MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO ASSISTANT ENGINEERING (CIVIL) CONTRACT BASIS UNDER TRADE AND COMMERCE DEPARTMENT, JULY 2016.

CIVIL ENGINEERING
PAPER - III

Time Allowed : 3 hours   Full Marks : 200

PART - A

(Objective Type Questions (100 Marks)

All questions carry equal marks of 2 each.

Attempt all questions.

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

1. The soil which contains finest grain particles is
  (a) coarse sand
  (b) fine sand
  (c) silt
  (d) clay

2. The ratio of the volume of voids to the total volume of the given soil mass is known as
  (a) porosity
  (b) specific gravity
  (c) void ratio
  (d) water content

3. The ratio of the volume of water present in a given soil mass to the total volume of its voids is known as
  (a) porosity
  (b) void ratio
  (c) degree of saturation
  (d) water content

4. Accurate determination of water content is made by
  (a) calcium carbide method
  (b) sand bath method
  (c) alcohol method
  (d) oven-drying method

5. The liquid and plastic limits exist in
  (a) sandy soils
  (b) clayey soils
  (c) silty soils
  (d) all of these

6. You are given a sample of soil containing coarse grain to determine its water content. You will use
  (a) Pycnometer
  (b) oven-drying method
  (c) calcium carbide method
  (d) alcohol method

7. Plasticity index is defined as the range of water content between
  (a) liquid limit and plastic limit
  (b) plastic limit and semi-solid limit
  (c) liquid limit and solid limit
  (d) semi-solid limit and liquid limit

8. Darcy's law is applicable to seepage if a soil is
   (a) isotropic
   (b) incompressible
   (c) homogeneous
   (d) all of these

9. The test recommended for testing the shear strength of a saturated clay is
   (a) direct shear test
   (b) unconfined compression test
   (c) triaxial compression test
   (d) all of these

10. For slopes of limited extent, the surface of slippage is usually along
    (a) a parabolic arc
    (b) an elliptical arc
    (c) a circular arc
    (d) a straight line

11. The main principle of surveying is to work from
    (a) part to the whole
    (b) whole to the part
    (c) higher to the lower level
    (d) lower to the higher level

12. Short offsets are measured with
    (a) an ordinary chain
    (b) a metallic tape
    (c) a steel tape
    (d) an invar tape

13. Closed contours of decreasing values towards their centre represent a
    (a) hill
    (b) depression
    (c) saddle or pass
    (d) river bed

14. The Fore Bearing of a line AB in the Whole Circle Bearing System is 137º38'. What will be its Fore Bearing in the Quadrantal Bearing System?
    (a) S 42º22' W
    (b) S 47º38' E
    (c) S 42º22' E
    (d) S 47º38' W

15. The angle between the observer's meridian and the declination circle of the celestial body is known as the
    (a) polar distance
    (b) azimuth
    (c) right ascension
    (d) hour angle

16. Number of links per metre length of a chain are
    (a) 4
    (b) 5
    (c) 6
    (d) 10

17. In chain surveying, perpendiculars to the chain line are set out by
    (a) a theodolite
    (b) a prismatic compass
    (c) a level
    (d) an optical square

18. The great circle of the earth, the plane of which is perpendicular to its axis of rotation is known as the
    (a) terrestrial equator
    (b) celestial equator
    (c) celestial sphere
    (d) celestial horizon

19. Which of the following items of work is not included in the plinth area estimate?
    (a) Wall thickness
    (b) Water Closet area
    (c) Courtyard area
    (d) Verandah area

20. Half brick wall is measured in

    (a) metre   (b) square metre

    (c) cubic metre   (d) number

21. The full width of land acquired before finalizing a highway is known as

    (a) formation width   (b) right of way

    (c) carriage way   (d) roadway

22. The formation width of a road in plain areas means the width of

    (a) carriageway   (b) embankment at ground level

    (c) pavement and shoulders   (d) embankment at the top level

23. The steepest gradient permitted on roads which, in ordinary conditions, must not be exceeded is known as

    (a) ruling gradient   (b) exceptional gradient

    (c) maximum gradient   (d) floating gradient

24. The shape of a vertical curve is

    (a) parabolic   (b) elliptical

    (c) circular   (d) spiral

25. The convexity provided to the carriageway between the crown and the edge of pavement is known as

    (a) super –elevation   (b) camber

    (c) transverse gradient   (d) vertical curve

26. The distance travelled by a moving vehicle during perception and brake reaction time is known as

    (a) sight distance   (b) lag distance

    (c) stopping distance   (d) braking distance

27. Rail section is generally designated by its

    (a) total weight   (b) total length

    (c) weight per metre length   (d) area of cross-section

28. Staggered rail joints are generally provided

    (a) on curves   (b) on tangents

    (c) on bridges   (d) in tunnels

29. The lift off distance is the distance along the centre of the runway between the starting point and

    (a) end of the runway   (b) point where aircraft becomes air borne

    (c) end of stopway   (d) point where aircraft attains 10.7 m height

30. The airport 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) none of these

31. In modern big projects, Contract Agreements are normally signed between

    (a) contractor and engineer   (b) employer and engineer

    (c) contractor and employer   (d) none of these

32. Road rollers are basically
- (a) compression equipments
- (b) consolidation equipments
- (c) compaction equipments
- (d) leveling equipments

33. Maximum numbers of earth-moving equipments available in Mizoram are
- (a) excavators
- (b) bull dozers
- (c) loaders
- (d) excavator-cum-loaders

34. For compaction of a 200 mm thick WMM layer to a degree of compaction as prescribed in MORTH specification, the most suitable machinery will be
- (a) JCB Excavator
- (b) Static roller
- (c) Vibratory roller
- (d) Pneumatic tyre roller

35. Bar charts are suitable for
- (a) minor works
- (b) major works
- (c) large projects
- (d) all the above

36. Completion of an activity on CPM network diagram is generally known as
- (a) a float
- (b) a duration
- (c) an event
- (d) a constant

37. The difference between the time available to do the job and the time required to do the job is known as
- (a) a float
- (b) a duration
- (c) an event
- (d) a constant

38. The time by which activity completion time can be delayed without affecting the start of a succeeding activity is known as
- (a) maximum float
- (b) free float
- (c) minimum float
- (d) zero float

39. The critical activity has
- (a) maximum float
- (b) free float
- (c) minimum float
- (d) zero float

40. On a graph plotting activity duration versus cost, the cost slope is assumed to be
- (a) a semi circle
- (b) a parabola
- (c) a straight line
- (d) an ellipse

41. First class bricks, when soaked in cold water should not absorb more than X of its weight. Find the appropriate replacement for X
- (a) 10 %
- (b) 15%
- (c) 20%
- (d) 25%

42. First class bricks should have crushing strength not below
- (a) 50 kg /sqcm
- (b) 55 kg /sqcm
- (c) 60 kg/sqcm
- (d) 65 kg/sqcm

43. The bonding in a half brick wall is known as
- (a) a Stretcher bond
- (b) an English bond
- (c) a Flemish bond
- (d) a Dutch bond

44. This brick bond contains alternate layers of headers and stretchers. A queen closer is placed after the first header course to stagger vertical joints. Identify the bond.
    (a) Stretcher bond
    (b) English bond
    (c) Flemish bond
    (d) Dutch bond

45. In this brick bond headers and stretchers are laid alternately in the same course. Identify the bond.
    (a) Stretcher bond
    (b) English bond
    (c) Flemish bond
    (d) Dutch bond

46. This brick bond consists of alternate courses of headers and stretchers laid with 3/4 bat as quoin in the stretcher course. Identify the bond.
    (a) Stretcher bond
    (b) English bond
    (c) Flemish bond
    (d) Dutch bond

47. In which part of the stem of semi - gravity retaining walls does one generally provide reinforcements to resist the tensile stresses?
    (a) top toe side
    (b) bottom toe side
    (c) top heel side
    (d) bottom heel side

48. A vertical projection is provided at the base in cantilever type retaining walls in order to increase resistance to sliding. This projection is known as
    (a) quoin
    (b) fillet
    (c) key
    (d) perpend

49. Counterforts are provided in counterfort type retaining walls on the
    (a) toe side
    (b) heel side
    (c) vertical side
    (d) none of these

50. Buttresses are provided in buttressed retaining walls on the
    (a) toe side
    (b) heel side
    (c) vertical side
    (d) none of these

PART - B

(Short Answer Questions (100 Marks)

All questions carry equal marks of 5 each.

Attempt all questions.

*This Part should be answered only on the **Answer Booklet** provided.*

1. Define flow net. Describe, in brief, the fundamental characteristics of a flow net.

2. Describe the various types of foundations used in construction of buildings.

3. A soil sample has a mass of 2290 g and a volume of 1150 cm³. On oven drying for 24 hours, the mass reduced to 2035 g. If the specific gravity of the soil is 2.68, determine the (a) dry density (b) bulk density (c) water content (d) voids ratio and (e) Porosity.

4. A purely cohesive soil was tested by unconfined compression. The mean unconfined compression strength was obtained as 50 KN/m². Estimate the ultimate bearing capacity, utilizing Terzaghi's concept. (Take 10 N = 1 Kg and Bearing capacity factor = 5.7)

5. What characteristics of contours must be kept in view while preparing or reading a contour map?

6. A chain line ABC crosses a river, B and C being on the near and distant banks respectively. A perpendicular BD, 50 m long, is set out at B on the left of the chain line. The respective bearings of C and A taken at D are 52°30' and 142°30' respectively. Find the chainage of C, given that AB= 25 m and the chainage at B = 325.30 m .

7. Define Tacheometry. List out the different systems of tacheometric survey with their sub-divisions. What is an anallactic lens?

8. The following consecutive readings were taken with a level and 5 metre levelling staff on continuously sloping ground at a common interval of 25 metres : 0.450, 1.120, 1.875, 2.905, 3.685, 4.500, 0.520, 2.150, 3.205 and 4.485. Given, RL of start point was 254.050 and RL of change point = 250.000. (a) Rule out a page of level field book and enter the above readings. (b) Calculate the reduce levels of the points by rise and fall method and show proper Arithmetical checks.

9. Define the term 'grade' or 'gradient' of a road. Give a list of various terms normally used in order to categorise gradients of roads and explain any one of them.

10. A vehicle is travelling at 80 km per hour. Assuming the driver's perception time as 1.5 seconds and reaction time as 1 second, Calculate the (a) absolute minimum and (b) desirable sight distances. Take Co-efficient of friction = 0.3625.

11. Describe the various types of rail sections generally used in Indian Railways.

12. What are railway yards? Give a broad classification of different railway yards in India. Describe any one of them in detail.

13. Write short notes on (a) Bulldozers (b) Road Rollers.

14. The following data of activities of a project are available for programming by CPM :

Activity	A	B	C	D	E	F	G
Predecessors	-	A	B	B	D	C,E	F
Time (days)	5	6	14	8	5	9	6

F and G are terminal activities. (a) Draw the network of activities (b) Determine the total duration along the critical path of the project.

15. Describe the differences between PERT and CPM networks.

16. If 6, 9, 15 days are the optimistic time t_O, the most likely time t_L and the pessimistic time t_p estimates of an activity respectively, Calculate (a) Expected time (b) Variance and (c) Standard deviation for the activity.

17. Give the general specification of brickwork in cement mortar 1: 6 .

18. Define wing walls, retaining walls, breast walls and toe walls clearly highlighting the distinguishing features of each one of them from the others.

19. List the general conditions of stability of retaining walls. What are the limitations of Rankine's theory of earth pressure?

20. A masonry retaining wall, 6 m high, has vertical face on the earth side and retains earth which has level surface. The wall has top width of 1 m and bottom width 3 m. The weight of earth is 16 KN/m^3 and angle of repose 30°. The weight of masonry is 22 KN /m^3. Investigate the stability of the wall. Co-efficient of friction = 0.50.

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