JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- December 2018

B.Tech VII Semester

COURSE CODE: 10B13CE736 MAX. MARKS: 35

COURSE NAME: UNDERGROUND TECHNOLOGY

COURSE CREDITS: 03 MAX. TIME: 2Hrs

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. A cut 10 m deep is excavated in sand (ϕ = 30° and γ = 17 kN/m^3) and is to be braced by sheeting and bracing system as shown in **Fig. 1 (a)**. The top strut will be at 0.5 m below the G.L., followed by subsequent struts at every 1.5 m centre to centre in vertical direction. The spacing of struts along the cut is 3 m centre to centre. The influence zone for top, middle and bottom strut is shown in **Fig. 1 (b)**. Compute the top, middle and bottom strut loads. **[8]**

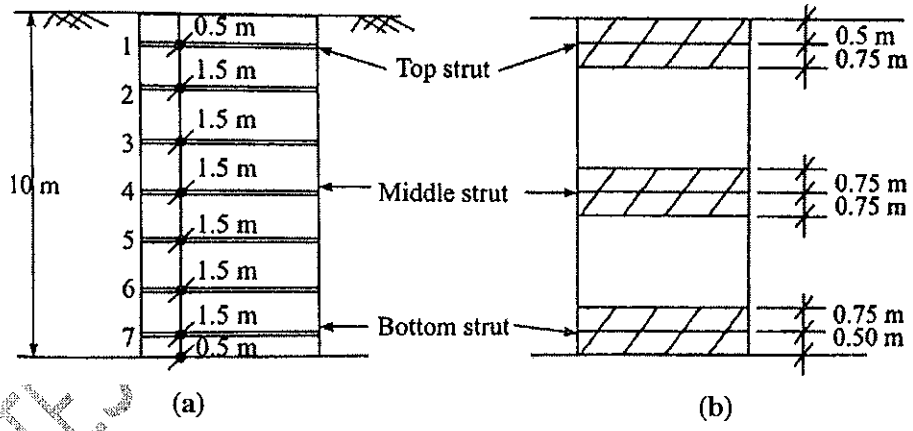

Fig. 1

2. Explain with reasons which type of shield tunneling equipment should be used in the following soil conditions:

a) Soil A: CLAY, stiff and moist

b) Soil B: SILT, clayey, soft, saturated (below water table)

c) Soil C: SAND, medium to coarse, saturated (below water table) **[2+2+2 = 6]**

3. Explain the phenomenon of 'Arching of soil'. State the assumptions of Cain's theory of soil arching and derive the solution for $q = 0$ and $c = 0$ condition. Also describe the significance of soil arching during designing of shallow and deep tunnel linings. **[1+4+2 = 7]**

4. Compute the embedment depth 'D' of the sheet pile wall as shown in **Fig. 2.** **[8]**

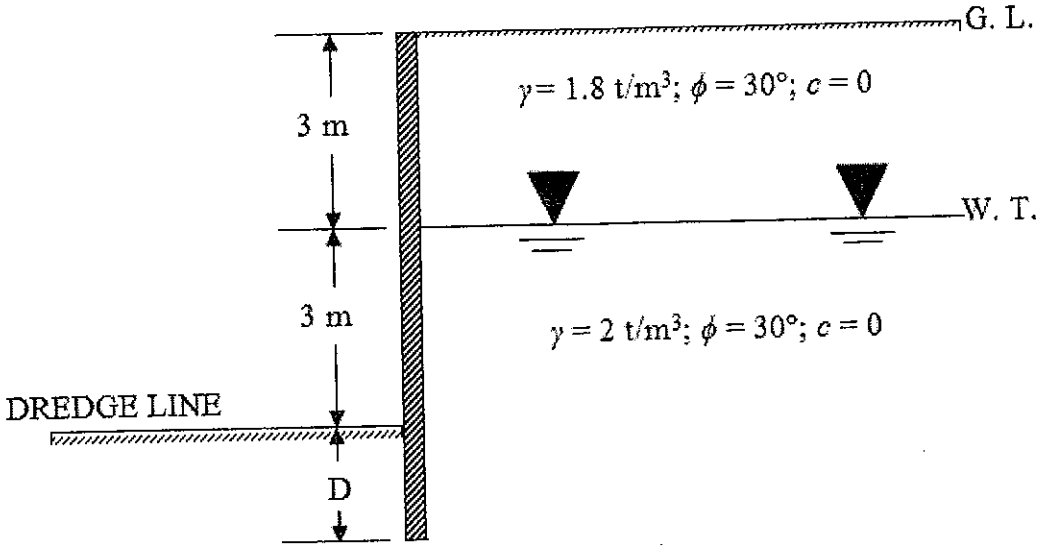

Fig. 2

5. Find the maximum grout pressure that can be applied for permeation grouting at point A in the loose sand layer shown in **Fig. 3.** **[6]**

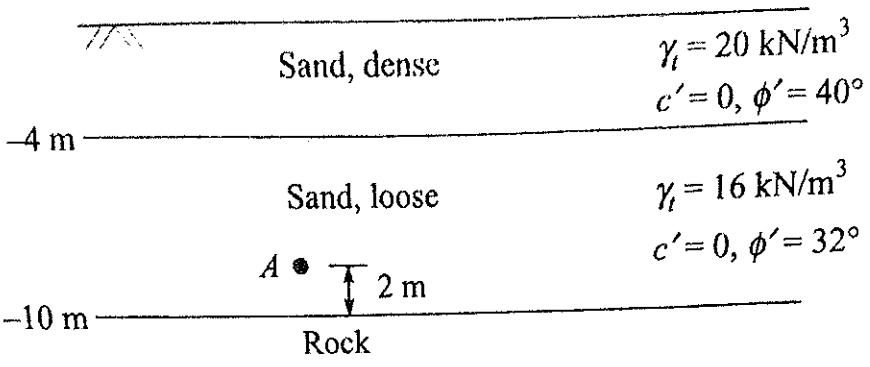

Fig. 3