

UNIVERSITY OF ASIA PACIFIC, DHAKA, BANGLADESH
Department of Civil Engineering
Mid-term Examination, CE 6402: Soil Mechanics- II
Full Marks: 100, Time: 1 Hour 30 Minutes, Exam Date: 29/11/2018
Course Instructor: Professor Md. Zoynul Abedin

- *There are EIGHT Questions. Answer ALL of them.*
 - *Questions are of equal value.*
 - *Answers should be brief and to the point.*
 - *Assume reasonable value(s) of any data, if missing.*
1. Describe with neat schematic diagram the various types of ground water that exist in nature?
 2. Derive the expression for porewater pressure in partially saturated soil, $u = u_a - \chi(u_a - u_w)$, where the symbols have their own meaning.
 3. An excavation is to be performed in a stratum of clay 9 m thick underlain by a bed of sand. In a trial borehole, the groundwater is observed to rise up to an elevation of 3 m below the ground surface. The unit weight of the clay layer above and below the water table is 18 kN/m^3 and 20 kN/m^3 respectively.
 - (i) Find the depth to which the excavation can be safely carried out without the bottom becoming unstable under uplift pressure of ground water.
 - (ii) If the excavation is to be carried to a depth of 7 m, how much should the water table be lowered in the vicinity of the trench?
 4. In a cold weather region the depth of frost penetration is 0.6 m. The soil has a void ratio of 0.5. Calculate the amount of surface heave that might occur due to frost heave.
 5. The void ratio of a soil is 0.45 and the effective grain size (D_{10}) is 0.05 mm. Estimate the suction index (pF) of the soil. Assume $C = 30$.
 6. A confined aquifer comprises a 4 m thick layer of sand overlain by a 3 m thick layer of clay and underlain by impermeable rock. The unit weights of the sand and clay respectively are 19.8 kN/m^3 and 18.2 kN/m^3 . Determine the effective overburden stress at the top and bottom of the sand layer, when the levels of the water in a standpipe driven through the clay into the sand layer are: (i) 2 m below the ground surface; and (ii) 2 m above the ground surface.
 7. Tests on the soil forming a road subgrade have shown a liquid limit of 54, a plastic limit of 20 and a unit weight of 18.6 kN/m^3 . The water table is expected to remain stable at a depth of 1.5 m below formation level. The water content at a depth of 0.5 m below formation level was found to be 23 immediately prior to construction. The road formation will transmit a contact pressure of 5.8 kN/m^2 . Assuming an average water content/suction relationship of $w = 50 + 10pF$, calculate the equilibrium water content for the soil at this point and so determine whether shrinking or swelling might occur after construction.
 8. Comment on the degree of saturation of the soil estimating the relevant pore pressure coefficient having a void ratio of 0.45, and soil skeleton compressibility of $120 \times 10^{-6} \text{ m}^2/\text{kN}$. The compressibility of water may be assumed as $0.454 \times 10^{-6} \text{ m}^2/\text{kN}$. Given that, $B = \frac{1}{1+n\frac{C_w}{C_s}}$.

(STUDENTS ARE REQUIRED TO SUBMIT THE ANSWERS OF ALL UNANSWERED QUESTIONS BY 4TH DECEMBER, 2018)

-----GOOD LUCK-----

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall 2018
Program: M.Sc. Engineering (Civil)

Course Title: Environmental Impact Assessment
Time: 1-hour

Course Code: CE 6311
Full Marks: 40

Answer the following questions.

1. (a) The upsurge of environmental concerns throughout 60s' in the US led to the enactment of the National Environmental Policy Act, NEPA 1969 that called for consideration of environmental values in decision making for development. The US set forth its guiding principles for environmental protection in NEPA 1969. What are these NEPA environmental principles? The Environment Conservation Act (ECA) 1995 constitutes the legal basis for undertaking EIA for any industry or development project in Bangladesh. Elaborate this statement and explain the processes/steps of obtaining 'Environmental Clearance Certificate (ECC)' from the Director General of the Department of Environment, for any 'RED' category project. **[10]**
- (b) The 1972 UN Stockholm Conference on the Human Environment set forth 26 principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment. Twenty years later in 1992, the UN Conference on Environment and Development (UNCED), held in Rio de Janeiro reaffirmed the work that had been done in Stockholm and found it desirable to add 27 more to the original list of principles. What are the important environmental issues that these guiding principles primarily deal with? **[10]**
2. (a) 'The purpose of IEE is not to exclude some of the environmental parameters and make the exercise less costly and less time consuming, rather it is the depth of details that differs from a full-scale EIA' – Explain this statement. How the nature and size of a project, and project location may influence the decision of undertaking IEE or EIA for the project? Explain with examples. **[10]**
- (b) Show, with a neat diagram, the relationship between the stages of conventional project cycle and the EIA steps. Explain briefly, how such relationships can lead to environmental safeguard and ensue sustainable development. **[10]**

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2018
Program: Master of Civil Engineering (MCE)

Course Title: Advanced Concrete Technology
 Time: 1 hour

Course Code: CE 6201
 Full Marks: 40 (8+20+6+6)

Answer all questions

1. “Incorporating of fly ash in Ordinary Portland Cement (OPC) decreases the amount of Calcium Hydroxide $[Ca(OH)_2]$ and then enhance the mechanical and durability performances of concrete”. If the statement is true, then justify the aforementioned statement with chemical reaction and proper comments. [8]
2. For a nuclear power plant construction, three types of cement (A, B, and C) have been chosen and technical data sheets are collected to pre-investigate the performance of cement in order to find suitable concrete for that construction. The chemical constituent of cement (A, B, and C) is given in Table 1. [10+6+4 = 20]

Table 1: Chemical constituent of cement (A, B, and C)

Bulk Oxide Content	Percentage in Cement		
	A	B	C
CaO	75	59	56
SiO ₂	26	22	20
Al ₂ O ₃	5	4	9
Fe ₂ O ₃	3	7	2
MgO	1.3	1.1	1.4
SO ₃	1	2.5	2
K ₂ O	0.3	0.2	0.4
Na ₂ O	0.3	0.3	0.5
LOI	0.2	2.9	1.6

- (i) Calculate the silica modulus, alumina modulus, and Bogue compound contents of three cement (A, B, and C).
 - (ii) From Bogue analysis, find the cements that will provide higher heat and higher strength of concrete. Based on the knowledge of cement chemistry, make comments on the mechanical and durability performance of concrete if the concrete is made with those cements.
 - (iii) Based on the silica modulus, alumina modulus, and Bogue analysis, propose a suitable cement for the nuclear power plant construction and justify your selection.
3. “The purpose of air entrainment in concrete is to protect concrete from cracks due to freezing and thawing cycles”. Explain the statement using schematic diagram and proper comments. [6]
- Or**
- “Fire performance of concrete made with 75% Ordinary Portland cement and 25% silica fume is not very good”. Justify the statement [6]
4. Sketch schematic diagram of failure mode of normal strength and high strength concrete in compression, explain. [6]