

Total No. of Questions : 12]

SEAT No. :

P722

[Total No. of Pages : 4

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B.E. (Civil) (Semester - I)

ADVANCED GEOTECHNICAL ENGINEERING

(2008 Pattern) (Elective - I(e))

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer 3 questions from Section - I and 3 questions from Section - II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Your answers will be valued as a whole.*
- 5) *Use of electronic pocket calculator is allowed & IS codes are not allowed.*
- 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) Explain the following :

[4 × 4 = 16]

- a) USCS
- b) ISCS
- c) PRA classification
- d) Diffuse Double layer

OR

Q2) a) Following data is obtained from a proposed foundation site :

[8]

- i) Total soil sieved = 250 gms
- ii) Cum. mass retained on 4 mm sieve = 40 gms
- iii) Cum. mass retained on 75 μ sieve = 200 gms
- iv) $D_{10} = 0.07$ mm, $D_{30} = 0.12$ mm, $D_{60} = 1.95$ mm.
- v) LL = 40% & PL = 30%

Classify the soil & comment, whether the soil is suitable for foundation?

- b) Enlist different 'soil structures' & 'clay minerals' and explain the role of 'Montmorillonite'. **[8]**

P.T.O.

- Q3)** a) A vertical retaining wall 4m high, supported a backfill with $\beta = 0$, $\gamma = 18 \text{ kN/m}^3$, $\phi = 30^\circ$, $\delta = 10^\circ$. A footing running parallel to the wall & carrying a load of 18 kN/m is to be constructed. Find the safe distance of the footing from the face of the wall, so that there is zero pressure increase, on the wall. [10]
- b) Explain, K_a , K_p & K_o giving field examples. [7]

OR

- Q4)** a) Design a gravity retaining wall, 6m high, with, $\theta = 0$, $\gamma = 18 \text{ kN/m}^3$, $\phi = 30^\circ$, dry soil as backfill. Also find the Fos against sliding, assuming $\delta' = 30^\circ$, the wall is made up of concrete with $\gamma = 24 \text{ kN/m}^3$ & top width of 1m. Use Rankine's theory. [8]
- b) Compute the embedment depth & pull in anchor rod for the sheet pile 6 m high backfill with anchor rod 1.5m below the top. The soil of backfill & below the dredge line are same, with following properties, $\phi = \phi' = 30^\circ$, $C = 0$, $\gamma_{\text{sat}} = 22 \text{ kN/m}^3$, $\gamma = 19 \text{ kN/m}^3$, GWT = 3 m above D.L.
Use 'Free Earth Support' method. [9]

- Q5)** a) Explain the different types of Geosynthetics, with their functions. [6]
- b) Explain the properties & functional requirements of geogrid. [6]
- c) Discuss the 'Binquet & Lee' theory for reinf. foundations. [5]

OR

- Q6)** a) Explain components of 'RE wall' with sketch. [6]
- b) Explain 'Soil nailing' with situations applicable. [5]
- c) Discuss the user of 'Geosynthetics in Geoenvironment. [6]

SECTION - II

- Q7)** Explain the following : [4 × 4 = 16]
- a) Free & Forced vibrations.
- b) Pressure Bulb concept of Balakrishna & Nagraj.
- c) Barken's method
- d) Pauw's Analysis

OR

- Q8)** a) Resonance occurred at a frequency of 25 cycles/sec in a vertical block vibration test on a block of $1\text{ m} \times 1\text{ m} \times 1\text{ m}$. Determine C_u if the wt. of oscillator is 700 N & the force produced by it at 15 cycles/sec is 1200 N. Also compute the amplitude in vert. direction at 15 cycles/sec. [8]
- b) Discuss the design criteria for impact type machines as per IS - 2974 (pt - II) - 1966. [8]

Q9) Explain the following :

- a) Multi under-reamed pile. [5]
- b) Bored compaction pile. [4]
- c) Vibrofloatation. [4]
- d) Sand drains. [4]

OR

- Q10)** a) Explain the stages of inserting reinforcement in Vibro-expanded pile.[7]
- b) A clay layer 5m thick is consolidated with the help of sand drains of dia. 30cm & spaced at 2.7 m c/c. Determine the influence of the drain wells on the Av. degree of consolidation at the time when the degree of consolidation in the clay without wells (U_z) would be 20%.

Arrange the sand drains in square pattern & compute the improvement in U , for the following cases. [10]

- i) $K_r = K_z$
- ii) $K_r = 5 K_z$. Use following data,

for $U_z = 20\%$, $T_v = 0.031$,

$$T_r = 0.070, U = 30\%$$

$$T_r = 0.085, U = 35\%$$

$$T_r = 0.373, U = 85\%$$

$$T_r = 0.455, U = 90\%$$

Q11) Explain the following :

- a) Hookean & Newtonian model. [5]
- b) Kelvin model. [4]
- c) Burger's model. [4]
- d) Bingham's model. [4]

OR

- Q12)** a) Explain 'Rheology' & simple Rheological models. [7]
- b) Explain 'Saint - Venant's' model. [5]
 - c) Discuss 'secondary consolidation' & 'creep', with the help of Rheological models. [5]

