

MIZORAM PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATIONS FOR JUNIOR GRADE OF M.E.S.
UNDER POWER & ELECTRICITY DEPARTMENT, AUGUST, 2018.

CIVIL ENGINEERING
PAPER - III

Time Allowed : 3 hours

FM : 200

SECTION - A (Multiple Choice questions)

(100 Marks)

All questions carry equal mark of 2 each. Attempt all questions.

*This Section should be answered only on the **OMR Response Sheet** provided.*

1. Shear strength of a soil
 - (a) Is directly proportional to the angle of internal friction of the soil
 - (b) Is inversely proportional to the angle of internal friction of the soil
 - (c) Decreases with increase normal stress
 - (d) Decreases with decrease normal stress
2. The uniformity coefficient of a soil is defined as the ratio of
 - (a) D_{40} to D_{10}
 - (b) D_{40} to D_{20}
 - (c) D_{50} to D_{10}
 - (d) D_{60} to D_{10}
3. The Terzaghi's general bearing capacity equation for a continuous footing is given by
 - (a) $qf = cNc + \gamma DNq + 0.5\gamma BN\gamma$
 - (b) $qf = cNc - \gamma DNq + 0.5\gamma BN\gamma$
 - (c) $qf = cNc + \gamma DNq - 0.5\gamma BN\gamma$
 - (d) None of these
4. Rankine's theory of active earth pressure assumes
 - (a) Soil mass is homogenous, dry and cohesionless
 - (b) Ground surface is plane which may be horizontal or inclined
 - (c) Back of the wall is vertical and smooth
 - (d) All of these
5. For testing a saturated clay for shear strength, the test recommended is
 - (a) Direct shear test
 - (b) Triaxial compression test
 - (c) Unconfined compression test
 - (d) All the above
6. When the plastic limit of a soil is greater than the liquid limit, then the plasticity index is reported as
 - (a) Negative
 - (b) Zero
 - (c) Non-Plastic
 - (d) 1
7. The ratio of volume of air voids to the volume of total voids is known as,
 - (a) Air content
 - (b) Percentage of air voids
 - (c) Percentage voids
 - (d) Porosity

8. Which of the following soil has more plasticity index
 - (a) Gravel
 - (b) Sand
 - (c) Silt
 - (d) Clay
9. A soil sample whose particles are of nearly same size is termed as
 - (a) Uniformly graded
 - (b) Well graded
 - (c) Poorly graded
 - (d) Gap graded
10. The soils most susceptible to liquefaction are
 - (a) Saturated dense sands
 - (b) Saturated fine and medium sands of uniform particle
 - (c) Saturated clays of uniform size
 - (d) Saturated gravels and cobbles
11. During the seepage through soil, the direction of seepage is
 - (a) Parallel to the equilibrium lines
 - (b) Perpendicular to the stream lines
 - (c) Perpendicular to the equipotential lines
 - (d) Along the gravity
12. The property of a soil which allows it to be deformed rapidly without rupture, elastic rebound and also volume change is known as
 - (a) Porosity
 - (b) Plasticity
 - (c) Permeability
 - (d) Ductility
13. Surveys which are carried out to depict mountains, rivers, water bodies, wooded areas and other cultural details are known as
 - (a) Cadastral surveying
 - (b) Geodetic surveying
 - (c) Topographical surveying
 - (d) Plane survey
14. Contour interval is
 - (a) The vertical distance between two consecutive contours
 - (b) The horizontal distance between two consecutive contours
 - (c) The vertical distance between two points on same contours
 - (d) The horizontal distance between two points on same contours
15. The smaller horizontal angle between the true meridian and a survey line is known as
 - (a) Declination
 - (b) Azimuth
 - (c) Dip
 - (d) Bearing
16. Bowditch rule is applied to
 - (a) An open traverse for graphical adjustment
 - (b) A closed traversed for adjustment of closing error
 - (c) Determine the effect of local attraction
 - (d) None of these
17. Planimeter is used for measuring
 - (a) Volume
 - (b) Area
 - (c) Contour gradient
 - (d) Slope angle
18. Remote sensing techniques are being usefully employed for the purpose of
 - (a) Improving natural resource management
 - (b) Land use
 - (c) Protection of environment
 - (d) All of these

19. The curve composed of two arcs of different radii having their centres on the opposite side of the curve, is known as
- (a) A simple curve
 - (b) A compound curve
 - (c) A reverse curve
 - (d) A vertical curve
20. A correction for sagging during chain surveying is
- (a) Always additive
 - (b) Always subtractive
 - (c) Always zero
 - (d) Sometimes additive or subtractive
21. The rise and fall method of surveying using theodolite is
- (a) Less accurate than height of instrument method
 - (b) Is not suitable for levelling with tilting levels
 - (c) Provides a check on the reduction of intermediate point levels
 - (d) Quicker and less tedious for large number of intermediate sights
22. The projection of a traverse line on a line perpendicular to the meridian is known as
- (a) Latitude of the line
 - (b) Departure of the line
 - (c) Bearing of the line
 - (d) Co-ordinate of the line
23. Which of the following methods of plane table surveying is used to locate the position of an inaccessible point?
- (a) Intersection
 - (b) Radiation
 - (c) Resection
 - (d) Traversing
24. When the bituminous surfacing is done on already existing black top road or over existing cement concrete road, the type of treatment given is
- (a) Seal coat
 - (b) Tack coat
 - (c) Prime coat
 - (d) Spray of emulsion
25. The drains which is provided parallel to roadway to intercept and divert the water from hill slopes is known as
- (a) Sloping drain
 - (b) Catch-water drain
 - (c) Side drain
 - (d) Cross drain
26. The advantage of providing super-elevation on road is
- (a) Higher speed of vehicle
 - (b) Reduced maintenance cost of the roads
 - (c) Draining off rainwater quickly
 - (d) All of these
27. The distance travelled by a moving vehicle during perception and brake reaction times, is known as
- (a) Sight distance
 - (b) Stopping distance
 - (c) Lag distance
 - (d) None of these
28. Stability of hill slope depends on
- (a) Angle of slope
 - (b) Geological condition
 - (c) Groundwater conditions
 - (d) All of these
29. Horizontal curves on highways are provided
- (a) To break the monotony of driving
 - (b) To discourage the tendency to increase speed
 - (c) To decrease the mental strain on drivers
 - (d) All of these

30. The safe stopping distance may be calculated from the equation

(a) $D = 0.278Vt + \frac{V^2}{254f}$

(b) $D = 0.254Vt + \frac{V^2}{278f}$

(c) $D = 0.254Vt + \frac{V^2}{225f}$

(d) $D = 0.225Vt + \frac{V^2}{254f}$

31. Penetration test on bitumen is used for determining its

(a) Grade

(b) Viscosity

(c) Ductility

(d) Temperature susceptibility

32. The suitable gradient within which the engineer must endeavour to design the road is called

(a) Limiting gradient

(b) Ruling gradient

(c) Average gradient

(d) exceptional gradient

33. In construction management PERT technique of network analysis is mainly useful for

(a) Small project

(b) Large and complex project

(c) Deterministic activity

(d) Research and Development project

34. Free float for any activity is defined as the difference between

(a) Its earliest finish time and earliest start time for its successive activity

(b) Its latest start time and earliest start time

(c) Its latest finish time and earliest start time for its successive activity

(d) Its earliest finish time and latest start time for its successive activity

35. The time with which direct cost does not reduce with the increase in time is known as

(a) Crash time

(b) Normal time

(c) Optimistic time

(d) Standard time

36. Site order book is used for recording

(a) Instruction of the executive engineer

(b) Construction measurements

(c) Requisition of plants and equipment

(d) Indents for materials to be ordered.

37. Which one of the following is not excavating and moving type equipment?

(a) Bulldozer

(b) Clam shell

(c) Scraper

(d) Dump truck

38. Batching refers to

(a) Controlling the total quantity at each batch

(b) Weighing accurately, the quantity of each material for a job before mixing

(c) Controlling the quantity of each material into each batch

(d) Adjusting the water to be added in each batch according to the moisture content of materials being mixed in the batch.

39. A Gantt chart indicates

(a) Comparison of actual process with the scheduled progress

(b) Cost of the project

(c) Balance of work to be done

(d) Efficiency of project work

40. Which of the following does not represent activity?
(a) Site located (b) Foundation is being dug
(c) Office area is being cleaned (d) Invitation are being sent
41. Slack time refers to
(a) An activity (b) An event
(c) Both activity and event (d) None of these
42. Which of the following R.C. retaining walls is suitable for heights beyond 6 m?
(a) L shaped wall (b) T shaped wall
(c) Counterfort type (d) All of these
43. For the design of retaining walls, the minimum factor of safety against overturning is
(a) 1.5 (b) 2.0
(c) 2.5 (d) 3.0
44. The type of roof which slopes in two directions with a break in the slope on each side is known as
(a) Gable roof (b) Hip roof
(c) Mansard (d) Gambrel roof
45. The type of foundation which is most suitable for bridge
(a) Pier foundation (b) Raft foundation
(c) Pile foundation (d) Strap foundation
46. The piles which supports the load due to friction between pile face and surrounding soil, is generally known as
(a) Bearing piles (b) Friction piles
(c) Batter piles (d) Compaction piles
47. The most commonly used material for damp proofing is
(a) Bitumen (b) Paraffin wax
(c) Cement solution (d) Cement concrete
48. The type of bond in a brick masonry containing alternate courses of stretchers and headers is called
(a) Flemish bond (b) English bond
(c) Strecher bond (d) Header bond
49. The higher water cement ratio in concrete results in
(a) Better workable mix (b) Strong mix
(c) Weak mixed (d) Less bleeding
50. Weep holes are provided in retaining and breast walls
(a) To drain off the water from the filling
(b) To ventilate the stone masonry
(c) To add architectural beauty
(d) All of these

SECTION - B (Short answer type question)
(100 Marks)

All questions carry equal marks of 5 each.

This Section should be answered only on the Answer Sheet provided.

1. What are the assumptions involved in Terzaghi's general theory for bearing capacity under a strip footing?
2. A soil sample with void ratio 0.73 and specific gravity of 2.7 is collected from the site. If the voids are 92% saturated with water, find the bulk density, and dry density and water content. What would be content for complete saturation if the void ratio remain same.
3. Using Terzaghi's theory find the ultimate bearing capacity for a square footing of 2.0m x 2.0m placed at a depth of 1.2 m below the ground on a pure cohesive soil having a density of 18 kN/m³, $N_c = 5.7$. Use local shear failure conditions $C = 40$ kN/m².
4. Explain and discuss the used of Liquidity Index and Activity Number in geotechnical engineering.
5. Briefly explain the classification of piles based on its use.
6. Briefly explain the principal of Electronic distance measurement (EDM) with suitable example.
7. Discuss tacheometric surveying with its advantages.
8. Surveying was performed to find the reduced level (RL) at top of the antenna which was erected on the building. The vertical angles to the bottom and top of antenna were measured using theodolite as 7° and 10° respectively. A horizontal staffs reading 1.245 m was taken at benchmark of 100.00 m.
9. In a proposed reservoir, the areas containing within the contours are

| | | | | | | | | |
|--|-----|----|----|----|----|----|----|----|
| Contour (m) | 100 | 95 | 90 | 85 | 80 | 75 | 70 | 65 |
| Area (10 ⁴ m ²) | 32 | 26 | 24 | 18 | 15 | 13 | 7 | 2 |

Calculate the capacity of the reservoir when it is full at 100 m level.

10. The driver of a vehicle travelling 60 kmph up a grade requires 9 m less to stop after he applies the brake than a driver travelling at the same initial speed down the same grade. If the coefficient of friction between the tyres and the pavement is 0.4, what is the percent grade?
11. The depth of the clay layer is 3 m thickness. The time factor for a particular degree of consolidation is 0.15. The time required to get that degree of consolidation is 2 years. Find the coefficient of consolidation considering single drainage?
12. Differentiate between Prime coat and Tack coat.
13. Briefly describe CBR method of designing pavement.
14. Write a note on track ballast. How the ballast depth is recommended.
15. Why origin and destination studies is conducted for a road?
16. What are the functions and ideal requirements of railway sleeper?
17. Lists out the various factors to be considered for potential site selection for a civilian Airport.
18. Explain the difference between pre-tensioning and post-tensioning.
19. Define 'slack'. What does negative slack indicate in PERT network analysis?
20. Explain the term resource levelling.