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

Course Title: Environmental Impact Assessment (EIA) Course Code: CE 6311
Time: 03 hours Full Marks: 100

There are Six (6) questions. Answer any Five (5) questions

Question 1 [Marks: 5+6+9]
What is the use of a value function curve in "Environmental Evaluation System" (EES)? How would you construct a value function curve? Explain with a suitable example how the value function curves for environmental parameters are used in EES?

Question 2 [Marks: 5+9+6]
Explain the role of baseline studies in EIA. What are some common problems in environmental baseline studies? How environmental baseline studies are closely linked to environmental monitoring?

Question 3 [Marks: 7+6+7]
"Site selection represents the first opportunity for reducing environmental impacts from a proposed development." – Explain. What constitutes an EMP? What are the important steps that should be considered in incorporating mitigation measures to reduce the scale of impacts to acceptable levels?

Question 4 [Marks: 9+4+7]
Explain with examples the differences between "baseline monitoring", "impact monitoring" and "compliance monitoring". What are 'Monitoring Indicators'? Give examples of monitoring indicators that reflect impacts on surface water quality, wetland habitat, and the socio-economic conditions of people.

Question 5 [Marks: 6+6+8]
Who are the key stakeholders for consultations during an EIA study? What are the principles that should be followed for effective public involvement/stakeholders' consultations? What strategies in stakeholders' consultation can minimize conflict?

Question 6 [Marks: 5+8+7]
What is the purpose of review of an EIA report? If you are given the responsibility of reviewing an EIA report what specific issues would you look into for a comprehensive review of the report? What key issues would you review related to managing and mitigating impacts in the EIA report?

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: M. Sc / M. Engg (Civil)

Course Title: Advanced Concrete Technology | Course Code: CE 6201
Time: 3 hours | Full Marks: 100

Answer all questions

QUESTION 1 [20 MARKS]

An industrial Reinforced Concrete (RC) roof slab will be constructed which is sensitive to thermal expansion due to direct exposer to the sun. In order to minimize/reduce the thermal effect, three types of cement (A, B, and C) have been chosen and technical data sheets are collected to pre-investigate the performance of cement. The chemical constituent of cement (A, B, and C) is given in Table 1.

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

Bulk Oxide Content	Percentage in Cement		
	A	B	C
CaO	60	61	67
SiO_2	18	18	25
Al_2O_3	5	14	4
Fe_2O_3	3	7	3
MgO	1.3	1.1	1.4
SO_3	1	2.5	2
K_2O	0.3	0.2	0.4
Na_2O	0.3	0.3	0.5
LOI	0.2	2.9	1.6

(i) Calculate the silica modulus and alumina modulus of three types of cement. **[3]**

(ii) Using Bogue's equation, determine the major chemical compounds of those cements and highlight the expected performance of the concrete mixes of a given composition when these cements will be used, with reference to the following: (a) temperature increase in concrete floor slab; (b) rate of strength development; (c) concrete microstructure; (d) concrete durability (i.e., porosity, permeability, and water absorption capacity). **[12]**

(iii) Propose a suitable cement for the industrial RC floor and justify your selection through analysis of given data. **[5]**

QUESTION 2 [5 MARKS]

"Fire performance of concrete made with 75% Ordinary Portland cement and 25% silica fume is not very good". Justify the statement. **[5]**

Or

"The purpose of air entrainment in concrete is to protect concrete from cracks due to freezing and thawing cycles". Explain the statement using the schematic diagram and proper mechanism.

QUESTION 3 [15 MARKS]

Ultra-High Performance Concrete (UHPC) has recently gained popularity in abroad due to reduction of the dead load of the structure and providing more space. Within this context, an industrial concrete slab having with length 20 m, width 10 m, and thickness 0.2 m will be constructed.

The following necessary data are provided for the mix design of UHPC:

Specific gravity of Ordinary Portland Cement (OPC) = 3.15
Specific gravity of Nano-Fly Ash (NFA) = 2.40
Binder (in weight) = 80% OPC + 20% NFA
Specific gravity of fine aggregate = 2.6
Water to binder ratio (w/b) = 0.20
Fine aggregate to binder ratio = 1.1
Entrapped air in compacted concrete = 1%

Concrete is considered as mortar since there is no coarse aggregate in UHPC. Assume that the fine aggregate is in the Saturated Surface Dry (SSD) condition and consider weight basis mix design for the calculation. Determine the following:

(i) Calculate the amount of binder (OPC and NFA), fine aggregate, and water per unit cubic meter of concrete (i.e., mortar). **[8]**

(ii) Determine the quantity of cement, nano-fly ash, fine aggregate, and water are required for the casting of the slab (20 m x 10 m x 0.2 m) and 9 cubes (50 mm x 50 mm x 50 mm) to monitor the strength of UHPC at 7, 14, and 28 days (3 cubes/test age). Allowing 20% wastage of concrete. **[5]**

(iii) In order to improve the ductility of UHPC, steel fiber is added at 3% of total concrete volume. Calculate the total amount of steel fibers is required to make the concrete slab. Assume the density of steel fiber is equal to the density of steel. **[2]**

QUESTION 4 [10 MARKS]

Discuss the lateral pressure on concrete formwork using a typical pressure diagram. Illustrate the key factors that affect the concrete pressure on formwork. **[6+4 =10]**

QUESTION 5 [10 MARKS]

Sketch the shrinkage and water loos relation for cement paste and discuss the effect of different water loos on shrinkage. **[10]**

Or

Explain the mechanisms involved in concrete deterioration due to sulphate attack.

QUESTION 6 [10 MARKS]

Discuss the potential mechanisms (pore pressure and thermal stress) of concrete spalling due to fire. **[10]**

QUESTION 7 [10 MARKS]

Sketch the schematic cross-section of pullout test at cast-in-place and explain the test procedure. Provide the equation for calculating nominal normal stress. **[8+2 =10]**

QUESTION 8 [20 MARKS]

In the literature, it is shown that the hybrid fibers (i.e., combination of polypropylene and nylon fibers) can mitigate the risk of fire spalling of concrete due to reducing the pore pressure and thermal stress caused by higher thermal• cracks. Within this context, three concrete (A, B, and C) has been selected and water absorption capacity test has been conducted in all concrete specimens at 1 hour after heat treatment (T = 160, 220, 400°C). The water absorption tests are measured on 150 mm in diameter and 70 mm thickness concrete disc. It is noted that among three concrete, one of the concrete contains a certain percentage of hybrid fibers. The test data at 1 hour are given below:

	Concrete	160°C	220°C	400°C
Mass of dry specimen [gm]	A	1480	1510	1550
	B	1490	1530	1585
	C	1620	1650	1720
Mass of wet specimen at 1 hour [gm]	A	1520	1555	1615
	B	1520	1565	1620
	C	1675	1745	1825

(i) Calculate the water absorption coefficient at 1h of three concretes for each temperature. **[4]**

(ii) The absorption coefficient of three concretes A, B, and C at 20•C are 1.1, 0.8, and 0.8 kg/m^2, respectively. Draw the evolution of absorption coefficient as a function of temperature (T = 20, 160, 220 and 400•C). Identify the concrete containing hybrid fibers and justify your selection. **[10]**

(iii) According to the knowledge of fire behavior of concrete, explain with proper mechanism how presence of hybrid fibers in the concrete matrix help to minimize the risk of fire spalling. **[6]**

Final Examination

CE 6609: River Engineering

Total Marks: 120, Duration: 3 Hours

Attempt all questions

(Symbols have their usual meaning; Relevant formulas are given)

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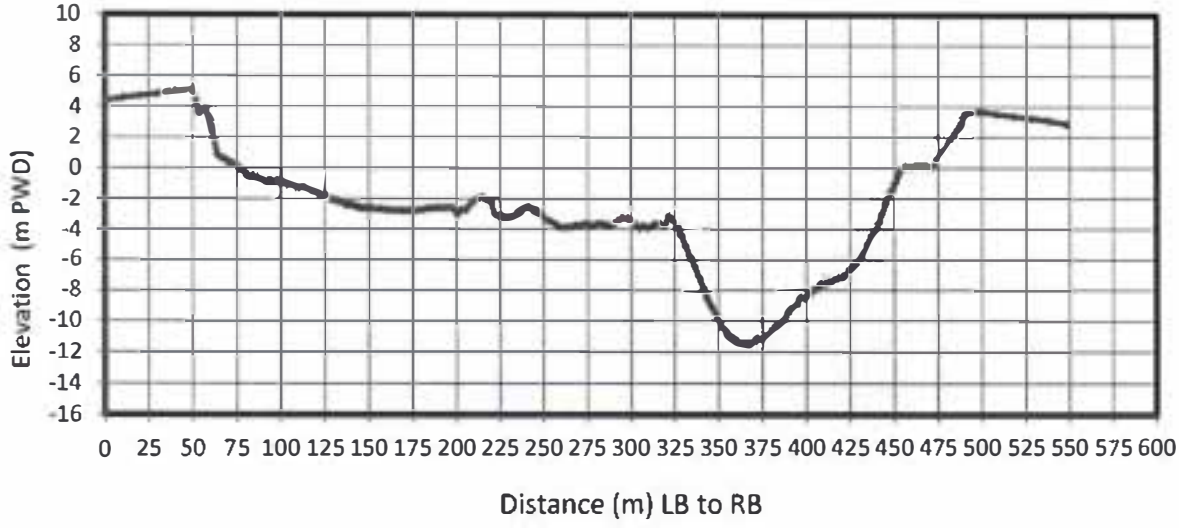
1. a) Define bed load, suspended load and wash load. (5)

   b) Derive DuBoys Formula for computing bed load transport rate. (5)

   c) During flood, the Kumar river has an average width and depth of 70 m and 5 m respectively. If the average velocity during the flood is 1.5 m/s, compute bed load transport rate using DuBoys formula. The average water surface slope during flood is 0.00007 and d_{50}=0.0002 m. (10)

2. A bridge is to be constructed over the Dhaleswari River with 5 equal spans at the cross section shown below where the average height of the dunes is 5 m. The spill through type abutments of the bridge will be located at the 75 m and 475 m from the left bank. The length and width of each rectangular pier are 15 and 10 m respectively and the piers are aligned with the flow. The grain size distribution of the bed material gives a median diameter of 0.2 mm. The average water surface slope at the design water level of 4.0 m PWD is 0.00003. The area of the flow is 4500 m^2 approximately.

- Compute the minimum level of scour of the pier at thalweg. (15)
- After construction it was found that the bridge piers are skewed 20^0 with the flow. What would be the new estimate of the local scour only at the thalweg under this condition? Comment on the effect of skewness on local scour. (5)



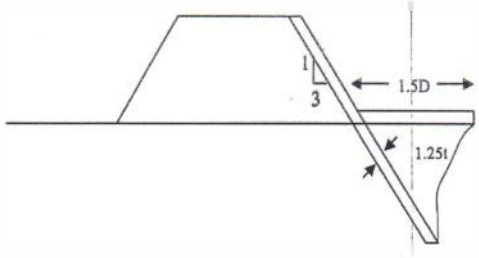
3. a) Derive the formulas of predicting equilibrium water level and bed level due to water withdrawal in a channel with constant width and constant upstream flow. (6)

b) A 1 km wide river with a steady flow rate of 25000 m^3/s falls into a lake whose water level is kept constant at 10 m PWD. The bed level of the river at downstream end is 2 m PWD and the bed slope is 0.00011 m/m. The upstream sediment transport rate is 6.5 m^3/s. Compute the resulting water and bed level if only sediment is withdrawn at 10 km upstream at 2.0 m^3/s (assume b=3). Show the results in neat sketches. (14)

4. a) Show the flow and scour pattern of different types of groyne in neat sketches. (6)

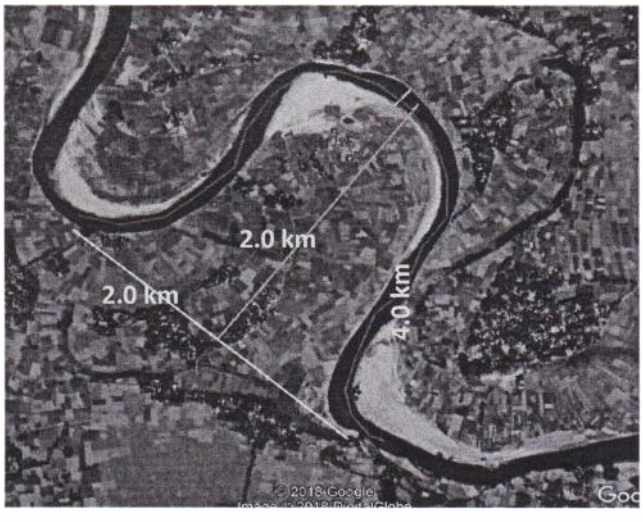
b) Find the total volume of stone required in per m for the shank portion as given below: (14)

River bed level = 100.00 m
Highest flood level = 104.00 m
Q=7000 m^3/s
Water Depth = 4m
D_{50}=0.15 mm
Use X = 1.25



5. a) Briefly describe the morphological features of the rivers in the four regions as classified in Chang's graphical relationship. (6)

(b) It is decided to cut off the bend of the following meandering river to reduce the bank erosion. The peak discharge is 60000 cfs and D_{50}=0.15 mm. The difference in bed elevations at the start and end of the cut-off is 25 cm. Determine the equilibrium morphological conditions before and after the cut-off. (14)



6. A bank protection measure is needed to control the erosion of a moderate meandering river. It is decided that a revetment is to be constructed to protect the eroding bank. Design the nominal size of hand placed cc block for the slope portion above low water level (LWL) and the nominal and median size of rock for the slope below LWL. Consider that the flow profile is not fully developed. Use the Pilarczyk equation.

   Following data are available. Assume reasonable value of any data if needed. (20)

Discharge (Q):	70,000.00	m^3/sec
Velocity (u):	3.50	m/sec
High Water Level (HWL):	10.7	m, PWD
Low Water Level (LWL):	5.7	m, PWD
Flood Plain Level (FPL):	11.0	m, PWD
Design bank slope:	1V:2.5H	
Soil type	A	
River bed level	1.7	m, PWD

Angle of repose θ for various revetment cover layers (Pilarczyk 2000)

Revetment type	θ , angle of repose
Rip-rap	40^0
Sand filled systems	30^0~40^0
Stiff and anchored mortared-filled mattresses and block mats (cabled)	90^0

Critical Shield's Parameter Ψ_{cr}

Revetment Type	Ψ (-)
Riprap, small bags	0.035
Placed blocks, geobags	0.05
Blockmats	0.07
Gabions	0.07 (to 0.10)
Geomattresses	0.07

Values of stability factor (Pilarczyk 1998)

Revetment Type	Stability factor ϕ_{sc}	
Cover layer	Continuous protection [-]	Exposed edges transitions [-]
Randomly placed, broken riprap and boulders	0.75	1.5
CC blocks, cubical shape, randomly placed in multi layer	0.80	1.50
CC blocks, cubical shape hand placed in single layer chess pattern	0.65	1.25
Riprap and placed blocks; Sand fill units	1.0	1.50
Block mats, gabions, washed-in blocks, geo-bags, concrete filled geo-bags and geo-mattresses, wire-mesh mattress	0.5	1.00
Gabions/ mattress filling by stones	0.75	1.5

Turbulence Intensity Factor K_τ (current) (FAP 21/22)

Turbulence Intensity	K_τ(-) Gabions, Mattresses	K_τ (-) Others
Normal turbulence in rivers	1.0	1.0
Non-uniform flow with increased turbulence, mild outer bends	1.0	1.5
High turbulence, local disturbances, sharp outer bends	1.0	2.0
Jet impact, screw race velocity, hydraulic jump	3.0 - 4.0	3.0 - 4.0

Recommended grading range of stone filling for rip-rap and mattress system (after PIANC, 1987)

Revetment type	Stability factor for incipient motion φ[-]	Stability upgrading factor, Ψ_u [-]	Interaction coefficient, b [-]
Randomly placed, broken riprap and boulders	2.25-3.00	1.00-1.33	0.50
CC blocks, cubical shape, randomly placed in multi-layer	2.25-3.00	1.33-1.50	0.50
CC blocks, cubical shape, hand placed single layer (geotextile filter)	2.25	2.00	0.67 - 1.00
CC blocks, cubical shape, hand placed in single layer, chess pattern (geotextile on sand)	2.25	1.50	0.67 - 1.00
CC blocks cable connected	2.25	1.80	0.67
Wire mesh mattress	2.25	2.50	0.50
Gabions/mattress filling by stone	2.25	2.50	0.50

The equivalent diameter D_n can be estimated as follows:

For rock: $D_n = (M_{50}/\rho_s)^{0.33}$ or $D_n = 0.84\ D_{50}$

For placed blocks and block mats: D_n = D = thickness of block,

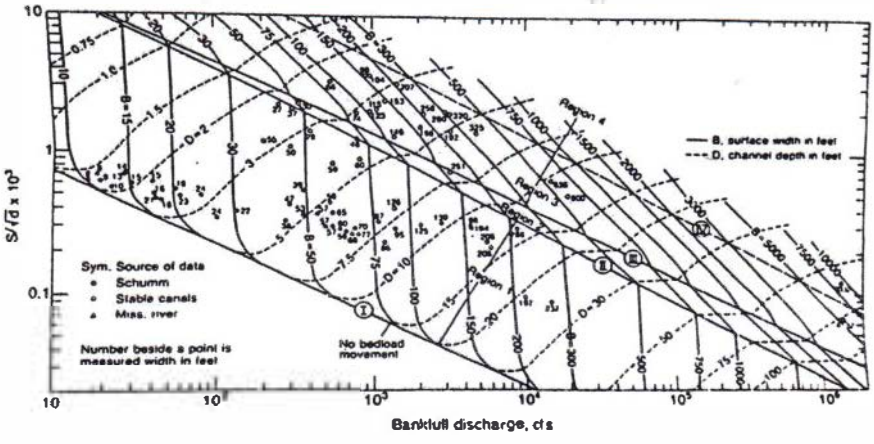


Fig: Chang's Graphical Method for Morphological Equilibrium

Relevant Formulas:

DuBoys, Bed-Load Formulas: $q_b = C_d\, T_0\, (T_0 - T_c)$

According to straub (1935), $C_d = \frac{0.17}{d^{3/4}}$ (m^3/kg/sec), Where d = in mm

$T_c = 0.061 + 0.093d$ (kg/m^2), Where d = in mm, and $T_0 = \gamma DS$

our due to General bed degradation, $Y_m = 0.47 \left(\frac{Q}{f}\right)^{\frac{1}{3}}$ where $f = 1.76\ (d_{50})^{1/2}$ and d_{50}= in mm

Scour due to constriction $Y_s = R' - Y$, And $R' = R \left(\frac{W}{L}\right)^{1.56}$

Local scour at bridge pier, $Y_s = 2.0\ K_1 K_2 K_3 K_4 a^{0.65} Y_1^{0.35} Fr_1^{0.43}$ where $K_2 = \left(Cos\theta + \frac{L}{a} Sin\theta\right)^{0.65}$

WITHDRAWL OF SEDIMENT: change of depth, $\frac{\Delta h}{h} = \frac{1}{\left(1 - \frac{\Delta Qs}{Qs}\right)^{\frac{1}{b}}} - 1$

Change of slope $\frac{\Delta S_b}{S_b} = \left[1 - \left(1 - \frac{\Delta Q_S}{Q_S}\right)^{\frac{3}{b}}\right]$

The thickness of stone pinching side = t = $\mathbf{0.06\ Q^{\frac{1}{3}}}$ **and** D = xR – y

Pilarczyk equation: $D_n \geq \frac{0.035 U^2\ \varphi_{sc} K_\tau K_h}{\Delta_m 2g K_s \Psi_{cr}}$

K_h = depth factor (for non-develop vel. Profile) = $(h/Dn+1)^{-0.2}$

$\Delta_m = (\rho s - \rho w)/\rho w$ and K_s = Bank normal slope factor = $[1 - (\sin\alpha/\sin\theta)^2]^{1/2}$