

Test Booklet No.

42

Test Booklet Code: B



Tripura University

Suryamaninagar-799022, Tripura (W)

Name of the Examination

Written Test for the post of Assistant Engineer (Civil)

Name of the Candidate: _____

Registration No. _____

Roll No. _____

Date of Birth (in figure) : _____

(in word) _____

Signature of the Candidate _____

Date : _____

Signature of the Superintendent

Signature of the Invigilators

INSTRUCTIONS TO THE CANDIDATES

1. This exam is of 120 minutes duration and the Test Booklet cum answer sheet contains 68 questions. All questions are compulsory.
2. These 68 questions are divided into four sections (A, B, C and D) as per the details given below:
 - i. Section A consists of 50 (fifty) multiple-choice questions (four options with a single correct answer) (Question no. – 01 to 50). For each correct answer, the candidate will get 1 mark. No negative marking.
 - ii. Section B consists of 10 (Ten) questions (Question no. – 51 to 60): Very Short Answer Type Questions (Answer in one word/one sentence) = 10 Questions (2 marks each)
 - iii. Section C consists of 05 (five) questions (Question no. – 61 to 65) Short Answer Type Questions (Answer within 50 words) (3 marks each)
 - iv. Section D consists of 03 (Three) questions (Question no. – 66 to 68) Descriptive Answer Type Questions (Answer within 100 words) (5 marks each)
3. Maximum marks are 100.
4. Use a Blue/Black ballpoint Pen (as provided by the Centre) only for writing particulars on this page/markings answers on the Test Booklet cum Answer Sheet.
5. Rough work is to be done in the space provided for this purpose in the Test Booklet only. No additional sheets would be provided.
6. On completion of the exam, the candidate must hand over the Test Booklet cum Answer Sheet to the Invigilator before leaving the room/hall.
7. The candidates should ensure that the Test Booklet cum Answer Sheet is not folded. Do not make any stray marks on it. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet cum Answer Sheet. The use of white fluid for correction is NOT permissible on it.
8. Each candidate must show on-demand his/her Admit Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of an Electronic/Manual Calculator or Smart watch or any other electronic gadget is strongly prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Room/Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the Test Booklet cum Answer Sheet shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Number and Code as given in the Test Booklet cum Answer Sheet in the Attendance Sheet.

Section - A

Note: Attempt all MCQ type questions, each question carries 1 mark.
Please tick anyone in the box –

1. A soil sample has a bulk unit weight of 18 kN/m^3 and a water content of 15%. Calculate the dry unit weight.
a) 15.6 kN/m^3 b) 16.2 kN/m^3
c) 17.4 kN/m^3 d) 18.8 kN/m^3

2. A soil sample has a liquid limit of 40% and a plastic limit of 20%. Calculate the plasticity index.
a) 10 b) 20 c) 30 d) 40

3. A clay layer 5 m thick has a coefficient of consolidation of $0.002 \text{ cm}^2/\text{sec}$. If there is single drainage, how long will it take for 50% consolidation to occur?
a) 3.1 years b) 2.2 years c) 1.5 years d) 0.78 years

4. A saturated soil sample has a void ratio of 0.65 and a specific gravity of 2.7. Calculate the bulk unit weight of the soil in kN/m^3 .
a) 9.61 b) 19.92 c) 20.1 d) 21.8

5. What is the primary purpose of compaction in soil engineering?
a) Increase the shear strength b) Increase the void ratio
c) Increase the permeability d) Decrease the unit weight

6. A fluid flows through a pipe with a diameter of 20 cm at a velocity of 3 m/s. What is the Reynolds number if the kinematic viscosity of the fluid is $1 \times 10^{-6} \text{ m}^2/\text{s}$?
a) 7.2×10^5 b) 6.0×10^5
c) 4.8×10^5 d) 3.6×10^5

7. Which of the following is the correct definition of Reynolds number?
- (a) Ratio of inertial forces to gravitational forces
- (b) Ratio of viscous forces to gravitational forces
- (c) Ratio of inertial forces to viscous forces
- (d) Ratio of viscous forces to elastic forces
8. Which of the following is not an assumption in Bernoulli's equation?
- (a) Flow is steady
- (b) Flow is incompressible
- (c) Flow is along a streamline
- (d) Flow is rotational
9. Water flows through a Venturi meter with an inlet diameter of 0.2 m and throat diameter of 0.1 m. If the inlet velocity is 3 m/s, calculate the velocity at the throat.
- (a) 6 m/s (b) 9 m/s (c) 12 m/s (d) 15 m/s
10. A tank discharges water through an orifice at a velocity of 4.43 m/s. Calculate the height of the water in the tank. (Take $g=9.81 \text{ m/s}^2$).
- (a) 0.5 m (b) 3 m (c) 2 m (d) 1 m
11. A fluid with viscosity $0.001 \text{ Pa}\cdot\text{s}$ flows through a pipe with a velocity gradient of 500s^{-1} . Calculate the shear stress (τ).
- (a) 0.25 Pa (b) 1 Pa
- (c) 0.05 Pa (d) 0.5 Pa
12. Which of the following treatment process removes hardness from water?
- (a) Sedimentation (b) Coagulation
- (c) Lime-soda process (d) Filtration

13. What is the acceptable limit of nitrate in drinking water as per BIS standards?
- (a) 10 mg/L (b) 25 mg/L
(c) 35 mg/L (d) 45 mg/L
14. Determine the organic loading rate (in kg/m³/d) for a trickling filter with a flow rate of 500 m³/d, influent BOD of 200 mg/L, and filter volume of 100 m³.
- (a) 0.5 (b) 1.0 (c) 2.0 (d) 3.0
15. Determine the free-flow speed of a vehicle with a spacing of 25 m between vehicles and a flow rate of 1440 vehicles/hour.
- (a) 50 km/h (b) 36 km/h
(c) 72 km/h (d) 90 km/h
16. Calculate the maximum rate of super elevation (e) for a curve of radius 300 m and design speed of 60 km/h, considering no lateral friction.
- (a) 0.03% (b) 0.05%
(c) 3.56% (d) 6.30%
17. The range of camber to be provided for carriageways for cement concrete surfacing for light rainfall areas, as per IRC 86-2018 is
- (a) 1.5 to 1.7% (b) 1.7 to 2%
(c) 2 to 2.5% (d) 2.5 to 3%
18. A signalized intersection has a cycle time of 90 seconds. The effective green time for one approach is 30 seconds, and the flow rate is 1000 vehicles/hour. What is the capacity of the approach (in vehicles/hour)?
- (a) 333.33 (b) 666.66
(c) 6000 (d) 3000

19. In the case of a closed traverse, the sum of interior angles should be:

- (a) $(n-2) \times 180^\circ$ (b) $(n+2) \times 180^\circ$
(c) $(n-1) \times 180^\circ$ (d) $(n+1) \times 180^\circ$

20. In an old map, a line PQ was drawn to a magnetic bearing of $8^\circ 30'$, the magnetic declination at that time being 2° West. If the present magnetic declination is $14^\circ 30'$, the line should be set now to what magnetic bearing?

- (a) 8° (b) 15° (c) 25° (d) 356°

21. The bench mark (B.M.) was set up on ground level during a construction work. The elevation of the bench mark was 54.200 m. The staff was set up at point A which read 1.760m. Further the staff was set inverted at point B on the underside of the ceiling slab, which read 1.440m. The elevation of the underside of ceiling slab will be equal to

- (a) 54.52 m (b) 51.0 m (c) 57.40 m (d) 53.88 m

22. Which of the given characteristics of contours is incorrect?

- (a) Contour lines of different elevations can unite to form one line only in case of a vertical cliff.
(b) A contour passing through any point is perpendicular to the line of steepest slope at that point.
(c) A closed contour line with one or more higher ones inside it represents a hill.
(d) Contour lines cross a water shed at right angles forming curves of V shape around it with the point of the "V" pointing downstream.

23. In stone masonry, the vertical joints in successive courses should ideally:

- (a) Be aligned to save material
(b) Be staggered to avoid continuous vertical joints
(c) Align perfectly to form a grid-like pattern
(d) Form a continuous line for aesthetic purposes

24. The foundation type most suitable for soil having low bearing capacity is:

- | | | | |
|---------------------|--------------------------|------------------------|--------------------------|
| (a) Pile foundation | <input type="checkbox"/> | (b) Strip foundation | <input type="checkbox"/> |
| (c) Strap footing | <input type="checkbox"/> | (d) Shallow foundation | <input type="checkbox"/> |

25. The primary purpose of expansion joints in buildings is to:

- | | |
|---|--------------------------|
| (a) Prevent water ingress | <input type="checkbox"/> |
| (b) Absorb movements due to temperature changes | <input type="checkbox"/> |
| (c) Improve the aesthetic appearance | <input type="checkbox"/> |
| (d) Provide resistance against wind loads | <input type="checkbox"/> |

26. The radius of the Mohr's circle when the stress element is under simple shear stress "q" shall be equal to

- | | | | |
|---------|--------------------------|----------------------|--------------------------|
| (a) q | <input type="checkbox"/> | (b) square root of q | <input type="checkbox"/> |
| (c) q/2 | <input type="checkbox"/> | (d) zero | <input type="checkbox"/> |

27. In a simply supported beam subjected to uniformly distributed load on the entire span, the following characteristics shall be Zero at the centre of the beam span:

- | | | | |
|-----------------|--------------------------|--------------------|--------------------------|
| (a) shear force | <input type="checkbox"/> | (b) bending moment | <input type="checkbox"/> |
| (c) deflection | <input type="checkbox"/> | (d) all of these | <input type="checkbox"/> |

28. For a triangular section of base width b and height h, the maximum shear stress occurs at

- | | | | |
|--------------------|--------------------------|--------------------|--------------------------|
| (a) h/3 from base | <input type="checkbox"/> | (b) 2h/3 from base | <input type="checkbox"/> |
| (c) 2h/5 from base | <input type="checkbox"/> | (d) h/2 from base | <input type="checkbox"/> |

29. In a thin cylindrical shell subjected to internal pressure, the ratio of magnitude of circumferential stress to magnitude of longitudinal stress is equal to

- | | | | | | | | |
|---------|--------------------------|-------|--------------------------|---------|--------------------------|-------|--------------------------|
| (a) 0.5 | <input type="checkbox"/> | (b) 1 | <input type="checkbox"/> | (c) 1.5 | <input type="checkbox"/> | (d) 2 | <input type="checkbox"/> |
|---------|--------------------------|-------|--------------------------|---------|--------------------------|-------|--------------------------|

30. A cantilever beam of length L is subjected to applied moment M at the free end. Which of the following set of values of shear force and bending moment in the cantilever will be correct?

- (a) Zero shear force and bending moment M throughout span
- (b) M/L shear force and zero bending moment throughout span
- (c) Both shear force and bending moment will be zero throughout span
- (d) $M/(2L)$ shear force throughout the span and bending moment varying from zero at free end to M at the fixed end of cantilever

31. Which one of the following steps is not correct in the application of the moment distribution method?

- (a) The distribution factors are first computed
- (b) All supports are assumed fixed or locked and fixed end moments are computed for each span, considered separate from every other span
- (c) Each support is now unlocked and the unbalanced moment at each support is distributed to adjacent spans of the corresponding support. Then each support is relocked
- (d) After distributing the unbalanced moment to each adjacent span, one half of this amount, with opposite sign is carried over to the other end of respective span.

32. A mild steel bar of uniform cross-section 'A' and length L is subjected to an axial load P . If the modulus of elasticity of the material of bar is E , the strain energy stored in the bar would be

- | | | | |
|----------------|--------------------------|----------------|--------------------------|
| (a) $PL/2AE$ | <input type="checkbox"/> | (b) $PL/4AE$ | <input type="checkbox"/> |
| (c) $P^2L/2AE$ | <input type="checkbox"/> | (d) $P^2L/4AE$ | <input type="checkbox"/> |

33. What is the horizontal thrust in a symmetric parabolic 2 hinged arch of span L and central rise y subjected to a UDL of intensity w per unit length over its entire span?

- | | | | |
|------------------|--------------------------|------------------|--------------------------|
| (a) $wL^2 / 4y$ | <input type="checkbox"/> | (b) $wL^2 / 8y$ | <input type="checkbox"/> |
| (c) $wL^2 / 12y$ | <input type="checkbox"/> | (d) $wL^2 / 16y$ | <input type="checkbox"/> |

34. The static indeterminacy of the given beam is equal to:



- (a) 3 (b) 4 (c) 5 (d) 6

35. Which of the following is not a force method of analysis of structures?

- (a) Flexibility method
 (b) Method of consistent deformation
 (c) Kani's method
 (d) Method of Strain energy

36. When the load line is in the plane of bolted connection in an eccentrically loaded bolted bracket joint in a steel structure, the force due to direct load in one bolt is 50 KN, the force due to moment in the critical bolt is 80 KN, the angle between the direction of the two forces is 30 degree, then the resultant force in the bolt will be equal to:

- (a) 94.34 KN
 (b) 117.90 KN
 (c) 113.58 KN
 (d) 125.81 KN

37. If an end plate connection in a steel structure fails in the check for prying forces, to make it safe, you can resort to which one of the following options?

- (a) Decrease the thickness of end plate
 (b) Decrease the length of end plate
 (c) Increase the thickness of end plate
 (d) Increase the length of end plate

38. The block shear strength of a single angle section tension member connected by bolted joint does not depend upon

- (a) Spacing of bolts
- (b) End distance of bolts
- (c) Diameter of bolts
- (d) Grade of bolts

39. A steel section can be classified as a compact section if

- (a) It undergoes local buckling before yield point
- (b) It undergoes local buckling post yield but before the formation of first plastic hinge
- (c) It has no local buckling till the formation of first plastic hinge but undergoes local buckling before converting into a mechanism
- (d) It undergoes no local buckling till sufficient plastic hinges are formed to convert it into a mechanism

40. A built up I section has to be made of 16 mm thick plates only and is to be used as a beam. The beam section fails in check for shear. What can be done to effectively increase the shear strength of the section?

- (a) Increase the thickness of flange
- (b) Reduce the width of flange
- (c) Increase the depth of web
- (d) Increase the width of flange

41. A building is subjected to a dead load of 80 KN, live load of 110 KN, wind load of 150 KN and earthquake load of 180KN. As per IS: 456-2000, the design load for the building in KN is

- (a) 285 KN
- (b) 520 KN
- (c) 390 KN
- (d) 444 KN

42. A doubly reinforced concrete beam has top effective cover of 50mm. The depth of neutral axis is 200mm. Effective depth is 450 mm. As per IS: 456-2000, the maximum strain in concrete at the level of compression steel is equal to:

- (a) 0.0018 (b) 0.0026
(c) 0.0039 (d) 0.0042

43. Main reinforcement of a RC slab consists of 10 mm bars at 10 cm spacing. If it is desired to replace 10 mm bars by 12 mm bars, then spacing of 12 mm bars should be equal to:

- (a) 12 cm (b) 13.2 cm
(c) 14.4 cm (d) 16 cm

44. The minimum reinforcement per unit width of Fe 415 grade for slab section of total depth 200 mm and effective cover 30 mm, as per IS: 456-2000 is equal to:

- (a) 204 mm² (b) 240 mm²
(c) 255 mm² (d) 300 mm²

45. Effective width of T beams is an imaginary width over which

- (a) Compressive stress is assumed to be uniform
(b) Compressive stress is assumed to be of parabolic variation with minimum value at ends and maximum at the centre
(c) Tensile stress is assumed to be uniform
(d) Tensile stress is assumed to be of parabolic variation with minimum value at ends and maximum at the centre.

46. Maximum possible value of compaction factor to determine the workability of fresh concrete is

- (a) 2 (b) 1 (c) 0.8 (d) 0.5

47. Which of the following is not an effect of air entrainment on the properties of concrete?

- (a) Increased resistance to freezing and thawing
- (b) Improvement in workability
- (c) Increase in resistance against chemical attack
- (d) Increase in strength

48. What is the allowable moisture content in well seasoned timber used for construction purposes?

- (a) 4-8%
- (b) 10-12%
- (c) 15-20%
- (d) 25-30%

49. If for the completion of an activity, the optimistic time is 4 days, pessimistic time is 10 days, and the most likely time is 7 days, what is the expected time (TE) of completion of that activity?

- (a) 8 days
- (b) 7.5 days
- (c) 7 days
- (d) 6 days

50. As per the Indian Standard guidelines IS: 1893 (Part 1)-2016, the Indian sub continent is divided into how many seismic zones for the purpose of calculation of earthquake forces?

- (a) 2
- (b) 3
- (c) 4
- (d) 5

TOTAL NUMBER OF MCQs ATTEMPTED

IN FIGURE

IN WORDS

ANSWERS AND SOLUTIONS TEST PAPER CIVIL ENGINEERING

PART : A

1. a
2. b
3. d
4. b
5. a
6. b
7. c
8. d
9. c
10. d
11. d
12. c
13. d
14. b
15. b
16. d
17. b
18. a
19. a
20. d
21. c
22. d
23. b
24. d
25. b
26. a
27. a
28. d
29. d
30. a
31. b
32. c
33. b
34. d
35. c
36. d
37. c
38. d
39. c
40. c
41. d
42. b
43. c
44. a
45. a

46. b
47. d
48. b
49. c
50. c