

# MIZORAM PUBLIC SERVICE COMMISSION

## COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO LECTURER (CIVIL ENGINEERING) (CONTRACT) UNDER HIGHER & TECHNICAL EDUCATION DEPARTMENT, MARCH, 2017

### PAPER - III

Time Allowed : 2 hours

Full Marks : 200

*Attempt all questions.*

*All questions carry equal marks of 2 each.*

1. A soil sample has a unit weight of 1.9g/cc and water content of 12%. If the specific gravity of solids be 2.65, determine the dry density of soil
  - (a) 1.696 g/cc
  - (b) 1.926 g/cc
  - (c) 1.770 g/cc
  - (d) 1.56 g/cc
2. The angle of internal friction of round grained loose sand is about
  - (a) 5° to 25°
  - (b) 25° to 35°
  - (c) 30° to 35°
  - (d) 32° to 37°
3. Plasticity Index is
  - (a) LL- PL
  - (b) LL+ PL
  - (c) LL- SL
  - (d) PL- LL
4. The most accurate method for the determination of water content in the laboratory is
  - (a) Sand bath method
  - (b) Pycnometer method
  - (c) Calcium carbide method
  - (d) Oven drying method
5. As per International classification of soil, the hydrometer analysis is valid for the particle range of
  - (a) less than 0.0002mm
  - (b) between 0.2 mm to 0.0002 mm
  - (c) greater than 0.2 mm
  - (d) None of these
6. Co-efficient of permeability of soil varies approximately as
  - (a)  $D_{10}^2$
  - (b)  $\sqrt{D_{10}}$
  - (c)  $D_{10}^{2/3}$
  - (d)  $D_{10}^3$
7. Standard load of crushed aggregate for 2.5mm penetration in CBR test is
  - (a) 1360
  - (b) 1370
  - (c) 2000
  - (d) 1800

8. Plasticity Index is

(a)  $i_c = \frac{G+1}{1+e}$

(b)  $i_c = \frac{G+1}{1-e}$

(c)  $i_c = \frac{G+1}{1-e}$

(d)  $i_c = \frac{G-1}{1+e}$

9. The hydrostatic pressure on the phreatic line within a dam section is

(a) equal to atmospheric pressure

(b) less than atmospheric pressure

(c) greater than atmospheric pressure

(d) None of these

10. The plasticity characteristics of clay are due

(a) free water

(b) capillary water

(c) adsorbed water

(d) all of these

11. The weakest bond in soil is

(a) Hydrogen bond

(b) Covalend bond

(c) Secondary valence bond

(d) Tertiary bond

12. Honeycomb structure is found in

(a) Clay

(b) Coarse sand

(c) Gravel

(d) Fine Sands and silts

13. The behavior of clay is governed by

(a) Mass energy

(b) Surface Energy

(c) present of water

(d) capillary action

14. Using Mohr's diagram, the relation between major principle stress,  $\sigma_1$  and minor principal stress,  $\sigma_3$  and shear parameter (C) and  $\phi$  is given by

$\sigma_1 = \sigma_3 N \phi + 2C \sqrt{N \phi}$  where  $N \phi$  is equal to

(a)  $\frac{\sin \phi}{1 + \sin \phi}$

(b)  $\frac{\sin \phi}{1 - \sin \phi}$

(c)  $\frac{1 - \sin \phi}{1 + \sin \phi}$

(d)  $\frac{1 + \sin \phi}{1 - \sin \phi}$

15. Allowable bearing pressure for a foundation depends upon

(a) Allowable settlement only

(b) ultimate bearing capacity of soil only

(c) both allowable settlement and ultimate bearing capacity

(d) None of these

16. The Phreatic line in a homogenous dam is
- (a) Circular (b) Elliptical  
(c) Hyperbolic (d) Parabolic
17. Quick sand is
- (a) a type of sand  
(b) a condition in which a cohesive soil loses its strength  
(c) a condition in which a cohesion less soil, its strength because of upward flow of water.  
(d) None of these
18. Undisturbed soil samples are required for conducting
- (a) Consolidation Test (b) Hydrometer  
(c) Shrinkage Limit Test (d) Specific Gravity Test
19. Consolidation time of a soil sample
- (a) increase with a decrease in permeability  
(b) increase with increase in compressibility  
(c) increase with a decrease in unit weight of water  
(d) None of these
20. For lowering the water table by about 10m, the following method is generally the most suitable
- (a) Electro-osmosis (b) Well point method  
(c) Shallow well system (d) Deep well points
21. The maximum and minimum particle size of sand as per IS, classification are
- (a) 4.75mm and 0.0075mm (b) 2.00mm and 0.06mm  
(c) 2.0mm and 0.075mm (d) 4.75mm and 0.6 mm
22. The factor of safety of the slope against sliding due to shear is given by
- (a)  $\frac{\tau_f}{\tau}$  (b)  $\tau_f \cos i$   
(c)  $\sigma_z \sin i$  (d) All of these
- Where  $\tau$  = shear stress,  $\tau_f$  = shear strength,  $\sigma_z$  = vertical stress and  $i$  = slope angle
23. Terzaghi equation of ultimate bearing capacity for strip footing may be used for square footing resting on pure clay soil with correction factor
- (a) 0.4 (b) 0.6  
(c) 1.2 (d) 1.3

24. The permeability of a given soil is
- directly proportional to the average grain size
  - directly proportional to the square of the average grain size
  - inversely proportional to the square of the average grain size
  - inverely proportional to the average grain size
25. Dupit's theory is used to find
- the co-efficient of permeability of soil
  - shear strength of soil
  - liquid limit of soil
  - settlement of soil
26. Darcy's law is valid only if
- the flow is laminar
  - the flow is turbulent
  - the flow is due to water
  - the flow is intermittent
27. Stability of an infinite slope is lowest for
- Partially saturated soil
  - Dry soil
  - Seepage parallel slope
  - Horizontal seepage
28. Match List I (Investigator) with List II (Equation) and select the correct answer using the codes given below the lists

	List I		List II
A	Skempton	1	$V=Ki$
B	Coulomb	2	$\sigma' = \sigma_u$
C	Stokes	3	$v = \frac{D^2(r_s - r_w)}{18\eta}$
D	Terzaghi	4	$S = C + \sigma \tan \phi$
		5	$u = 13 [(\sigma_3 + A(\sigma_1 - \sigma_3))]$

Codes

- |   |   |   |   |
|---|---|---|---|
| A | B | C | D |
| 4 | 5 | 3 | 2 |
- |   |   |   |   |
|---|---|---|---|
| A | B | C | D |
| 5 | 4 | 3 | 2 |
- |   |   |   |   |
|---|---|---|---|
| A | B | C | D |
| 4 | 5 | 1 | 3 |
- |   |   |   |   |
|---|---|---|---|
| A | B | C | D |
| 5 | 4 | 2 | 2 |

29. In a shear box test, the failure plane is
- (a) weakest plane
  - (b) horizontal plane
  - (c) vertical plane
  - (d) major principal plane
30. A foundation is said to be shallow, if
- (a) width of the foundation is more than depth of foundation
  - (b) width of the foundation is equal to depth of foundation
  - (c) width of the foundation is two time to depth of foundation
  - (d) width of the foundation is three time to depth of foundation
31. Compaction of soil is measured in terms of
- (a) specific gravity
  - (b) compressibility
  - (c) permeability
  - (d) dry density
32. Coulomb's wedge theory assumes that
- (a) back fill is dry, cohesionless, homogenous and isotropic
  - (b) slip surface is the plane which passes through the heel of the wall
  - (c) sliding wedge itself acts as a rigid body and the value of earth pressure is obtained by considering the limiting equilibrium of the wedge
  - (d) all the above
33. A soil not fully consolidated under the existing overburden pressure, is called
- (a) pre consolidated
  - (b) normally consolidated
  - (c) over consolidated
  - (d) none of these
34. According to Rankine's formula, the minimum depth of foundation
- (a)  $h = \frac{P}{W} \left( \frac{1 - \sin \phi}{1 + \sin \phi} \right)^2$
  - (b)  $h = \frac{w}{P} \left( \frac{1 - \sin \phi}{1 + \sin \phi} \right)^2$
  - (c)  $h = \frac{p}{w} \left( \frac{1 - \sin \phi}{1 + \tan \phi} \right)^2$
  - (d)  $h = \frac{P}{w} \left( \frac{1 - \tan \phi}{1 + \tan \phi} \right)^2$
35. Offsets are
- (a) lateral measurements made with respect to main survey lines
  - (b) perpendiculars erected from chain lines
  - (c) taken to avoid unnecessary walking between stations
  - (d) all of these

36. A 30m metric chain is found to be 0.1m short throughout the measurement. If the distance measured is recorded as 300m, then the actual distance measured will be
- (a) 200 m (b) 299 m  
(c) 300 (d) 301 m
37. For locating an inaccessible point with the help of only a Plane table, one should use
- (a) resection (b) radiation  
(c) intersection (d) traversing
38. During the mid day, the rigid pavement slab is
- (a) warping down (b) warping up  
(c) crack (d) none of these
39. A scale of 1 inch = 50ft is mentioned in the map, what is the corresponding equivalent scale?
- (a) 1 cm = 5 m (b) 1 cm = 10 m  
(c) 1 cm = 7 m (d) 1 cm = 6 m
40. For setting out right angles, the instrument used is
- (a) Optical square (b) Abney level  
(c) Alidade (d) Ceylon ghat tracer
41. The line of joining the points of equal altitude is called
- (a) horizontal line (b) contour interval  
(c) contour (d) vertical line
42. The first reading made with the staff on a point of reduced level is called
- (a) fore sight (b) back sight  
(c) intermediate sight (d) reduced level
43. Removal of parallax may be achieved by focusing
- (a) the objective (b) the eye piece  
(c) the objective and the eye piece (d) all the above
44. If the whole Circle Bearing of a line is  $270^{\circ}$ , its reduced bearing is
- (a)  $N90^{\circ}W$  (b)  $N90^{\circ}$   
(c)  $W90^{\circ}$  (d)  $N90^{\circ}S$
45. A well conditioned triangle has no angle less than
- (a)  $20^{\circ}$  (b)  $30^{\circ}$   
(c)  $45^{\circ}$  (d)  $60^{\circ}$
46. The back staff reading on a B.M of R.L 500.00 m is 2.685 m. If foresight reading on a point is

1.345m, the reduced level of the point is

- (a) 502.685m (b) 501.345m  
(c) 501.340m (d) 502.585m

47. For the construction of highway(railway)

- (a) longitudinal sections are required  
(b) cross sections are required  
(c) both longitudinal and cross sections are required  
(d) none of these

48. Two contour lines, having the same elevation

- (a) cannot cross each other (b) can cross each other  
(c) cannot unite together (d) can unite together

49. The curve composed of two arcs of different radii having their centres on the opposite side of the curve, is known

- (a) a reverse curve (b) a compound curve  
(c) a simple curve (d) a vertical curve

50. If  $\Delta$  is the angle of deflection of a simple curve of radius R, the length of the curve is:

- (a)  $\frac{\pi R \Delta}{90^\circ}$  (b)  $\frac{\pi R \Delta}{180^\circ}$   
(c)  $\frac{\pi R \Delta}{270^\circ}$  (d)  $\frac{\pi R \Delta}{360^\circ}$

51. An ideal transition curve is

- (a) cubic parabola (b) cubic spiral  
(c) clothoid spiral (d) true spiral

52. With usual notations, the expression  $\frac{V^2}{gR}$  represents

- (a) centrifugal force (b) centripetal force  
(c) superelevation (d) radial acceleration.

53. Cross staff is used for

- (a) setting out right angles (b) measuring contour gradient  
(c) taking levels (d) measuring distances

54. Reaction time of driver

- (a) decrease with increase in speed (b) increase with increase in speed  
(c) is same for all speeds (d) None of these

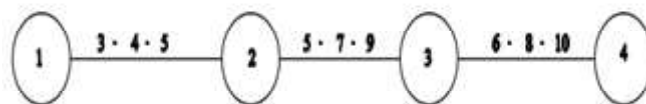
55. Grade compensation is not necessary for gradients flatter than  
(a) 1% (b) 5.5%  
(c) 3% (d) 4%
56. For a comfortable travel on highways, the centrifugal ratio should not exceed  
(a) 0.15 (b) 0.25  
(c) 0.20 (d) 0.30
57. The maximum width of a vehicle as recommended by IRC is  
(a) 1.85 m (b) 4.72 m  
(c) 3.81m (d) 2.44 m
58. The thickness of bituminous carpet varies from  
(a) 50 to 75 mm (b) 75 to 100mm  
(c) 20 to 25mm (d) 100 to 120mm
59. On the recommendations of IRC, the ruling gradient in mountainous terrain  
(a) 1 in 20 (b) 1 in 30  
(c) 1 in 40 (d) 1 in 25
60. If  $V$  is the design speed of vehicles in km/hr, the change of radial acceleration in metre/sec<sup>3</sup>  
(a)  $\frac{65}{70+V}$  (b)  $\frac{70}{60+V}$   
(c)  $\frac{80}{75+V}$  (d)  $\frac{80}{60+V}$
61. If the stopping distance is 60 metres, then the minimum stopping sight distance for two lane, two way traffic is  
(a) 60m (b) 30m  
(c) 120 m (d) 170m
62. Due to change in price level, a revised estimate is prepared if the sanctioned estimate exceeds  
(a) 2.0% (b) 2.5%  
(c) 4% (d) 5%
63. The diameter of a domestic sewer pipe laid at a gradient 1 in 100 is recommended  
(a) 100 mm (b) 150 mm  
(c) 200 mm (d) 175 mm



64. For 12mm thick cement plastering 1:6 on 100 sq.m new brick work, the quantity of cement required is
- (a) 0.200 m<sup>3</sup> (b) 0.247 m<sup>3</sup>  
(c) 0.274 m<sup>3</sup> (d) 0.295 m<sup>3</sup>
65. For 100 sq.m cement concrete (1:2:4) 4 cm thick floor, the quantity of cement required is
- (a) 0.90 m<sup>3</sup> (b) 0.94 m<sup>3</sup>  
(c) 0.98 m<sup>3</sup> (d) 1.0 m<sup>3</sup>
66. The thickness design of the pavement, is decided on the load carried by
- (a) main gears (b) nose wheel  
(c) tail wheel (d) All of the above
67. The depressions and undulations in the pavement, are caused due to
- (a) improper compaction of subgrade (b) impact of heavy wheel loads  
(c) punching effect (d) all the above
68. The height of the pilot's eye above the runway surface is assumed
- (a) 1m (b) 3m  
(c) 4m (d) 5m
69. The runway orientation is made so that landing and take off are
- (a) against the wind direction  
(b) along the wind direction  
(c) perpendicular to wind direction  
(d) All of the above
70. For night landing, the threshold are lighted
- (a) green (b) red  
(c) white (d) yellow
71. On Indian railways standard length of rails for B.G track is
- (a) 12.8m (b) 10.97m  
(c) 11.89m (d) 10.06m
72. Coning of wheels is provided at
- (a) to check lateral movement of the wheels  
(b) to avoid damage to inner faces of rails  
(c) to avoid discomfort to passengers  
(d) All of the above

73. Track construction involves preparation of
- (a) subgrade
  - (b) plate laying
  - (c) ballasting
  - (d) All of the above
74. Shaft provides
- (a) Ventilation
  - (b) Work front
  - (c) transfer centre line to inside the tunnel
  - (d) All of the above
75. Forepoling method is generally adopted for tunneling in
- (a) soft ground
  - (b) firm ground
  - (c) running ground
  - (d) none of these
76. The method of draining in the tunnels is generally known as:
- (a) pre- drainage
  - (b) dewatering
  - (c) permanent drainage
  - (d) all of the above
77. The purpose of cross- drainage is
- (a) to divert the hill side water to valley side
  - (b) to provide side drain
  - (c) to make the drainage stable
  - (d) all the above
78. Extended breathing of the silica dust while tunneling causes a dangerous lungs disease known as
- (a) Influenza
  - (b) Asthma
  - (c) Septicimia
  - (d) Silicosis
79. The best section for resisting external or internal forces in tunnel is:
- (a) 'D' section
  - (b) Circular section
  - (c) Egg –shaped section
  - (d) Horse shoe section
80. Afflux is
- (a) Freeboard
  - (b) Vertical clearance
  - (c) Rise of water level
  - (d) Scour
81. Scour occurs when
- (a) Velocity of the stream exceeds than limiting velocity
  - (b) Velocity of the stream is lower than limiting velocity
  - (c) Velocity of the stream is equal to limiting velocity
  - (d) All the above

82. For most economic span, the cost of superstructure equals
- (a) cost of wing wall (b) cost of substructure  
(c) cost of approach slab (d) none of the above
83. Which one of the following methods is generally adopted for tunneling in firm ground
- (a) Full face method (b) Top heading and benching method  
(c) Drift method (d) All of the above
84. Site order book is used for recording
- (a) instructions by the executive engineers  
(b) construction measurements  
(c) issue of store equipments  
(d) names of the casual labour
85. Various activities of a project, are shown on bar charts by
- (a) vertical lines (b) horizontal lines  
(c) dots (d) crosses
86. The performance of a specific task in CPM, is known as
- (a) Dummy (b) Event  
(c) Activity (d) Contract
87. The three times estimates for the activities of the network shown in the figure are shown above their arrows, The earliest expected time for the event 4 is



- (a) 19 (b) 14  
(c) 24 (d) All of the above
88. The maximum permissible differential settlement, in case of foundations in clayey soil, is usually limited to
- (a) 10 mm (b) 20 mm  
(c) 30 mm (d) 40 mm
89. Pile foundations are suitable for
- (a) water logged soils (b) soft rocks  
(c) compact soils (d) multi-storey buildings

90. Dampness causes
- (a) Efflorescence
  - (b) bleaching of paints
  - (c) crumbling of plaster
  - (d) growth of termites
91. Building houses along the routes of communications radiating from a human settlement is
- (a) ribbon development
  - (b) economic development
  - (c) agriculture development
  - (d) social development
92. The strip of land acquired and reserved for construction and future development of road is
- (a) shoulder
  - (b) formation width
  - (c) right of way
  - (d) setback
93. Island is provided at
- (a) intersection
  - (b) shoulder
  - (c) culvert
  - (d) retaining wall
94. Formation width of two lane pavement is
- (a) 7.5m
  - (b) 7m
  - (c) 12m
  - (d) 9m
95. The rise or fall of elevation along the alignment is
- (a) gradient
  - (b) camber
  - (c) cross fall
  - (d) none of these
96. Tar is obtained by the destructive distillation of:
- (a) Gold
  - (b) Coal
  - (c) Charcoal
  - (d) None of these
97. Flexible pavement is having
- (a) grain to grain pressure distribution
  - (b) slab action
  - (c) high flexural strength
  - (d) liquid limit
98. The ruling gradients for mountainous terrain :
- (a) 1 in 30
  - (b) 1 in 40
  - (c) 1 in 20
  - (d) None of the above
99. The rear wheels of vehicle do not follow the same path as that of the front wheels is called as:
- (a) Horizontal plane
  - (b) braking distance
  - (c) off tracking
  - (d) None of these
100. CBR is
- (a) Shear test
  - (b) Penetration test
  - (c) Bearing test
  - (d) Flexural test