

# MIZORAM PUBLIC SERVICE COMMISSION

## TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO JUNIOR ENGINEER (J.E) UNDER PUBLIC HEALTH ENGINEERING AND PUBLIC WORKS DEPARTMENTS, APRIL, 2016

### CIVIL ENGINEERING PAPER - I

Time Allowed : 2 hours

Full Marks : 150

*Attempt all questions.*

*All questions carry equal marks of 2 each.*

- As per Indian Standards, the size of a modular brick with mortar is
  - 19cm × 9cm × 9cm
  - 20cm × 10cm × 10cm
  - 19cm × 19cm × 9cm
  - 20cm × 20cm × 10cm
- The most important purpose of providing frog in a brick is to
  - reduce weight of the brick
  - improve insulation by providing hollows
  - emboss manufacturer's name
  - to form a key for holding the mortar
- Which of the following is not one of the operations involved in manufacturing of clay brick?
  - Soiling
  - Weathering
  - Moulding
  - Blending
- Water absorption for Ist class bricks should not be more than
  - 12%
  - 15%
  - 20%
  - 25%
- The specific gravity of most stones lie between
  - 1.8 to 2.2
  - 2.5 to 3.0
  - 3.0 to 3.5
  - 3.5 to 4.5
- Which of the following stones has maximum % water absorption by volume?
  - Shale
  - Granite
  - Slate
  - Quartzite
- The age of trees can be predicted by
  - length of medulary rays
  - counting number of rings
  - measuring the diameter of pith
  - the thickness of bark
- Seasoning of timber is required to
  - soften the timber
  - harden the timber
  - straighten the timber
  - remove sap from the timber
- What is the time a timber may likely require for natural seasoning?
  - 20 months
  - 4 – 6 months
  - 1 year
  - 2 years

10. Plywood is specified by
  - (a) weight
  - (b) volume
  - (c) thickness
  - (d) number of layers
11. The most widely available type of Cement in Mizoram is
  - (a) White Cement
  - (b) Ordinary Portland Cement
  - (c) Portland Pozzolana Cement
  - (d) Rapid Hardening Cement
12. Which of the following aggregates gives maximum strength in concrete?
  - (a) Rounded aggregate
  - (b) Elongated aggregate
  - (c) Flaky aggregate
  - (d) Cubical aggregate
13. The maximum bulking of sand is likely to occur at a moisture content of
  - (a) 5%
  - (b) 8%
  - (c) 11%
  - (d) 14%
14. Plastics are examples of
  - (a) ceramic materials
  - (b) polymeric materials
  - (c) anhydrides
  - (d) elastomers
15. Distemper is used to coat
  - (a) external concrete surfaces
  - (b) compound walls
  - (c) interior surfaces not exposed to weather
  - (d) wood work
16. An undisturbed sample of soil has a volume of 50 cc and weighs 90 gm. On oven drying for 24 hours, the weight is reduced to 80 gm. Determine the water content.
  - (a) 11.11%
  - (b) 12.50%
  - (c) 20%
  - (d) 62.50%
17. An undisturbed sample of soil has a volume of 50 cc and weighs 95 gm. On oven drying for 24 hours, the weight is reduced to 80 gm. Determine the bulk density of the soil sample.
  - (a) 1.60 gm/cc
  - (b) 1.80 gm/cc
  - (c) 1.90 gm/cc
  - (d) 1.95 gm/cc
18. An undisturbed sample of soil has a volume of 50 cc and weighs 90 gm. On oven drying for 24 hours, the weight is reduced to 80 gm. Determine the dry density of the soil sample.
  - (a) 1.60 gm/cc
  - (b) 1.80 gm/cc
  - (c) 1.90 gm/cc
  - (d) 1.95 gm/cc
19. An undisturbed sample of soil has a volume of 50 cc and weighs 100 gm. On oven drying for 24 hours, the weight is reduced to 90 gm. If the Specific gravity of the soil is 2.70, determine the voids ratio of the sample.
  - (a) 0.45
  - (b) 0.50
  - (c) 0.60
  - (d) 0.80
20. Plastic limit is the water content corresponding to an arbitrary limit between the plastic and X states of consistency of a soil. Find the correct replacement for X.
  - (a) solid
  - (b) semi-solid
  - (c) liquid
  - (d) semi-liquid
21. When the plastic limit is equal to or greater than the liquid limit, the Y is reported as zero. Find the correct replacement for Y.
  - (a) liquid limit
  - (b) plastic limit
  - (c) plasticity index
  - (d) liquidity index

22. The liquidity index is defined as the ratio, expressed as a percentage, of the natural water content of a soil minus its  $Z$ , to its plasticity index. Find the correct replacement for  $Z$ .
- (a) liquid limit (b) plastic limit  
(c) plasticity index (d) liquidity index
23. The cgs unit for coefficient of permeability is
- (a) darcy (b) gm/sec  
(c) stoke (d) cm/sec
24. Which of the following methods is related to direct test for degree of compaction i.e field density of soils?
- (a) Plate Load Test (b) Modified Proctor Test  
(c) California Bearing Ratio (CBR) Test (d) LA Abrasion Test
25. The data available as a result of conducting Standard Proctor Test on a soil sample are as follows :
- |                       |      |      |      |      |      |      |
|-----------------------|------|------|------|------|------|------|
| Moisture Content :    | 0.08 | 0.09 | 0.10 | 0.12 | 0.14 | 0.16 |
| Dry density (gm/cc) : | 1.20 | 1.40 | 1.60 | 1.80 | 1.70 | 1.50 |
- Give the Optimum Moisture Content in percentage.
- (a) 9% (b) 10%  
(c) 12% (d) 14%
26. Rankine's Theory of Active Earth Pressure assumes that the resultant earth pressure acts at a height of  $X$  from the base. If  $h$  is the height of the retaining wall, then  $X$  is equal to
- (a)  $h$  (b)  $h/2$   
(c)  $h/3$  (d)  $h/4$
27. Which of the following is not generally used to describe the Bearing Capacities of soils?
- (a) Natural Bearing Capacity (b) Ultimate Bearing Capacity  
(c) Safe Bearing Capacity (d) Allowable Bearing Capacity
28. Which of the following is not generally used to describe the type of foundation of buildings?
- (a) Raft foundation (b) Spread foundation  
(c) Grillage foundation (d) Clamp foundation
29. Minimum depth of foundation is given by
- (a) Terzaghi's formula (b) Rankine's formula  
(c) Coulomb's formula (d) Darcy's formula
30. Which of the following is not an example of deep foundations?
- (a) Pile foundation (b) Pier foundation  
(c) Well foundation (d) Pad foundation
31. Identify the source of energy for the hydrological cycle.
- (a) Ocean (b) Sun  
(c) Water (d) Precipitation
32. Which of the following is not a form of precipitation?
- (a) Hail (b) Snow  
(c) Cloud (d) Dew

33. The portion of the precipitation which by a variety of paths above and below the surface of the earth reaches the stream channel is called
- (a) runoff (b) rainfall  
(c) infiltration (d) groundwater
34. Which of the following is not used to designate a rain-gauge?
- (a) Pluviometer (b) Ombrometer  
(c) Hyetometer (d) Hydrometer
35. The standard rain-gauge adopted in India is of
- (a) weighing bucket type (b) natural siphon type  
(c) tipping bucket type (d) telemetry type
36. Which of the following processes is treated as a 'loss' in engineering hydrology?
- (a) Infiltration (b) Precipitation  
(c) Percolation (d) Transpiration
37. The (i) interception process and (ii) the depression storage are together called
- (a) Primary loss (b) Initial loss  
(c) Evaporation loss (d) Permanent loss
38. Based on the time delay between the precipitation and the runoff, the runoff is classified into two categories; viz Base flow and
- (a) Groundwater runoff (b) Surface runoff  
(c) Direct runoff (d) Delayed runoff
39. A hydrograph is essentially a graph establishing the relation between the time of flow due to rainfall and
- (a) catchment area (b) discharge  
(c) velocity of flow (d) volume
40. A unit hydrograph is defined as the hydrograph of direct runoff resulting from one unit X of rainfall excess occurring uniformly over the basin at a uniform rate for a specified duration. Find the correct replacement for X.
- (a) depth (b) area  
(c) discharge (d) Volume
41. 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) aquiclude
42. An aquifer confined at the bottom but not at the top is called
- (a) semiconfined aquifer (b) unconfined aquifer  
(c) confined aquifer (d) perched aquifer
43. The level of water within its granular pores of soil or fissures of rock below which the pores of the host are saturated is known as
- (a) ground water (b) aquifer  
(c) aquiclude (d) water table

44. The most important parameters for optimum design of Settlement tanks in Rainwater harvesting Schemes are (i) Size of Catchment (ii) Rate of Recharge and (iii)
- (a) Discharge (b) Size of gutter  
(c) Intensity of Rainfall (d) Width of tank
45. X is of the systems that removes contamination and debris in a roof top rainwater harvesting scheme. Identify X.
- (a) Gutter (b) Leaf screen  
(c) Downspout (d) Cistern
46. Which of the following is an important parameter considered in Limit State Design of Serviceability?
- (a) Buckling (b) Collapse  
(c) Shear (d) Deflection
47. In Limit State Method of Design, the partial factor of safety for concrete is kept
- (a) more than that of steel (b) less than that of steel  
(c) equal to that of steel (d) equal to 1
48. For complete hydration of cement, the water cement ratio 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
49. Which of the following is true for a mid-span section of a simply supported concrete beam?
- (a) the top fibres are in tension (b) the bottom fibres are in tension  
(c) all fibres are in tension (d) all fibres are in compression
50. Which of the following is true for a near support section of a concrete cantilever beam?
- (a) the top fibres are in tension (b) the bottom fibres are in tension  
(c) all fibres are in tension (d) all fibres are in compression
51. What will be the shape of the Bending Moment Diagram for a simply supported concrete beam acted upon by a uniformly distributed dead and live loads of 5 KN/m throughout the whole span?
- (a) rectangular (b) triangular  
(c) circular (d) parabolic
52. Which of the following is true for an under reinforced concrete section?
- (a) concrete and steel reach maximum permissible stresses simultaneously  
(b) permissible stress is attained by the steel first  
(c) permissible stress is attained by the concrete first  
(d) maximum stress in concrete is more than the permissible stress
53. Identify the incorrect statement from the following :
- (a) Bending Moment is important for determining design depth of beams  
(b) Bending Moment is important for determining area of steel reinforcement  
(c) Steel is assumed to resist tensile stresses  
(d) Concrete is assumed to resist tensile stresses
54. Identify the incorrect statement from the following :
- (a) Bending Moment is maximum in a Cantilever beam at its end  
(b) No tensile or compressive stress exists at Neutral Axis  
(c) Neutral Axis of a balanced section is called Critical Neutral Axis  
(d) Permissible stress is attained by the Concrete first in over reinforced sections

55. Effective depth of a concrete beam is the distance from
- (a) top fibre to bottom fibre
  - (b) top fibre to neutral axis
  - (c) top fibre to reinforcing bar
  - (d) neutral axis to reinforcing bar
56. As per IS: 456 : 2000 the formula for Permissible loads, P on short concrete columns is given by  $P = \sigma_{cc} \cdot A_c + \sigma_{sc} \cdot A_{sc}$ . The term  $A_{sc}$  stands for
- (a) Cross-sectional area of longitudinal (concrete – steel)
  - (b) Cross-sectional area of longitudinal (concrete + steel)
  - (c) Cross-sectional area of longitudinal concrete
  - (d) Cross-sectional area of longitudinal steel
57. As per IS 3370 (Part I) : 2009, the minimum grade of concrete prescribed for RCC Water tanks larger than 50 cum capacity is
- (a) M20
  - (b) M25
  - (c) M30
  - (d) M35
58. As per IS 3370 (Part I) : 2009, the roofs of liquid retaining structures should be tested by flooding for 24 hours or more with water to a minimum depth of
- (a) 25 mm
  - (b) 30 mm
  - (c) 35 mm
  - (d) 40 mm
59. As per IS 3370 (Part 2) : 2009, the minimum reinforcement in RCC Water tank walls, floors, roofs in each of the two directions at right angles to each other can be reduced for tanks having any dimension not more than 15 m for deformed bars to
- (a) 0.18%
  - (b) 0.24%
  - (c) 0.30%
  - (d) 0.36%
60. As per IS 3370 (Part 2) : 2009, the bar spacing in reinforcement in RCC Water tanks should generally not exceed X or the thickness of the Section, whichever is less. Find the correct value of X.
- (a) 200 mm
  - (b) 250 mm
  - (c) 300 mm
  - (d) 350 mm
61. The failure of a mass of soil located beneath a slope is called
- (a) a slide
  - (b) a shear
  - (c) a seepage
  - (d) an overturning
62. Determination of Y along the sloping surface is an important process of slope stability analysis. Find the most appropriate replacement for Y.
- (a) shearing strength
  - (b) bearing capacity
  - (c) density
  - (d) soundness
63. Earth dams, embankments and cuts are examples of
- (a) infinite slopes
  - (b) finite slopes
  - (c) angular slopes
  - (d) tangential slopes
64. A road formation has been eroded by heavy rains. Remedial measures have to be taken immediately by construction of a masonry Z wall on the downstream side. Find the most appropriate replacement for Z.
- (a) Breast
  - (b) Toe
  - (c) Retaining
  - (d) Revetment

65. Maximum numbers of Retaining walls in Mizoram are constructed using  
(a) stone masonry (b) brick masonry  
(c) plain cement concrete (d) reinforced Cement Concrete
66. A properly designed Retaining Wall should be safe against (i) Overturning (ii) Sliding and (iii)  
(a) Compression (b) Tension  
(c) Flexure (d) Bending
67. As per Indian Standards, specified minimum thickness of Plain Cement Concrete at the base of stone masonry is  
(a) 75 mm (b) 100 mm  
(c) 150 mm (d) 200 mm
68. The most commonly adopted type of Stone Masonry in Mizoram is  
(a) Random Rubble Masonry (b) Coursed Rubble Masonry  
(c) Ashlar Masonry (d) Dry Rubble Masonry
69. Weep holes in Retaining Walls are meant primarily for  
(a) passing of air (b) easing of subsurface pressure  
(c) flow of water (d) foothold of masons
70. A stone masonry Retaining wall, of height 5.00 m, has to be constructed with a face slope of 1 : 4 (I H : 4 V). Determine the base thickness if the top thickness is 0.60 m.  
(a) 1.25 m (b) 1.65 m  
(c) 1.45 m (d) 1.85 m
71. As per CPWD Specification, the height of each course in a Regular Coursed Rubble Stone masonry (1<sup>st</sup> sort) shall not be less than  
(a) 15 cm (b) 20 cm  
(c) 25 cm (d) 30 cm
72. As per CPWD Specification, the height of each course in a Regular Coursed Rubble Stone masonry (1<sup>st</sup> sort) shall not be more than  
(a) 15 cm (b) 20 cm  
(c) 25 cm (d) 30 cm
73. As per CPWD Specification, the use of chips in hearting stones in a Regular Coursed Rubble Stone masonry (1<sup>st</sup> sort) shall not exceed X % of the quantity of stone masonry. Find the correct replacement for X.  
(a) 10 (b) 15  
(c) 20 (d) 25
74. As per CPWD Specification, no portion of the dressed surface of masonry stones in a Regular Coursed Rubble Stone masonry (1<sup>st</sup> sort) shall be at a distance more than Y mm from a straight edge placed on it. Find the correct replacement for Y.  
(a) 4 (b) 6  
(c) 8 (d) 10
75. As per CPWD Specification, the minimum period of curing by continuous wetting in a Regular Coursed Rubble Stone masonry (1<sup>st</sup> sort) shall be  
(a) 7 days (b) 14 days  
(c) 21 days (d) 28 days