The size of fine aggregate should not exceed
(a) 2.75 mm () (b) 3.75 mm ()
(c) 4.75 mm () (d) 5.75 mm ()

8. In a concrete mix, if maximum size of coarse aggregate is increased, then the proportion of fine to coarse aggregate should be
- (a) Increased ()
 (b) Decreased ()
 (c) Does not depend on the size of aggregate ()
 (d) Kept the same ()
9. For complete hydration of cement the w/c ration needed is
- (a) Less than 0.25 ()
 (b) More than 0.25 but less than 0.35 ()
 (c) More than 0.35 but less than 0.45 ()
 (d) More than 0.45 but less than 0.60 ()
10. The compressive strength of common building bricks should not be less than
- (a) 3.5 N/mm² () (b) 5.5 N/mm² ()
 (c) 7.5 N/mm² () (d) 10.5 N/mm² ()
11. The maximum bulking of sand is likely to occur at a moisture content of
- (a) 5% () (b) 8% ()
 (c) 11% () (d) 14% ()
12. The aggregate crushing value of coarse aggregates, which is used for making concrete, which in turn is used for purposes other than wearing surfaces should not exceed
- (a) 30% () (b) 40% ()
 (c) 45% () (d) 50% ()
13. Which of the following aggregates gives maximum strength in concrete?
- (a) Rounded aggregate () (c) Flaky aggregate ()
 (b) Elongated aggregate () (d) Cubical aggregate ()
14. Sand is classified into four zones viz Zone-1, 2, 3 & 4 according to
- (a) IS-383:1970 () (b) IS-373:1970 ()
 (c) IS-343:1970 () (d) IS-353:1970 ()
15. The minimum specific gravity of stone to be used as building material is
- (a) 2.5 () (b) 1.1 ()
 (c) 1.5 () (d) 3 ()
16. After addition of cement, the gauged mortar should be used within
- (a) 30 minutes () (b) 1-2 hours ()
 (c) 8-10 hours () (d) 24 hours ()

17. The portion of wood which is most useful in construction is___
- (a) Heartwood () (b) Sapwood ()
(c) Pith () (d) Cambium layer ()
18. The seasoning of timber helps in
- (a) Increasing the weight of timber ()
(b) Improves the strength properties of timber ()
(c) Increases the density of timber ()
(d) Increases the moisture content of timber ()
19. Which of the following is used for making electrical switches?
- (a) PVC () (b) Polypropylene ()
(c) Bakelite () (d) Polyvinyl acetate ()
20. The pain may peel off in some parts due to poor adhesion. This defect is known as
- (a) Blistering () (b) Flaking ()
(c) Flashing () (d) Grinning ()
21. Distemper is used on
- (a) Plastered surface not exposed to weather ()
(b) Plastered surface exposed to weather ()
(c) Unplastered brick wall ()
(d) Roof tops ()
22. Which of the following is not a varnish?
- (a) Spar varnish () (b) Flat varnish ()
(c) Asphalt varnish () (d) Methyl varnish ()
23. As per BIS recommendation, windows of size 600mm width and height 1200mm, double shutter is written as
- (a) 6 WT 12 () (b) 6 WS 12 ()
(c) 6 WD 12 () (d) 6 WDS 12 ()
24. The most commonly used base for iron & steel work is
- (a) Zinc white () (b) White lead ()
(c) Red lead () (d) None of these ()
25. To produce a cement mortar with fine sand than coarse sand, the cement required will be about
- (a) Half () (b) Double ()
(c) About 1.2 times () (c) Same ()

26. If a void ratio of soil is 0.67, water content is 0.188 and specific gravity is 2.68, the degree of saturation is _____
- (a) 25% () (b) 40% ()
(c) 75% () (d) 60% ()
27. Dry density of soil is equal to the
- (a) Mass of solids to the volume of solids ()
(b) Mass of solids to the total volume of soil ()
(c) Density of soil in the dried condition ()
(d) None of the above ()
28. The most accurate method for the determination of water content in the laboratory is
- (a) Sand bath method () (c) Pycrometer method ()
(b) Oven drying method () (d) Calcium carbide method ()
29. If Liquidity index of a given soil is 100%, it indicates
- (a) The soil is in hard state () (c) The soil is in liquid state ()
(b) The soil is in plastic state () (d) The soil is in fluid state ()
30. For well-graded sand, the coefficient of curvature should be
- (a) More than 3 () (b) Between 1 and 3 ()
(c) Less than 1 () (d) None of above ()
31. At shrinkage limit, the soil is
- (a) Dry () (b) Partially saturated ()
(c) Saturated () (d) None of above ()
32. The water holding capacity of soil is
- (a) Thixotropy () (b) Activity of soils ()
(c) Flow index () (d) Sensitivity ()
33. The unconfined compressive strength test is
- (a) Undrained test () (c) Consolidated undrained ()
(b) Drained test () (d) None of the above ()
34. For cohesive soils, with increasing compactive effort the optimum moisture content
- (a) Increases () (b) Decreases ()
(c) remains the same () (d) Zero ()

35. IS classification of soil is in many respects similar to
 (a) AASHTO classification () (c) Unified soil classification()
 (b) Textual classification () (d) MIT classification ()
36. If the plasticity index of a soil mass is zero, the soil is
 (a) Clay () (b) Clayey silt ()
 (c) Sand () (d) Silt ()
37. The permeability of soil varies
 (a) Inversely as square of grain size() (c) As grain size ()
 (b) As square of grain size () (d) Inversely as void ratio ()
38. The allowable bearing capacity of soil is
 (a) Net safe bearing capacity () (c) Smaller of (a) & (b) ()
 (b) Net safe settlement pressure () (d) Higher of (a) & (b) ()
39. The ultimate bearing capacity of a shallow foundation on sand is reduced to about_____? When the water table rises to the ground surface
 (a) 75 % () (b) 50% ()
 (c) 25% () (d) None of these ()
40. According to Terzaghi, a shallow foundation is the one in which
 (a) $D_f \leq 1$ () (b) $B/D_f \leq 1$ ()
 (c) $B \leq 1/D_f$ () (d) $B/D_f \leq 1$ ()
41. Colluvial soils are transported by
 (a) Water () (b) Wind ()
 (c) Gravity () (d) Ice ()
42. Pneumatic-tyred rollers are useful for compacting
 (a) Cohesive soils () (c) Both (a) and (b) ()
 (b) Cohesionless soil () (d) For soils in confined space()
43. Vibratory rollers are best suited for compacting
 (a) Coarse sand and gravels() (c) Silts ()
 (b) Silts () (d) Organic soils ()
44. The coefficient of permeability of soil
 (a) Increases with increase in temperature ()
 (b) Increases with decrease in temperature ()
 (c) Increases with decrease in unit weight of water ()
 (d) Decreases with increase in void ratio ()

45. The standard penetration test is useful to measure
 (a) Shear strength of soft clays () (c) Consistency of clay ()
 (b) Shear strength of sand () (d) None of the above ()
46. Rankine's theory of active earth pressure
 (a) The soil element is in a state of plastic equilibrium ()
 (b) The soil is weightless and is free from residual stress ()
 (c) Soil is laterally confined and settlement takes place only in one direction ()
 (d) The wall surface is rough ()
47. A shallow foundation is usually defined as a foundation which has
 (a) Depth less than 0.60 m () (c) Depth less than 1.00 m ()
 (b) Depth less than its width () (d) Depth less than 2.00 m ()
48. The permissible settlement is the maximum in the case of
 (a) Isolated footing on clay () (c) Isolated footing on sand ()
 (b) Raft on clay ()
49. Trapezoidal combined footings are required when
 (a) The space outside the exterior column is limited ()
 (b) The exterior column is heavier ()
 (c) Both (a) and (b) ()
 (d) Neither (a) nor (b) ()
50. The coefficient of subgrade reaction depends upon
 (a) The size of footing () (c) The depth of footing ()
 (b) The shape of footing () (d) All the above ()
51. The maximum Free water cement ratio for M-20 grade of RCC at mild environmental exposure conditions as per IS 456:2000 is
 (a) 0.45 () (b) 0.50 ()
 (c) 0.55 () (d) 0.40 ()
52. The minimum cement content of M-20 RCC at mild environmental exposure conditions as per IS 456:2000 is
 (a) 300 kg/m³ () (b) 250 kg/m³ ()
 (c) 350 kg/m³ () (d) 400 kg/m³ ()
53. The maximum permissible free fall of concrete may be taken as
 (a) 2.00 metres () (b) 1.5 metres ()
 (c) 1.2 metres () (d) 1.00 Metre ()

54. The minimum period of removal of form work as per IS 456:2000(II) for Props to slabs spanning upto 4.5 m is
 (a) 7 days () (b) 14 days ()
 (c) 10 days () (d) 21 days ()
55. Factor of safety in RCC structure is the ratio of
 (a) Yield stress to working stress ()
 (b) Tensile stress to working stress ()
 (c) Compressive stress to working stress ()
 (d) Bearing stress to working stress ()
56. In RCC water tanks, the minimum reinforcement in walls, floors and roofs in each of the two directions at right angles for sections upto 100mm thick shall have an area of
 (a) 0.20 percent of concrete section in that direction ()
 (b) 0.30 percent of concrete section in that direction ()
 (c) 0.40 percent of concrete section in that direction ()
 (d) 0.25 percent of concrete section in that direction ()
57. In RCC work, the maximum clear cover for the main reinforcement in column as per IS-456:2000 is
 (a) 25mm () (b) 30mm ()
 (c) 40mm () (d) 45mm ()
58. The depth of footing required for a column of size 300x300mm having SBC of 150 kN/m³, angle of repose 30° and unit weight of soil= 150 kN/m³ is____
 (a) 0.87 m () (b) 1.50 m ()
 (c) 1.10 m () (d) 2.00 m ()
59. A column is regarded as long column if the ratio of its effective length and lateral dimension exceeds
 (a) 10 () (b) 15 ()
 (c) 20 () (d) 12 ()
60. Which of the following IS Code deals with design of water tanks
 (a) IS-456:2000 () (b) IS-3370:1965 ()
 (c) IS-3390:2009 () (d) IS-801:1975 ()
61. For unconfined aquifers, storage co-efficient is same as__
 (a) Porosity () (b) Specific retention ()
 (c) Specific yield () (d) None of these ()

62. Which of the following is non-recording rain gauge
- (a) Tipping bucket type rain gauge ()
 - (b) Simon's rain gauge ()
 - (c) Steven's weighing type rain gauge ()
 - (d) Floating type rain gauge ()
63. Variability of annual rainfall in India is
- (a) Least in regions of scanty rainfall ()
 - (b) Largest in regions of high rainfall ()
 - (c) Least in regions of high rainfall ()
 - (d) Largest in coastal area ()
64. The chemical that is found to be most suitable as water evaporation inhibitor is
- (a) Ethyl alcohol ()
 - (b) Methyl alcohol ()
 - (c) Cethyl alcohol ()
 - (d) Butyl alcohol ()
65. Evaporation is confined
- (a) To daylight hours ()
 - (b) Night time only ()
 - (c) Land surfaces only ()
 - (d) One of these above ()
66. Interception losses
- (a) Include evaporation, through flow and stemflow ()
 - (b) Consists of only evaporation loss ()
 - (c) Includes evaporation and transpiration losses ()
 - (d) Consists of only stemflow ()
67. A hydrograph is a plot of
- (a) Rainfall intensity against time ()
 - (b) Stream discharge against time ()
 - (c) Cumulative rainfall against time ()
 - (d) Cumulative runoff against time ()
68. The rain freezes as it comes in contact with cold objects is known as
- (a) Drizzle ()
 - (b) Glaze ()
 - (c) Sleet ()
 - (d) Snow ()
69. An intermittent stream
- (a) Has water table above the stream bed throughout the year ()
 - (b) Has only flash flows in response to storms ()
 - (c) Does not have any contribution of ground water at any time ()

70. A geological formation which is essentially impermeable for flow of water even though it may contain water in its pores is called
- (a) Aquifer () (b) Aquifuge ()
(c) Aquitard () (d) Aquidud ()
70. The depression of water table in a well due to pumping is maximum at
- (a) A distance R from the well () (c) Close to the well ()
(b) A distance R/2 from the well () (d) None of these ()
72. An aquifer confined at the bottom but not at the top is called
- (a) Semiconfined aquifer () (c) Unconfined aquifer ()
(b) Unconfined aquifer () (d) Perdual aquifer ()
73. Mark the incorrect statement.
- The common mistakes with sloping roof catchment design for harvesting rainfall are
- (a) Gutters that are horizontal or sloping away from the tanks, when connected directly to ground level tanks ()
(b) Proper gradients for different roofs of the buildings not provided ()
(c) Downtake pipes leading to waste ()
(d) Only part of the roof being used ()
74. Rainwater is the softest naturally occurring water available, for all practical purposes with hardness of
- (a) Zero () (b) 10mg/l ()
(c) 15mg/l () (d) 20mg/l ()
75. Following the major rainfall, rainwater should not be consumed directly from the tank for the
- (a) first two days () (c) first five days ()
(b) first three days () (d) first ten days ()
76. In a counterfort type retaining wall
- (a) The vertical slab alone is designed as a continuous slab ()
(b) The heel slab alone is designed as a continuous slab ()
(c) The vertical and heel slabs are designed as continuous slabs ()
(d) The vertical slab is designed as continuous slab and the heel slab is designed as cantilever ()

77. In stability analysis, the term mobilised shear strength is referred to as
 (a) Shear strength () (c) Applied shear stress ()
 (b) M ()
78. As per IS-14458:1997, the factor of safety against sliding of retaining wall considering earthquake force is
 (a) > 1.5 () (b) > 1 ()
 (c) > 2 () (d) > 3 ()
79. As per IS-14458:1997, the depth of retaining wall and breast wall below ground level shall be at least
 (a) 600 mm () (b) 700 mm ()
 (c) 500 mm () (d) 400 mm ()
80. Identify the incorrect statement
 The stability of a slope is decreased by
 (a) Removal of a part of slope by excavation ()
 (b) Shock caused by an earthquake ()
 (c) Pore water pressure in the soil ()
 (d) Providing a beam at the toe ()
81. The base width of retaining wall of height 'h' is generally taken as
 (a) $0.8h$ () (b) $0.95h$ ()
 (c) $0.6h$ () (d) $0.3h$ ()
82. Gravity retaining wall which is constructed from interlocking precast concrete component is
 (a) Rivetment wall () (c) Toe wall ()
 (b) Crib wall () (d) Breast wall ()
83. The active earth pressure coefficient K_a generally refers to
 (a) Effective stresses () (c) Neutral stress ()
 (b) Total stresses ()
84. The active pressure caused by a cohesionless backfill on a smooth vertical retaining wall may be reduced by
 (a) Compacting the backfill ()
 (b) Providing a surcharge load on the backfill ()
 (c) Saturating the backfill with water ()
 (d) None of the above ()

85. If a uniform surcharge of 120 kN/m^2 is placed on the backfill with $\phi'=30^\circ$, the increase in pressure is
 (a) 12 kN/m^2 () (b) 30 kN/m^2 ()
 (c) 40 kN/m^2 () (d) 120 kN/m^2 ()
86. The minimum allowable factor of safety against sliding in the case of a cantilever retaining wall is
 (a) 2.00 () (b) 3.00 ()
 (c) 1.50 () (d) 2.50 ()
87. In the case of counterfort retaining wall, the toe slab acts as a
 (a) Cantilever () (c) Simply supported slab ()
 (b) Continuous slab () (d) None of above ()
88. The type of slope failure in which the failure surface passes below the toe is
 (a) Toe failure () (c) Slope failure ()
 (b) Base failure () (d) Transitional failure ()
89. For a base failure of slope, depth factor is
 (a) $D_f = 1$ () (b) $D_f < 1$ ()
 (c) $D_f > 1$ () (d) None of these ()
90. When the retaining wall tends to tilt forward
 (a) The earth pressure behind it is gradually reduced and the minimum value of the pressure will be the active pressure ()
 (b) The earth pressure behind it is gradually increased and the minimum value of the pressure will be the active pressure ()
 (c) The earth pressure behind it is gradually reduced and the minimum value of the pressure will be the passive pressure ()
 (d) The earth pressure behind it is gradually increased and the minimum value of the pressure will be the passive pressure ()
91. When an external load forces the retaining wall to move backwards
 (a) The soil will support the retaining wall, the earth pressure may rise to a limiting maximum value called passive pressure ()
 (b) The soil will not support the retaining wall, the earth pressure may be a minimum value ()
 (c) The soil will support the retaining wall, the earth pressure may be reduced to a minimum value ()
 (d) None of the above ()

92. If the back fill behind retaining wall is submerged under a high water table
- (a) The dynamic active earth pressure is increased ()
 - (b) The dynamic active earth pressure is decreased ()
 - (c) The dynamic active earth pressure is neither increased nor decreased ()
 - (d) There is no earth pressure ()
93. The method of slices is applicable to
- (a) Homogenous soil ()
 - (b) Stratified soil ()
 - (c) Saturated soil ()
 - (d) Non-uniform soil ()
94. The height of Random Rubble Dry Masonry Retaining wall should generally be
- (a) About 3.00 m ()
 - (b) About 4.00m ()
 - (c) About 5m ()
 - (d) About 6m ()
95. For safety against overturning of a retaining wall, the resultant force of the horizontal and vertical forces must pass through
- (a) The middle of the base of the wall ()
 - (b) Middle third of the base of the wall ()
 - (c) One-fourth of the base of the wall ()
 - (d) None of the above ()
96. Masonry or RCC structures supporting the uphill slopes along a road are termed
- (a) Crib walls ()
 - (b) Breast walls ()
 - (c) Retaining walls ()
 - (d) Toe walls ()
97. Choose the incorrect answer to the causes of land slide
- (a) Change in the slope gradient ()
 - (b) Surcharge ()
 - (c) Change in temperature ()
 - (d) Change in water content ()
98. Failure of a slope occurs only when total shear force is_____
- (a) Equal to total shearing strength ()
 - (b) Greater than total shearing strength ()
 - (c) Less than total shearing strength ()
 - (d) None of the above ()

99. As per IRC:SP:48-1998, Range of permissible slopes for Bed rocks cuts for sedimentary rocks (massive sand stones and limestones) is

Horizontal : Vertical

- (a) $\frac{1}{4} : 1$ to $\frac{1}{2} : 1$ () (b) $\frac{1}{3} : 1$ to $\frac{1}{2} : 1$ ()
(c) $\frac{1}{2} : 1$ to $\frac{3}{4} : 1$ () (d) $1:1$ to $\frac{1}{2} : 1$ ()

100. Which of the following statement is true

- (a) The friction circle method can be used for non-homogenous soil mass ()
(b) The stability members can be used for the analysis of purely cohesionless soil slope ()
(c) The factor of safety of an infinite slope of a cohesive soil depends upon the height of the slope ()
(d) None of these. ()