



MPPSC (AE) 2017 Test Series

Test 02

Test ID: 877

Time: 45 Minutes

Date: 10/06/2017

Total Marks: 120

Topics:

Soil Mechanics and Foundation Engineering

Instructions for Candidates

1. Do not open the Question Booklet until you are asked to do so by the invigilator.
2. This Question Booklet contains **05** pages. After you are permitted to open the booklet, please check all pages and report discrepancies, if any, to the invigilator.
3. There are a total of 40 **questions** carrying **120 marks**. All these questions are of objective type. Each Question has only **one** correct answer. Questions must be answered on the Back side of the **OMR** by darkening the appropriate bubble (marked A, B, C, D) using **ONLY a black/blue ink ball point pen** against the question number. **For each question darken the bubble of the correct answer**. More than one answer bubbled against a question will be treated as an incorrect response.
4. Since bubbles darkened by the black/blue ink ball point pen **cannot** be erased, candidates should darken the bubbles in the OMR very carefully.
5. Questions 01 – 40 belong to ***Soil Mechanics and Foundation engineering*** and carrying **03 marks each**.
6. Unattempted questions will result in zero mark and also **there is no negative marking** for wrong answers.
7. Calculator, charts, graph sheets or tables are **NOT** allowed in the examination hall.
8. Rough work can be done on the question paper itself. Rough Work on Answer sheet is strictly prohibited otherwise answer sheet will be rejected.
9. **Use of mobile is strictly prohibited during exam.**
10. Before the start of the examination, write your name and registration number in the space provided below using a black ink ball point pen.

Name of Student

Batch (B1/B3)

Registration Number

Q.1. Specific Gravity for soil high in Mica, ranges between

- (a) 2.56-2.68 (b) 2.66-2.77
(c) 2.75-2.85 (d) Less than 1

Q.2. The Light source of Torsion Balance Method for water content determination, works on?

- (a) 220 V 50 cycle single phase main supply
(b) 220 V 100 cycle single phase main supply
(c) 220 V 50 cycle double phase main supply
(d) 220 V 100 cycle double phase main supply

Q.3. The state in which soil do not have plasticity and it becomes brittle is

- (a) Liquid State (b) Plastic State
(c) Semi solid State (d) None of the above

Q.4 For Casagrande liquid limit test soil sample is sieved through which size of sieve?

- (a) 425 μ (b) 125 μ (c) 75 μ (d) 35 μ

Q.5 An undisturbed sample of clay brought from the field was noted to have a volume of 18.0cc and weight of 30.8g. On oven drying, the weight of the Sample was reduced to 12.5 cc Calculate the shrinkage limit and the specific gravity of solids. What is the shrinkage ratio?:

- (a) 1.64 (b) 2.40 (c) 2.44 (d) 2.50

Q.6. A sample of soil with a liquid limit of 72.8% was found to have a liquidity index of 1.21 and water content of 81.3%. What are is plastic limit and plasticity index

- (a) 32.3% & 40.5% (b) 2.5% and 4.5%
(c) 56% and 87% (d) 3.5% and 1.2%

Q.7. What is the theoretical height of capillary rise in a fine grained sand with effective size of 0.002 mm

- (a) 75mm (b) 85mm (c) 30mm (d) non of these

Q.8. In a falling head permeability test on a sample 12.2cm high and 44.41cm² in cross sectional area, the water level in a stand pipe of 6.25 mm internal diameter dropped from height of 75cm to 24.7cm in 15 minutes. Find the coefficient of permeability.

- (a) 1.04x10⁻⁴ cm/s (b) 4.41x10⁻⁴ cm/s
(c) 2.04x10⁻⁴ cm/s (d) 5.21x10⁻⁴ cm/s

Q9. Soil sample in its natural state has, when fully saturated, a water content of 32.5%. Calculate the total weight of water required to saturate a soil mass of volume 10 m³. Assume G= 2.69

- (a) 45.8kN (b) 35.8kN (c) 72.8kN (d) 49.8kN

Q.10. From the flownet, we can calculate

- (a) flow rate
(b) distribution of heads
(c) maximum hydraulic gradient
(d) All of the above

Q.11. Which of the following is not correct.

- (a) If seepage occurs upward then the seepage stresses are in the opposite direction to the gravitational effective stresses.
(b) Higher normal stress level tends to reduce the hydraulic connectivity by forcing a tighter configuration (compression) of the soil fabric.
(c) Coulomb's model applies strictly to soil failures that occur along a presumptive or known slip plane.
(d) Soils retain a memory of the past maximum effective stress, which cannot be erased by loading to a higher stress level.

Q.12. The soil profile at a site for a proposed office building consists of a layer of fine sand 10 ft thick above a layer of soft, normally consolidated clay 2 ft thick. Below the soft clay is a deposit of coarse sand. The groundwater table was observed at 3 ft below ground level. The void ratio of the sand is 0.76 and the water content of the clay is 34%. The building will impose a vertical stress increase of 3000 lb/foot² at the middle of the clay layer. Estimate the primary consolidation settlement of the clay. Assume the soil above the water table to be saturated, C_c = 0.3, and G_s = 2.7.

- (a) 0.206ft (b) 5.5in
(c) 0.452ft (d) 85in

Q.13. Limitation of Stokes' law

- (a) It is true for spherical particles only.
- (b) It cannot be applied to particles of size smaller than 0.2 m.
- (c) All particles should have same specific gravity.
- (d) All the above.

Q.14. Stokes' law is applicable to soil particles of size between

- (a) 0.3 mm to 0.2 m
- (b) 0.2 mm to 0.2 m
- (c) 0.3 mm to 3 m
- (d) 0.2 mm to 2 m

Q.15. To minimize the influence of one particle over the other particle, the mass of soil in sedimentation analysis is limited to _____ in the sedimentation jar of 1 litre

- (a) 20 gm
- (b) 50 gm
- (c) 75gm
- (d) 100gm

Q. 16.

Assertion: For sedimentation tests, it is desirable to have a fairly large container.

Reason: Sides of container affect the fall of particles near the wall.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q. 17. Assertion: Entrapped air and foreign matters reduce permeability considerably.

Reason: Entrapped air and foreign matters plug the soil pores.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.18. The combined effect of permeability and compressibility of a soil on the rate of volume change is given by

- (a) coefficient of volume compressibility
- (b) coefficient of permeability
- (c) coefficient of consolidation
- (d) compaction factor

19. Degree of compaction depends upon

- (a) thickness of clay layer
- (b) coefficient of permeability
- (c) coefficient of consolidation
- (d) all the above

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20. The Soil used in Sub grade of Highway should be compacted on

- (a) Dry side of optimum
- (b) wet side of optimum
- (c) on optimum
- (d) all the above

Q21. The property of soil which permits the seepage of water is known as

- (a) porosity
- (b) capillarity
- (c) permeability
- (d) viscosity

Q.22. Assertion: Permeability of soil varies with temperature.

Reason: Viscosity of water varies with temperature.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.23. Assertion: In the densest state, void ratio of soil cannot be less than 0.40.

Reason: In the soil grains are not uniform, hence smaller grains fill the space between the bigger ones.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q.24. Darcy's law is based on the assumption that

- (a) there is laminar flow condition
- (b) soil is saturated
- (c) soil is homogeneous and isotropic
- (d) all the above

Q.25. Shrinkage will be more on

- (a) Dry side of optimum
- (b) wet side of optimum
- (c) on optimum
- (d) all the above

Q.26. CU test of Shear Strength is preferred for

- (a) Coarse Sand
- (b) Silty Sand
- (c) Clay
- (d) For all type soil

Q.27. A sample of sand, 2.5 in. diameter and 7.5 in. long, was prepared at a porosity of 60% in a constant head apparatus. The total head was kept constant at $h = 10$ in. and the volume of water collected in 5 seconds was 2.5 in.³ The test temperature was 20°C. Calculate the seepage velocity.

- (a) 1.4×10^{-2} ft/s
- (b) 2.4×10^{-2} ft/s
- (c) 3.4×10^{-2} ft/s
- (d) 4.4×10^{-2} ft/s

Q.28. A flownet must meet the following criteria:

1. The quantity of flow through each flow channel is constant.
2. The head loss between each consecutive equipotential line is constant.
3. A flow line cannot intersect another flow line.
4. An equipotential line cannot intersect another equipotential line.

Which of the following is correct?

- (a) 1,2,3
- (b) 2,3,4
- (c) 1,3,4
- (d) 1,2,3,4

Q.29. The angle of internal friction is maximum

- (a) angular-grained loose sand
- (b) angular-grained dense sand
- (c) round-grained dense sand
- (d) round-grained loose sand

Q.30. Pile foundations are generally preferred to for

- (a) bridge foundations
- (b) sky scrapper buildings
- (c) residential buildings
- (d) runways.

Q.31. Pick up the correct statement from the following:

- (a) Coefficient of compressibility is the decrease in void ratio per unit increase of pressure
- (b) The percent settlement at any time is called degree of consolidation m^3
- (c) The initial curve on either side of the point of unloading and reloading is called 'virgin curve'
- (d) All the above

Q.32. The maximum possible value of dry density is referred to as

- (a) dry density
- (b) zero air voids
- (c) saturation dry density
- (d) Density index

Q.33. A vertical excavation was made in a clay deposit having unit weight of 22 kN/m^3 . It caved in after the digging reached 4m dept. Assuming internal friction as zero calculate the magnitude of cohesion.

- (a) 22 kN/m^2
- (b) 24 kN/m^2
- (c) 20 kN/m^2
- (d) 28 kN/m^2

Q.34. What is the safe bearing capacity of a circular footing of 1.5m diameter resting on the surface of a saturated clay of unconfined compressive strength of 100 kN/m^2 . (FOS=3.00)

- (a) 11.4 kN/m^2
- (b) 111.4 kN/m^2
- (c) 1.4 kN/m^2
- (d) 1111.4 kN/m^2

Q.35. A wooden pile is being driven with a drop hammer weighing 20kN having a free fall of 1.0m. The penetration in the last blow was 5mm. Determine load carrying capacity of the pile according to engineering news Formula.

- (a) 111.1kN
- (b) 1111.1kN
- (c) 1.1kN
- (d) 11.1kN

Q.36. A group of 9 piles, 10m long is used as a foundation for a bridge pier. The piles used are 30 cm in dia. With c/c spacing of 0.9m. The subsoil has UCS of 1.5kg/cm². Determine the efficiency neglecting the bearing action. (take adhesion factor as 0.9)

- (a) 1.1 (b) 2.1 (c) 3.1 (d) 0.85

Q.37. When an Unconfined compression test is conducted on a cylinder of soil, it fails under axial stress of 1.2kg/cm². The failure plane makes an angle of 50° with horizontal. Determine the Cohesion.

- (a) 0.530kg/cm² (b) 1.530kg/cm²
(c) 2.530kg/cm² (d) 3.530kg/cm²

Q.38. Compute the effective pressure at a depth of 20 m below the bottom of lake consists of soft clay with a thickness of more than 20m. The average water content of the clay is 35% and the specific gravity of the soil may be assumed to be 2.65

- (a) 167.96kN/m² (b) 267.96kN/m²
(c) 367.96kN/m² (d) 467.96kN/m²

Q.39. The mass gravity of a fully saturated specimen of clay having a water content of 40% is 1.88. On oven drying the mass specific gravity dropsto

- (a) 23% (b) 30% (c) 45% (d) 60%

Q.40. When a cohesionless soil attains quick condition, it loses

- (a) shear strength (b) bearing capacity
(c) both (a) and (b) (d) None of the above

THE END

(Space for Rough Work)