

MIZORAM PUBLIC SERVICE COMMISSION

TECHNICAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO JUNIOR GRADE OF MIZORAM ENGINEERING SERVICE UNDER PUBLIC HEALTH ENGINEERING DEPARTMENT, NOVEMBER, 2015

CIVIL ENGINEERING PAPER - III

Time Allowed : 3 hours

Full Marks : 200

Attempt all questions.

Part A - Objective Type Questions (100 Marks)

All questions carry equal marks of 2 each.

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

- The rail is designated by its
 - length
 - weight
 - cross-section
 - weight per unit length
- Due to battering action of wheels over the end of the rails, the rails get bent down and are deflected at ends. These rails are called
 - roaring rails
 - hogged rails
 - corrugated rails
 - buckled rails
- The side slope of embankments for a railway track is generally taken as
 - 1:1
 - 1.5:1
 - 2:1
 - 1:2
- The main function of a fish plate is
 - to join the two rails together
 - to join rails with the sleeper
 - to allow rail to expand and contract freely
 - none of these
- The shape of transition curve used by Indian Railways is
 - cubic parabola
 - spiral
 - sine curve
 - lemniscate of Bernoulli
- The height of the centre of arm of a semaphore signal above the ground is
 - 5.5m
 - 6.5m
 - 7.5m
 - 8.5m
- The most efficient traffic signal system is
 - simultaneous system
 - alternate system
 - flexible progressive system
 - simple progressive system
- The percentage compensation in gradient for ruling gradient of 4% and horizontal curve of radius 760 m is
 - 0.1%
 - 1%
 - 10%
 - no compensation

9. In CBR test the value of CBR is calculated at
- (a) 2.5 mm penetration only (b) 5.0 mm penetration only
(c) 7.5 mm penetration only (d) both 2.5mm and 5.0 mm penetrations
10. Flexible pavement distribute the wheel load
- (a) directly to subgrade (b) through structural action
(c) through a set of layers to the subgrade (d) none of these
11. The most suitable equipment for compacting clayey soils is a
- (a) smooth wheeled roller (b) pneumatictyred roller
(c) sheep foot roller (d) vibrator
12. The stopping sight distance depends upon
- (a) total reaction time of driver (b) speed of vehicle
(c) efficiency of brakes (d) all of these
13. Reaction time of a driver
- (a) increases with increase in speed (b) decreases with increase in speed
(c) is same for all speeds (d) none of these
14. Which of the following lining materials is useful for shield driven tunnels in sub aqueous regions?
- (a) stone masonry (b) timber
(c) cast iron (d) cement concrete
15. If 'D' is the diameter of tunnel in metres, then the thickness of lining in mm, as per the empirical formula is given by
- (a) 42 D (b) 82 D
(c) 104 D (d) 124 D
16. The ruling design speed on a National Highway in plain terrain as per IRC recommendations is
- (a) 60 kmph (b) 80 kmph
(c) 100 kmph (d) 120 kmph
17. Consider the following operations :
1. Drilling
 2. Blasting
 3. Mucking
 4. Placing steel
 5. Placing concrete
- The correct sequence of these operations in tunnel construction is
- (a) 1,2,4,3,5 (b) 1,3,2,4,5
(c) 1,2,3,4,5 (d) 1,3,4,2,5
18. Which of the following is a component of a shield for tunnelling?
- (a) liner plate (b) trench jack
(c) stiffener (d) cutting edge
19. When the speed of traffic flow becomes zero, then
- (a) traffic density attains maximum value whereas traffic volume becomes zero
(b) traffic density and traffic volume both attain maximum value
(c) traffic density and traffic volume both become zero
(d) traffic density becomes zero whereas traffic volume attains maximum value

20. The transition curve used in the horizontal alignment of highways as per IRC recommendations is
- (a) spiral
 - (b) lemniscate
 - (c) cubic parabola
 - (d) any of these
21. The basic action involved in sheep foot rolling is
- (a) Kneading
 - (b) Pressing
 - (c) Tamping
 - (d) Vibration
22. Which of the following surfaces will give highest coefficient of traction while using crawler track tractors?
- (a) Ice
 - (b) Concrete
 - (c) Loose sand
 - (d) Earth
23. Which of the following is not a PERT event?
- (a) site investigation started
 - (b) sessional work completed
 - (c) bus starts from Jaipur
 - (d) class is being attended
24. Free float is mainly used to
- (a) identify the activities which can be delayed without affecting the total float of preceding activity
 - (b) identify the activities which can be delayed without affecting the total float of succeeding activity
 - (c) establish priorities
 - (d) identify the activities which can be delayed without affecting the total float of either the preceding or succeeding activities
25. Whenever an activity has zero total float, then
- (a) free float of the activity must be zero but independent float need not be zero
 - (b) independent float must be zero but free float need not be zero
 - (c) free float and independent float both must be zero
 - (d) free float and independent float both need not be zero
26. Rolling resistance of a wheel depends upon
- (i) Vehicle load
 - (ii) Grade
 - (iii) Ground conditions of these statements
- (a) only (i) is correct
 - (b) (i) and (ii) are correct
 - (c) (i) and (iii) are correct
 - (d) (ii) and (iii) are correct
27. Preliminary project report for a road project must contain
- (a) the detailed estimated cost based on detailed design
 - (b) the several alternatives of the project that have been considered
 - (c) the soil survey, traffic survey, concept design and approximate cost
 - (d) the contract documents for inviting tenders
28. The probability of completion of any activity within its expected time is
- (a) 50%
 - (b) 84.1%
 - (c) 99.9%
 - (d) 100%
29. Total float for any activity is defined as the difference between
- (a) its latest finish time and earliest start time for its successor activity
 - (b) its latest start time and earliest start time
 - (c) its latest start time and earliest finish time
 - (d) its earliest finish time and earliest start time for its successor activity

- 30. Critical path**
(a) is always longest (b) is always shortest
(c) may be longest (d) may be shortest
- 31. The effective height of free standing non load bearing wall and column respectively will be**
(a) 1.0H and 1.0H (b) 1.5H and 1.5H
(c) 2.0H and 1.5H (d) 2.0H and 2.0H
where H is the height of wall or column between centres of supports.
- 32. The timber floor not spanning on the masonry wall but properly anchored to the wall gives**
(a) lateral restraint but not rotational restraint
(b) rotational restraint but not lateral restraint
(c) both lateral and rotational restraints
(d) neither lateral nor rotational restraint
- 33. In a cavity wall, both leaves of which are load bearing, the effective thickness is taken as**
(a) sum of thickness of both leaves
(b) two-third of the sum of thickness of both the leaves
(c) actual thickness of the stronger leaf
(d) larger of (b) and (c)
- 34. Water retentivity for brick masonry should not be less than**
(a) 50% (b) 60%
(c) 70% (d) 80%
- 35. Minimum compressive strength in N/mm² for H1 type mortar used for masonry is**
(a) 3 (b) 5
(c) 7.5 (d) 10
- 36. Voids ratio of a soil mass can**
(a) never be greater than unity (b) be zero
(c) take any value greater than zero (d) take values between 0 and 1 only
- 37. Terzaghi's bearing capacity factors N_c , N_q and N_r are functions of**
(a) cohesion only (b) angle of internal friction only
(c) both cohesion and angle of internal friction (d) none of these
- 38. The water content of soil, which represents the boundary between plastic state and liquid state is known as**
(a) liquid limit (b) plastic limit
(c) shrinkage limit (d) plasticity index
- 39. The type of footing which is used to transmit heavy loads through steel columns is**
(a) raft foundation (b) grillage foundation
(c) well foundation (d) isolated footing
- 40. The maximum total settlement for isolated foundations on clayey soils should be limited to**
(a) 25 mm (b) 40 mm
(c) 65 mm (d) 100 mm

41. If the R.L. of a B.M. is 100.00 m, the back-sight is 1.215 m and the foresight is 1.870 m, the R.L. of the forward station is
(a) 99.345 m (b) 100.345 m
(c) 100.655 m (d) 101.870 m
42. The type of surveying which requires least office work is
(a) tacheometry (b) trigonometrical levelling
(c) plane table surveying (d) theodolite surveying
43. The two point problem and three point problem are methods of
(a) resection (b) orientation
(c) traversing (d) resection and orientation
44. In the quadrantal bearing system, a whole circle bearing of $293^{\circ} 30'$ can be expressed as
(a) $W23^{\circ}30'N$ (b) $N66^{\circ}30'W$
(c) $S113^{\circ}30'N$ (d) $N23^{\circ}30'W$
45. According to ICAO, all markings on the runways are
(a) Yellow (b) White
(c) Black (d) Red
46. Which of the following is an example of failure in flexible pavements?
(a) Alligator cracking (b) Mud pumping
(c) Warping cracks (d) Shrinkage cracks
47. The slope of the transitional surface for A, B and C type of runway shall be
(a) 1:5 (b) 1:7
(c) 1:10 (d) 1:12
48. The slope of the obstruction clearance line from the boundary of the heliport should be
(a) 1:2 (b) 1:5
(c) 1:8 (d) 1:40
49. When a ship floats at its designed water line, the vertical distance from water line to the bottom of the ship is known as
(a) beam (b) depth
(c) freeboard (d) draft
50. In basins subjected to strong winds and tide, the length of the berthing area should not be less than
(a) the length of design vessel
(b) the length of design vessel + 10% clearance between adjacent vessels
(c) the length of design vessel + 20% clearance between adjacent vessels
(d) twice the length of design vessel

Part B - Short Answer Questions (100 Marks)

All questions carry equal marks of 5 each.

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

1. What is gauge? What are the various types of gauges in Indian railway?
2. What is points and crossings? What are the objectives of providing signalling?
3. What is stopping sight distance, overturning sight distance and intermediate sight distance?
4. What is the difference between flexible and rigid pavements?
5. Describe briefly five different types of earthwork equipment (roller) used for compacting soils.
6. What is the difference between “Security deposit” and “Mobilisation advance” in a construction contract?
7. Define critical path, activity and event.
8. Explain how Variance & Standard Deviation can be determined in PERT analysis.
9. What is stone masonry? What are the different types of stone masonry?
10. Write the detailed specifications for plastering in cement mortar 1 : 5 and 20mm thick over brick wall on superstructure.
11. In what type of soil is condition piling necessary? What are the following types of piles based on function or use and material or composition?
12. What is retaining wall and breast wall? Where is it used?
13. What do you mean by shear strength of soil? What are the components of shear strength of soil?
14. What is active and passive earth pressure? What are the assumptions made by Rankine’s theory of active earth pressure?
15. A soil sample is partially saturated. Its natural moisture content was found to be 22% and bulk density 2 gm/cc. If the specific gravity of the solid particles be 2.64, determine the degree of saturation and the void ratio.
16. Comparison of collimation and rise and fall methods of reduced levels.
17. The following consecutive readings were taken with a level and 4 meter leveling staff on continuously sloping ground at a common interval of 5 meter:
0.450, 1.855, 2.950, 3.875, 0.825, 3.760, 2.985
Calculate the reduced levels of the points, if R.L. of 1st station is 250.000 meter.
18. A chain line CDE crosses a river, D and E being on the near and distant bank respectively a perpendicular DF, 54km long is set out at D on the length of the same line. The respective bearing of E and C taken at F are 67°30' and 157°30'. Find the chainage of E, given that CD is 27m and chainage of D is 376.5m.
19. What is an estimate? What are the different types of estimate?
20. Explain briefly about the special considerations necessary for alignment of Hill Roads.