

B.TECH 6<sup>TH</sup> SEM (CIVIL) EXAMINATION  
MAY-2013  
GEO TECHNOLOGY  
PAPER-CE-306-F

1. State whether the following statements are true or false :

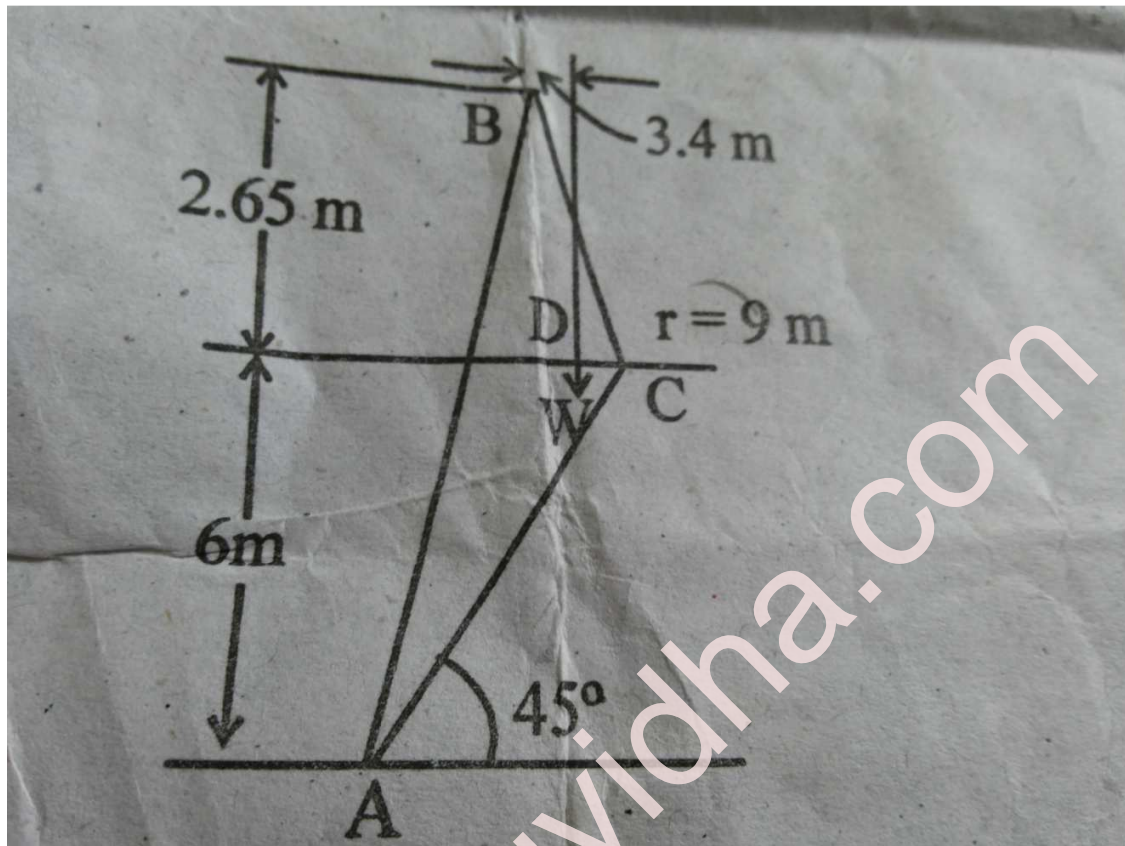
- i) In clay, inclination of a stable slope can be more than the angle of shearing resistance of soil.
- ii) Taylor's stability charts are based on the friction method using 'total stress' analysis.
- iii) In the Swedish circle method of analysis, the interslice forces are ignored for all sides.
- iv) The sheeting can be considered to tilt about its top.
- v) Failure of one of the struts behind bracings would lead to the failure of entire bracing system.
- vi) The anchors depend on the passive resistance for their stability.
- vii) Cantilever sheet piles can be used only up to a very moderate height above the dredge level.
- viii) Value of  $C_u$  recommended by Barkan are for a base area of 10 m<sup>2</sup> or less.

$$8 \times 1.5 = 20$$

**SECTION-A**

2. (a) Explain, in detail, the stability analysis of downstream slope during steady seepage.

(b) A 45° slope has been excavated to a depth of 6 m in a saturated clay having  $C_u = 50 \text{ kPa}$ ;  $\phi_u = 0$ ;  $\gamma = 19 \text{ kN/m}^3$ ; for a trial slip surface as shown below.



Determine the factor of safety and also find the minimum value of FOS for given slope.

$$6 + 14 = 20$$

3. (a) What is Taylor's Stability Number ?
3. (b) Calculate the F.O.S. with respect to cohesion of a Clayey slope laid at 1 in 2 to a height of 10 m. Take the value of angle of internal friction as  $10^\circ$ ;  $C = 25 \text{ kN/m}^2$ ; Density =  $19 \text{ kN/m}^3$ ;  $S_n = 0.064$ . Find critical height.

$$6 + 14 = 20$$

### SECTION-B

4. (a) How is the stability of braced system ensured against heaving of the bottom ?
4. (b) A cut 5m wide 10m deep is proposed in a cohesionless deposit ( $\phi = 30^\circ$  and  $C = 0$ ). Assuming the first rows of struts to be

located at 1.0 m below ground level and spacing between struts as 1.5 m, calculate the maximum strut load. Assume horizontal spacing of struts as 3m;  $\gamma = 20 \text{ kN/m}^3$  and  $\delta = 15^\circ$ . 6+14= 20

5. (a) What is a coffer dam? Explain the relative merits and demerits of different types of coffer dams.

5. (b) What are the parameters for designing of cellular coffer dams. 10+10 = 20

### SECTION-C

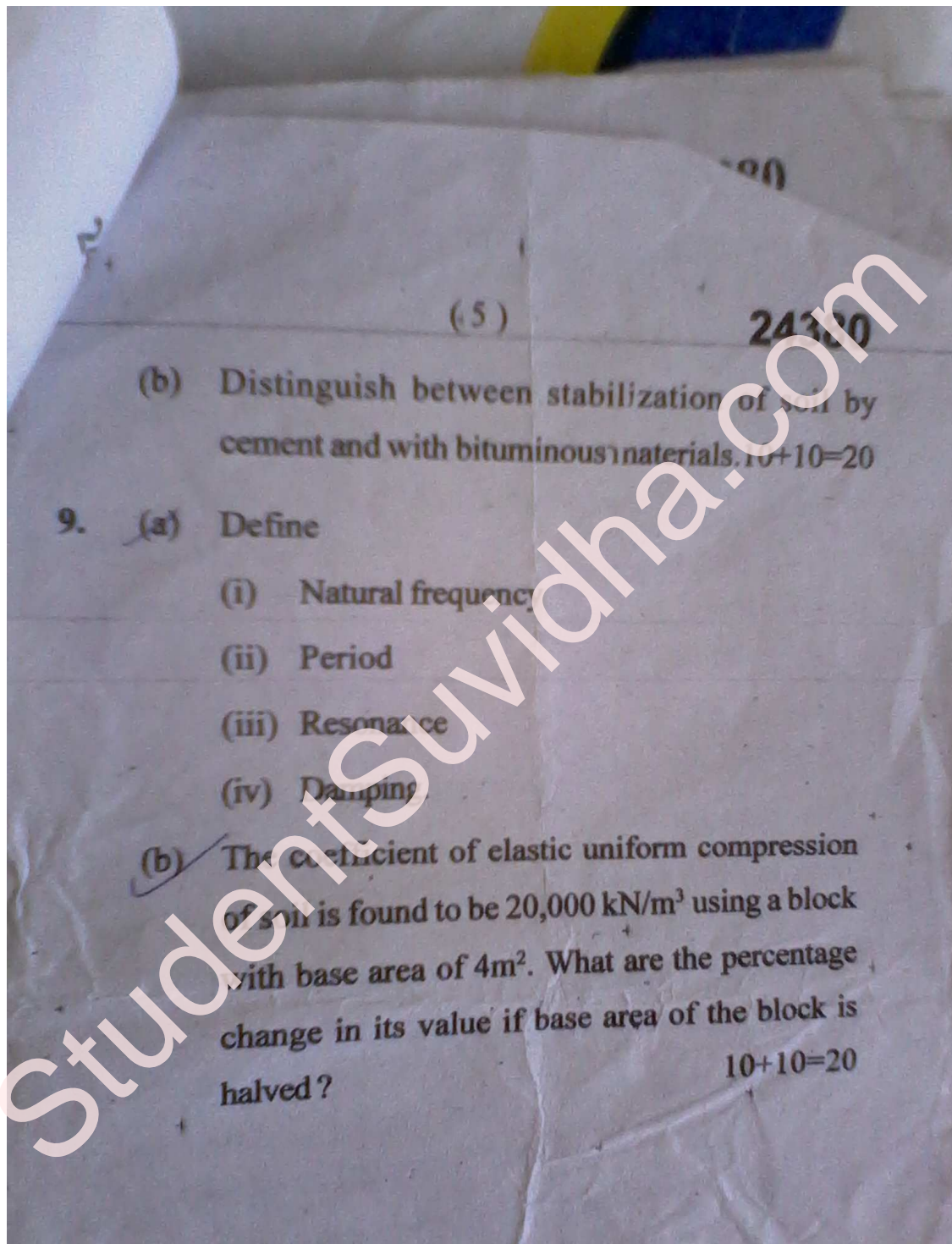
6. An anchored sheet pile wall of total height 15m is penetrated 4.5m into a sandy stratum. It retains a similar sandy soil on its back upto top with a horizontal ground surface. The tie bars are horizontal at a depth of 2m below top. The free water level stands at a height of 8m above dredge line on both sides of the wall. The bulk density of sand above free water level is  $16 \text{ kN/m}^3$  and submerged density below water level is  $10 \text{ kN/m}^3$ . The angle of internal friction of sand is  $35^\circ$ . Determine the factor of safety w.r.t. passive resistance of soil for given depth of penetration.

7. An anchored bulkhead (free earth support) is 4.5m high and retains sand on both sides. If the anchor rod is at a depth of 0.9m below the top and depth of embedment is 1.5m; determine FS against failure. Assume  $\phi = 30^\circ$ , submerged weight of sand =  $10 \text{ kN/m}^3$ . 20

### Section-D

8. (a) What is blending and how does it improve the soil properties?





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