

# 17420

**15162**

**3 Hours / 100 Marks**

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.  
(2) Answer each next main Question on a new page.  
(3) Illustrate your answers with neat sketches wherever necessary.  
(4) Figures to the right indicate full marks.  
(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1. a) Attempt any SIX of the following: 12**

- (i) Define geology and state its branches.
- (ii) Define petrology and rock.
- (iii) State classification of rocks based on their genesis.
- (iv) Define outcrop and faults.
- (v) Define joints and state their classification.
- (vi) Define earthquake and intensity.
- (vii) Define soil as per I.S.
- (viii) State objectives of Geotechnical Engineering.
- (ix) State Darcy's Law of permeability.

**b) Attempt any TWO of the following: 8**

- (i) Define the following terms :
  - 1) Focus
  - 2) Epicenter
  - 3) Seismograph
  - 4) Isoseismic lines

P.T.O.

- (ii) State any four causes and two effects of earthquake.
- (iii) Define minerals and state any six properties of minerals.

**2. Attempt any FOUR of the following: 16**

- a) Define folds and draw neat sketch of a fold and label its different parts.
- b) State formation and classification of soil.
- c) Classify earthquakes based on focus and origin.
- d) State field applications of geotechnical engineering (any four).
- e) Draw phase diagram of a soil when soil is :
  - (i) moist
  - (ii) fully saturated and label the diagrams.
- f) Define voids ratio; porosity; water content and degree of saturation.

**3. Attempt any FOUR of the following: 16**

- a) The density of a soil sample is  $2000 \text{ kg/m}^3$  and its water content is 18%. Determine its dry density, voids ratio, porosity and degree of saturation. Assume  $G=2.72$ ,  $V_w=10 \text{ kN/m}^3$ .
- b) Write step by step procedure to determine specific gravity of soil by pycnometer in the laboratory.
- c) Define Liquid Limit, Plastic Limit, Shrinkage Limit and Plasticity Index.
- d) Write step by step procedure to determine plastic limit in the laboratory.
- e) What do you mean by coarse grained soil and fine grained soil.
- f) State field identification tests on soil and explain any one.

**4. Attempt any FOUR of the following: 16**

- a) A sieve analysis test was conducted in laboratory and from particle size distribution curve following observations recorded. Calculate coefficient of curvature and coefficient of uniformity. Also classify soil.

$$D_{10}=0.32 \text{ mm}, D_{30}=1.25 \text{ mm}, D_{60}=1.98 \text{ mm}$$

- b) State meaning of following symbols.  
GW, GC and SP, SM.
- c) Enlist factors affecting permeability.
- d) Define permeability and Phreatic line.
- e) Write step by step procedure to determine coefficient of permeability of fine grained soil by falling head method in laboratory.
- f) Define flow net and state its characteristics.

**5. Attempt any FOUR of the following: 16**

- a) Define shear strength of soil and state field situations of shear failure.
- b) Draw strength envelope for :
- (i) C-soil
  - (ii)  $\phi$ -soil and
  - (iii) C- $\phi$  soil
- c) A constant head permeameter gives discharge of 350 ml in 270 seconds under a constant head of 1050 mm. Determine coefficient of permeability in m/day, if the soil sample was 150 mm long and 78.50 cm<sup>2</sup> in c/s area.
- d) Define ultimate bearing capacity and safe bearing capacity.
- e) State any four assumptions in the theory of Terzaghi's analysis of bearing capacity.
- f) Draw a neat sketch of plate load test set-up for gravity loading.

**6. Attempt any FOUR of the following:****16**

- a) Define active earth pressure and passive earth pressure. Draw sketches for each.
- b) Compute the intensity of active and passive earth pressure at depth 8.7 m in dry cohesionless sand with angle of internal friction of  $28^\circ$  and unit weight of  $18 \text{ kN/m}^3$ . Also calculate total earth pressure and its line of action.
- c) Define compaction and state purpose of compaction.
- d) State suitability of following compaction equipments
  - (i) Smooth wheel roller
  - (ii) Sheep foot roller,
  - (iii) Rammer and
  - (iv) Vibrator
- e) State difference between compaction and consolidation (any four points).
- f) Following observations were made using standard proctor test on a soil sample.

Bulk density (gm/cc)	1.75	1.95	2.10	2.20	2.15	2.05
Water content (%)	5	10	15	20	25	30

Determine OMC and MDD by plotting compaction curve.

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