



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019**

COURSE NAME : SITE INVESTIGATION
COURSE CODE : BNC 31803
PROGRAMME CODE : BNC
EXAMINATION DATE : JUNE / JULY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

- Q1** (a) Subsurface exploration work required samples (disturbed and undisturbed samples) to be brought back to the laboratory for further testing analysis. Briefly assess the purpose and usage of disturbed and undisturbed samples in preparing a detailed site investigation report. (6 marks)
- (b) A thin-walled Shelby tube sampler was pushed into soft clay at the bottom of a borehole a distance of 600 mm. When the tube was recovered, a measurement down inside the tube indicated a recovered sample length of 400mm.
- (i) Determine the recovery ratio R_r of the sample. (2 marks)
- (ii) If a tube having an external diameter of 89 mm and wall thickness of 1.7 mm was used. Examine the quality of the sample, and give comments whether the tube could be used for obtaining undisturbed sample. (4 marks)
- (iii) If a Shelby tube sampler was not available during a site investigation work, recommend any **TWO (2)** other samplers that can be used to obtain soil sample that has almost the same quality as sample retrieved from a Shelby tube sampler. (2 marks)
- (c) A property developer wants to build a subdivision consisting of 500 residences, a shopping mall, and five office buildings near your college. Assume that the total area is 50 hectares. The developer hires you to conduct a soil investigation as part of the due diligence process. Analyse how many borehole and depth of the borehole should be conducted with a valid reason. Write down (if any) the relevant equations too. (6 marks)

- Q2** (a) Point out the important steps in designing the proper site layout to make sure the planning and activities at site run smoothly and efficiently. (8 marks)
- (b) Discuss **THREE (3)** elements in site layout for a site designed to maximize efficiency of operations in order to promote worker productivity, shorten project time and reduce cost. (6 marks)
- (c) Construct a minimum temporary storage area for common plywood 1/2 inches thick, which comes in a bundle (100 pcs/bundle) in 42 foot transporter if storage method does not overlap each bundle.
- Given:
Plywood size = 4ft x 8 ft \approx 1.2m x 2.4m
Transporter dimension = 42 ft x 8 ft \approx 12.8m x 2.4m
Assume extension factor, $k = 1.2$ (6 marks).
- Q3** (a) Define earthmoving and grading in the perspective of civil engineering. (4 marks)
- (b) A ditch having a cross-sectional area of 4.6 m² is being excavated in common earth. The soil's angle of repose is 35° and its swell is 25%. Calculate the height and width of the spoil bank that will result from trench excavation. (6 marks)
- (c) Earth moving equipment covers a broad range of machines that can excavate and grade soil and rock, along with other jobs. In Malaysia, the role of heavy equipments in construction industry is indispensable. As a project engineer for the construction 4 blocks apartment in Johor Bahru, suggest a suitable earth moving equipment for the site construction with considerate scale of project. (10 marks)

- Q4** (a) Ground improvement is defined as the controlled alteration of the state, nature or mass behaviour of ground materials in order to achieve an intended satisfactory response to existing or projected weight thereon. Illustrate the ground improvements of compressible surface layers by pre-loading and vertical drain methods. (6 marks)
- (b) Suggest **TWO (2)** waste materials reuse efforts for soil improvement. (4 marks)
- (c) Enumerate various geo-synthetics commonly used for ground improvement techniques.
- (i) Discuss in detail **THREE (3)** main function of geo-synthetic. (6 marks)
- (ii) Examine how reinforcement of soil beneath foundation is done with neat sketches. (4 marks)
- Q5** (a) Soil permeability depends on the properties of the soil including the size and arrangement of the soil particles, and the resulting pore spaces formed when the particles are in contact. Explain **THREE (3)** flow conditions of the soil related to the soil particles and voids. (3 marks)
- (b) Groundwater control describes the range of engineering techniques used to allow engineering excavations and mines to be constructed below groundwater level in workably dry, stable and safe conditions. Dewatering is the one of the main types of groundwater control techniques. With the aid of sketches, clarify **THERE (3)** dewatering techniques commonly used in construction. (9 marks)
- (c) Examine **FOUR (4)** criteria influencing in the selection of the dewatering system in consideration the effective cost of the installation system during the construction works. (8 marks)

-END OF QUESTIONS -

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Equation

$$R_r = \frac{\text{Length of the sample within the tube, } L}{\text{Depth of penetration of the sampling tube, } H}$$

$$\text{Area ratio, } A_r = \frac{D_2^2 - D_1^2}{D_1^2}$$

Volume, $V = \text{section area} \times \text{Length}$

$$\text{Width, } W = \left[\frac{4V}{L \times \tan R} \right]^{\frac{1}{2}}$$

$$\text{Height, } H = \left[\frac{B \times \tan R}{2} \right]$$