



## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B-Tech GSE

Subject (Course) : Soil mechanics and Foundation Engineering

Course Code : GSEG-392

No. of page/s:3

Semester –VI

Max. Marks : 100

Duration : 3 Hrs

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All the questions of section A B, & C are compulsory. Wherever necessary do with neat sketches.

### SECTION-A (4×5= 20 Marks)

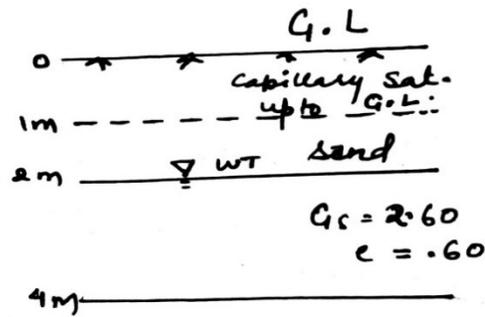
Attempt all questions

- 1) What is the difference between seepage velocity and discharge velocity?
- 2) What is seepage pressure? What happens to the effective stress if the movement of water is in the upward direction in the soil layer and why?
- 3) Differentiate between shallow and deep foundation.
- 4) Define the following terms:
  - a) exit gradient
  - b) piping failure
  - c) consolidation
  - d) hydraulic gradient
  - e) permeability

### SECTION-B (4×10= 40 Marks)

Attempt all questions

- 5) For the given subsoil condition show in figure 1 what are the effective stresses value at 1 m, 2 m, and 4 m depths. Assume  $\gamma_w = 10\text{KN/m}^3$



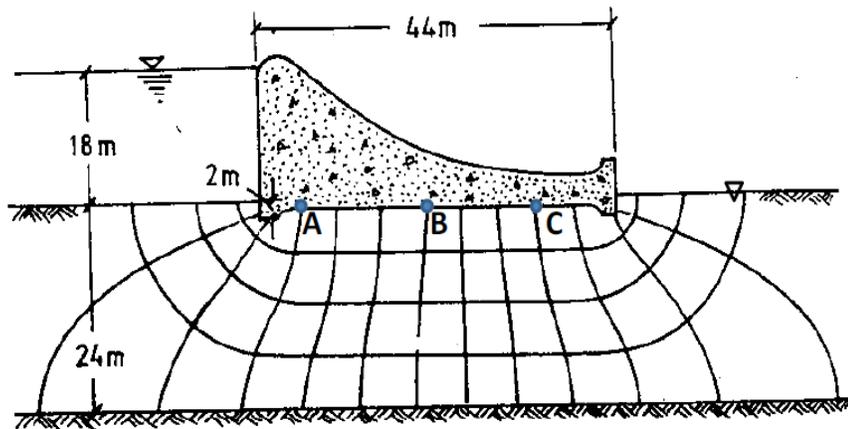
- 6) What are the basic characteristics of the failure mechanism in general shear failure punching, shear failure and local shear failure.
- 7) Explain variable head permeability test and derive the expression for coefficient of permeability.
- 8) A 3.0 m square footing is located in a dense sand deposit at a depth of 2 m. ( $N_c=30.14, N_q=18.4, N_y=22.4$ ) Determine the Ultimate Bearing Capacity for the following water table position: a) at ground surface b) water table at footing level. The moist Unit Weight above the water table is  $17 \text{ KN/m}^3$  and the saturated Unit Weight is  $19 \text{ KN/m}^3$ .

### SECTION-C (2×20 = 40 Marks)

#### Attempt all questions

- 9) A 3m thick clay layer beneath a building is overlain by a permeable stratum and is underlain by an impervious rock. The coefficient of consolidation of the clay was found to be  $0.025 \text{ cm}^2/\text{min}$ . The final expected settlement for the layer is 8cm.
  - a) How much time will it take for 80% of the total settlement to take place.
  - b) Determine time required for a settlement of 2.5cm to occur.
  - c) Compute the settlement that would occur in 1 year.

- 10) A concrete weir (shown in fig 2 ) of 44m length has to retain water upto 18m above GL . The cross section of the weir is shown in fig. The foundation soil consists of a 24m thick stratum of sand having  $k=0.015\text{cm/sec}$ .
- Determine the quantity of seepage loss that will occur in one day, if width of the weir be 65m.
  - Determine Exit gradient if the smallest flow channel has a length of 1.2m
  - Determine the FOS against piping if the soil has  $G=2.65$  and  $e=1.08$ .
  - Determine Piezometric head and uplift pressure at points A,B and C



**Figure 2** Flow net under a concrete dam