

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring 2019
Programme: B.Sc. Engineering (Civil)
(2nd Year 1st Semester)

Course Title: Bangladesh Studies: Society and Culture

Course Code: HSS 211(a)

Credit: 2

Time: 2 Hours

Full Marks: 100

Answer any **FOUR** questions of the following. Figures in the right margin indicate marks.

1. 'Technology shapes the nature of society.' Explain the statement in the light of G. E. Lenski's classification of society. 25
2. a) Define caste system. 5
b) Explain how caste as a type of social stratification is a closed system. 20
3. a) Define power. 5
b) Mention the major sources of power. 5
c) Briefly discuss authority as a legal source of power. 15
4. a) Define family. 5
b) Discuss the possible reasons for divorce and explain the effects of divorce on children. 20
5. a) Distinguish between material and non-material culture. 10
b) Show how and to what extent the culture of Bangladesh has changed with the influences of globalization. 15
6. Write short notes on
a) Violence against women 12.5
b) Capitalism and Socialism 12.5

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring 2019
Program: B. Sc. Engineering (Civil)
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Course code: HSS 211(b)
Total Time: 2.00 hrs.

Course Title: Bangladesh Studies: History

Credit: 2.00
Full Marks: 100

There are **Six** Questions. Answer any **Four**. All questions are of equal value. Figures in the right margin indicate marks.

1. a) Define the Permanent Settlement Act of 1793. 10
b) Discuss the merits and demerits of Permanent Settlement. 15
2. Write an essay on the social reforms of Raja Ram Mohan Roy. 25
3. a) Explain the reasons behind the Partition of Bengal in 1905. 10
b) Discuss the reaction of the Partition of Bengal. 15
4. a) Explain the causes of the beginning of the Language Movement of 1952. 10
b) Show the significance of the Language Movement in our national history. 15
5. a) Narrate elaborately the points of Six Points Demand of 1966. 12
b) Explain the impact of the Six Points Programme. 13
6. a) Write short note on 'Operation Search Light'. 10
b) Discuss the role of India in the liberation war of Bangladesh. 15

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination, Spring-2019
Program: B.Sc. in Civil Engineering

Course Title: Mathematics-III
Time: 3.00 Hour.

Course Code: MTH 201
Full Marks: 150

There are **Eight** questions. Answer any **Six**. All questions are of equal values, indicated in the right margin.

1. (a) Find rank and nullity of the following transformation 18

$$T: \mathbb{R}^4 \rightarrow \mathbb{R}^3 : T = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 2 & -1 & 2 & -1 \\ 1 & -3 & 2 & -2 \end{pmatrix}$$

- (b) Show that the following transformation defines a linear operator on 07
 $\mathbb{R}^3 : T(x, y, z) = (x + y, -x - y, z)$

2. (a) Verify Cayley-Hamilton theorem for $A = \begin{pmatrix} 1 & 0 & 1 \\ -1 & -1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$ 10

- (b) Find a matrix P that diagonalizes $A = \begin{pmatrix} 1 & 0 \\ 6 & -1 \end{pmatrix}$ also determine $P^{-1}AP$. 15

3. (a) Using Gaussian Elimination method solve the following system of linear 10

$$\text{equations } \begin{cases} 2x + y - 2z = 10 \\ 3x + 2y + 2z = 1 \\ 5x + 4y + 3z = 4 \end{cases}$$

- (b) Test whether the following set is linearly dependent or independent 15
 $\{(1,1,2), (1,0,1), (2,1,3)\}$

4. (a) If $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$, then show that $A^3 = A^2A = AA^2 = I$. 15

- (b) Show that A is a linear combination of the matrices A_1, A_2 and A_3 where 10

$$A = \begin{pmatrix} 3 & 1 \\ 1 & -1 \end{pmatrix}, A_1 = \begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}, A_2 = \begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}, A_3 = \begin{pmatrix} 0 & 2 \\ 0 & -1 \end{pmatrix}$$

5. (a) Find the mean of the following data 5

Class	8	10	15	20
Frequency	5	8	8	4

- (b) Calculate the mode and median of the frequency distribution given below. Hence calculate mean using empirical relation between them. 20

weight	30-40	40-50	50-60	60-70	70-80	80-90
frequency	18	37	45	27	15	8

6. (a) Calculate mean deviation and then quartile deviation using empirical relation for the following data 15

marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Number of students	6	5	8	15	7	6	3

- (b) Calculate variance for the following data 10

Profit(Lakhs)	10-20	20-30	30-40	40-50	50-60
No.of com.	8	12	20	6	4

7. (a) A pair of dice is thrown; find the probability that sum of the points on the two dice is 8 or greater if a 5 appears on the first die. **6**

(b) A random variable X has the following functional form **11**

$$f(x) = \begin{cases} kx^2, & 0 < x < 4 \\ 0, & \text{elsewhere} \end{cases}$$

- i) Determine k for which $f(x)$ is a density function
- ii) Find $P(1 < X < 3)$ and $P(X > 3)$

(c) Let X and Y have the following distribution **8**

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y), & 0 \leq x \leq 1, 0 \leq y \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

Check that $f(x, y)$ is a density function.

8. An analysis of companies resulted in the following distribution **25**

Earning(tk)	50-70	70-90	90-110	110-130	130-150	150-170	170-190
No. of employees	4	8	12	20	6	7	3

Calculate the first four moments about assumed mean. Convert the result into moments about the mean.

University of Asia Pacific

Department of Civil Engineering

Semester Final Examination, Spring-2019

Program: B.Sc Engineering (2nd Year / 1st Semester)

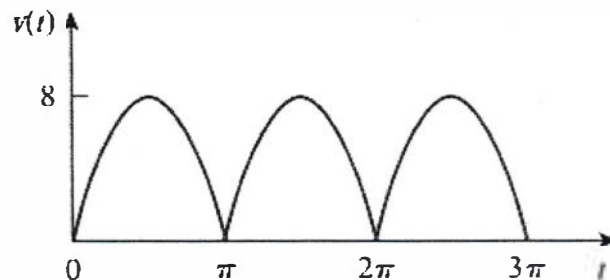
Course Title: Basic Electrical Engineering Course No. ECE (CE) 201 Credits: 3.00

Time: 3.00 Hours.

Full Marks: 150

There are **Eight** Questions. Answer any **Six**. Figures in the right margin indicate marks.

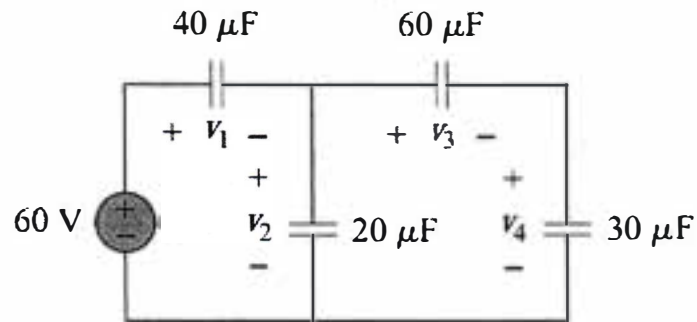
1. (a) Find the phase angle between $i_1 = -10\cos(377t + 50^\circ)$ and $i_2 = 12\sin(377t - 10^\circ)$ 10
Does i_1 lead or lag i_2 ?
- (b) For the inductor L , assume the current through it is $i = I_m \cos(\omega t + \phi)$. Show that, 10
the voltage across the inductor is $V = j\omega Li$.
- (c) Find the amplitude, phase, angular frequency, period, and frequency of the 5
sinusoid $v(t) = 12 \cos(50t + 10^\circ)$
2. (a) Find the rms voltage value of the full-wave rectified sine wave in the following 12
figure. Calculate the average power dissipated in a $6\text{-}\Omega$ resistor.



Waveform for question 2(a)

- (b) Obtain the power factor and the apparent power of a load whose impedance is $\mathbf{Z} = 60 + j40 \text{ }\Omega$ 13
when the applied voltage is $v(t) = 150 \cos(377t + 10^\circ) \text{ V}$.
Also, determine the circuit element values that form the series-connected load.
3. (a) Prove with necessary figure that the equivalent capacitance of series connected 12
capacitors is the reciprocal of the sum of the reciprocals of the individual
capacitances.

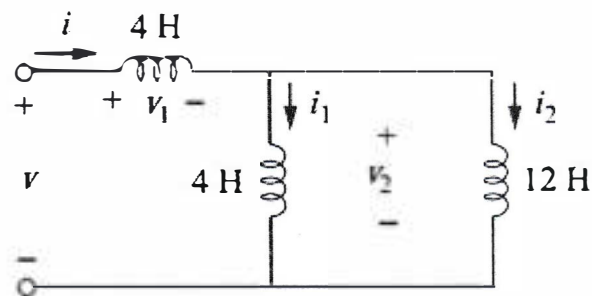
- (b) For the circuit in following figure, find the voltage across each of the capacitors. 13



Circuit diagram for question 3(b)

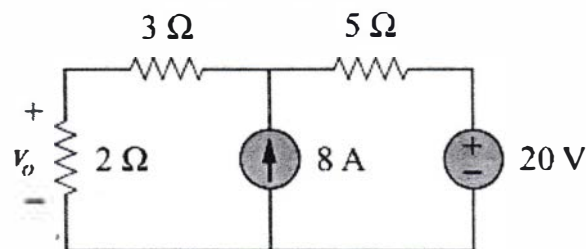
4. (a) Find the current through a 5-H inductor if the voltage across it is 10

$$v(t) = \begin{cases} 30t^2, & t > 0 \\ 0, & t < 0 \end{cases}$$
 Also find the energy stored within $0 < t < 5$ s.
- (b) For the circuit in following figure, $i(t) = 4(2 - e^{-10t})$ mA. If $i_2(0) = -1$ mA, find: 15
 (a) $i_1(0)$; (b) $v(t)$, $v_1(t)$, and $v_2(t)$; (c) $i_1(t)$ and $i_2(t)$.



Circuit diagram for question 4(b)

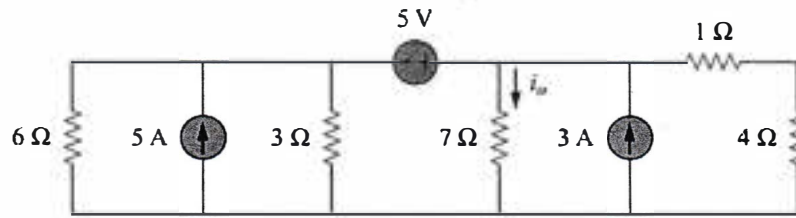
5. (a) Using the superposition theorem, find v_0 in the following circuit. 12



Circuit diagram for question 5(a)

(b) Find i_o in the following circuit using source transformation.

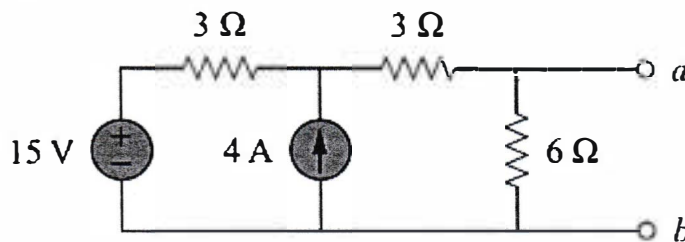
13



Circuit diagram for question 5(b)

6. (a) State Norton's theorem. Find the Norton equivalent circuit for the following circuit.

13



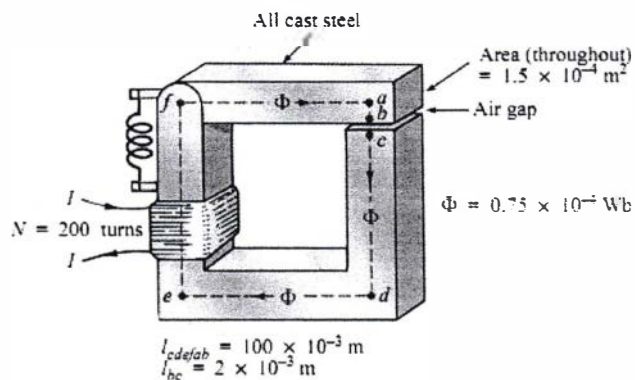
Circuit diagram for question 6(a)

(b) State and prove maximum power transfer theorem.

12

7. (a) Find the value of I required to establish a magnetic flux of $\Phi = 0.75 \times 10^{-4}$ Wb in the series magnetic circuit of following figure.

13



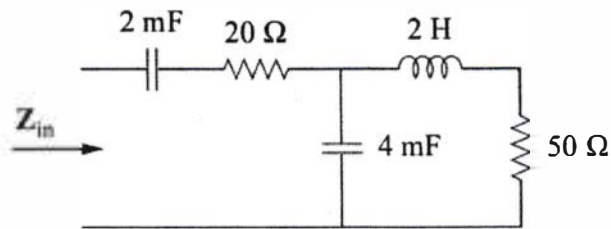
Circuit diagram for question 7(a)

Required B-H table for cast steel:

B(T)	0.1	0.2	0.3	0.4	0.5	0.6	0.7
H(At/m)	100	160	200	230	280	340	410

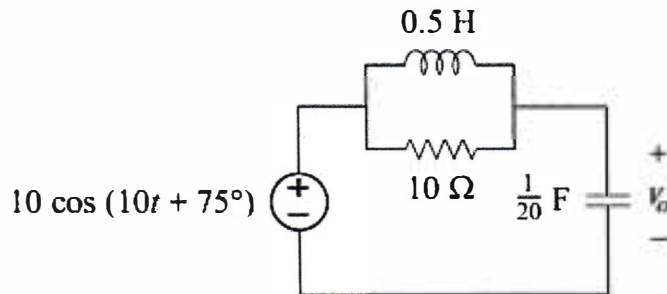
(b) Write short notes on (i) flux density (ii) magnetomotive force (iii) magnetizing force (iv) permeability 12

8. (a) Determine the input impedance of the circuit in the following figure at $\omega = 10$ rad/s. 12



Circuit diagram for question 8(a)

(b) Calculate V_o in the circuit of the following figure. 13



Circuit diagram for question 8(b)

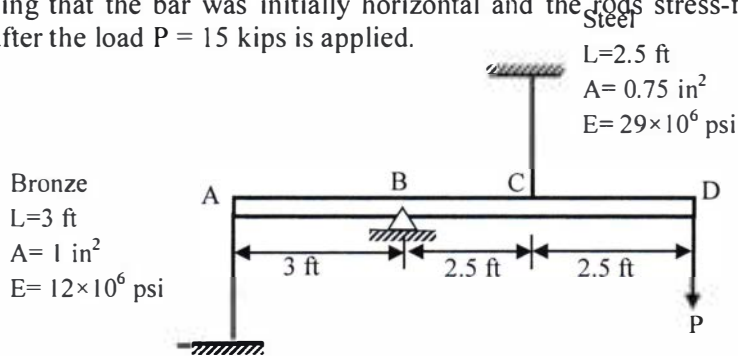
University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2019
Program: B.Sc. in Civil Engineering

Course Title: Mechanics of Solids I
 Time: 3:00 hours

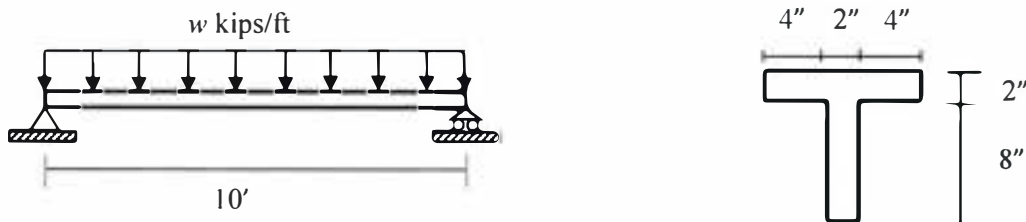
Course Code: CE 211
 Full Marks: $10 \times 10 = 100$

Answer all 10 (Ten) Questions
The symbols have their usual meanings.
[Assume Reasonable Values for Any Missing Data]

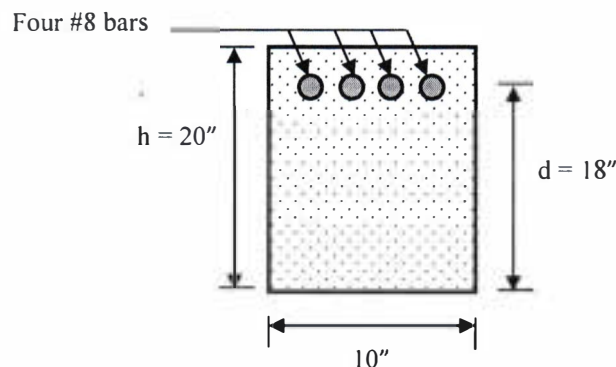
1. The light rigid bar ABCD shown below is pinned at B and connected to two vertical rods at A and C. Assuming that the bar was initially horizontal and the rods stress-free, determine the stress in each rod after the load $P = 15$ kips is applied.



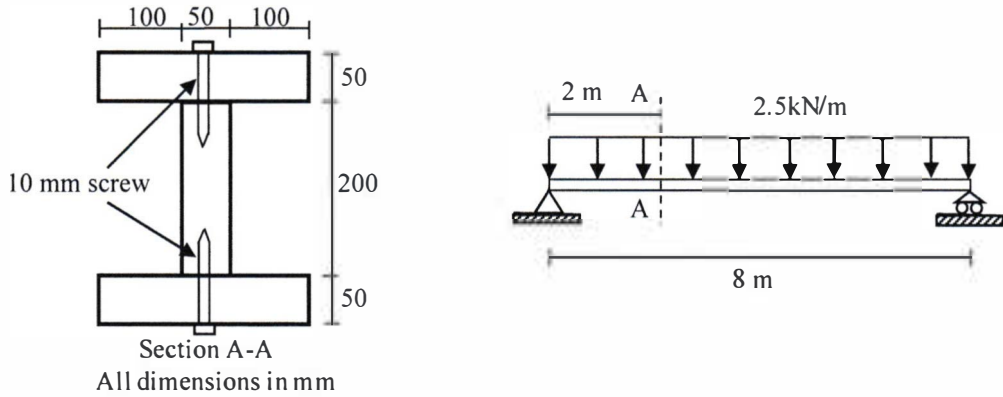
2. Determine the magnitude of the uniformly distributed load, w , of the simply supported beam as shown in the following figure, if the maximum allowable tensile and compressive bending stresses in the cross-section are 60 ksi and 36 ksi respectively.



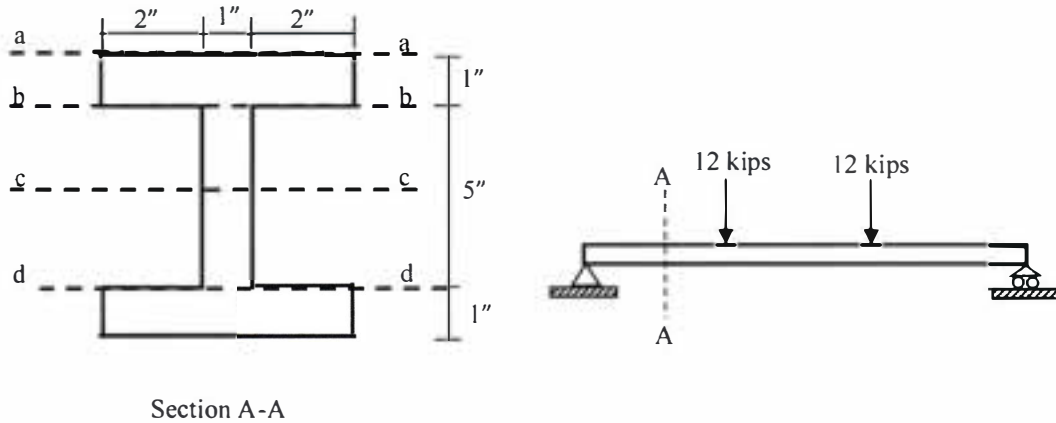
3. Calculate the maximum stresses in concrete and steel for a reinforced concrete beam with the section shown below if it is subjected to a negative bending moment of 60 kip-ft. The reinforcement consists of four #8 steel bars. Assume cracked section and $n = 8$. Diameter of each #8 steel bar is 1 inch.



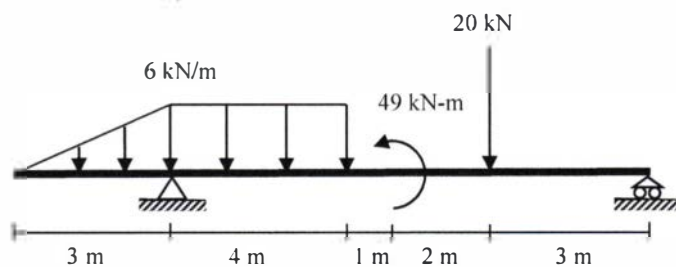
4. A simple beam on 8-m span carries a load of 2.5kN/m including its own weight. Specify the spacing of 10-mm screw (as shown) necessary to fasten the parts together at (i) quarter point of the beam i.e., section A-A and (ii) maximum shear. Assume that allowable shear capacity for a 10-mm screw is 3kN.



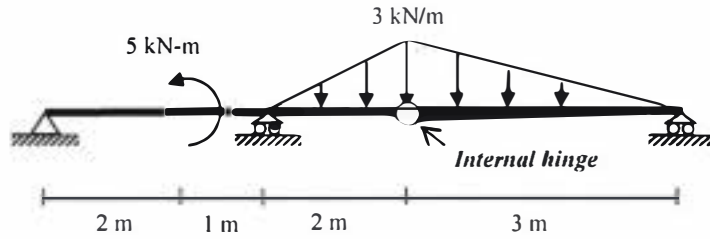
5. An I beam having the cross-section A-A with dimensions shown below is loaded with two point loads at one third points of the beam. Determine the shear stresses at section a-a, b-b, c-c and d-d. Section c-c is at neutral axis.



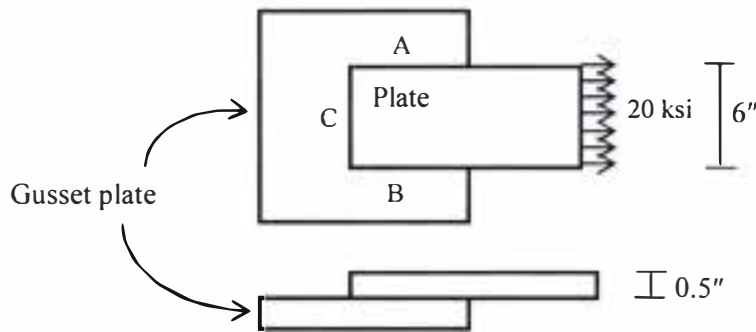
6. Draw shear force and bending moment diagram by using summation method for the following beam.



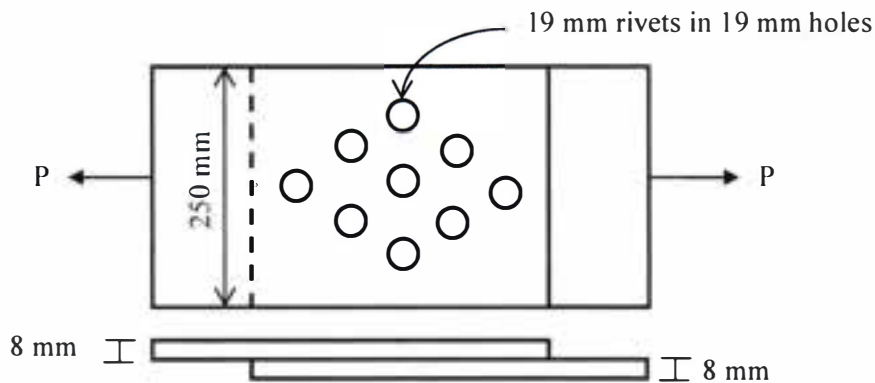
7. Draw shear force and bending moment diagram for the following beam by any convenient method.



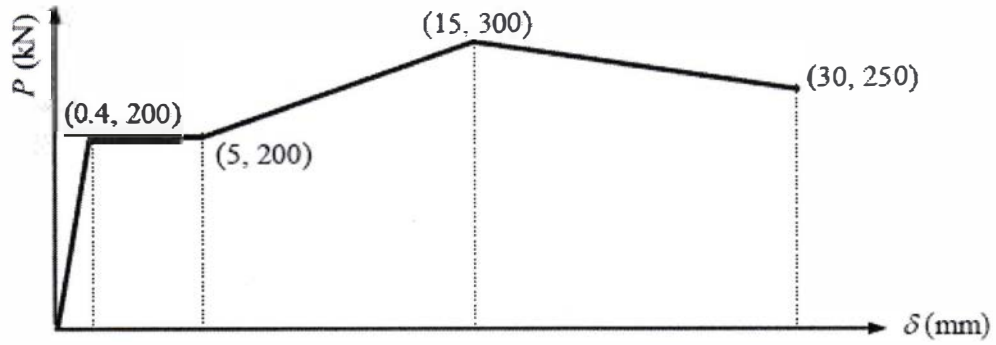
8. The figure below shows a 6 in. wide and $\frac{1}{2}$ in. thick plate is lapped over and welded to a gusset plate. Determine the minimum length of a $\frac{5}{16}$ in. fillet weld that will be necessary -
 (a) On sides A and B,
 (b) Sides A, B and C, if the plate is subjected to an axial stress of 20 ksi.
 Give: allowable shearing stress through the throat of the weld of 21 ksi.



9. Determine the safe load, P on the lap connection (250 mm wide) shown in the following figure below if the rivets are of 19-mm diameter (assume 19-mm holes) and plates are 8 mm thick. Use allowable shearing stress of 95 MPa, tearing stress of 140 MPa and bearing stress of 220 MPa.



10. The figure below shows the axial force (P) vs. elongation (δ) diagram of a 200 mm long mild steel specimen of 25 mm diameter. Calculate the (i) Young's modulus, (ii) apparent and actual breaking strength and (iii) energy needed to break the specimen.



University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2019
Program: B.Sc. in Civil Engineering

Course Title: Engineering Materials
Time: 3 hours

Course Code: CE 201
Full Marks: 100

Answer all questions.

QUESTION 1 [50 MARKS]

Ultra-High Performance Concrete (UHPC) has recently gained popularity abroad due to reduction of the dead load of the structure and providing more space. The compressive strength of UHPC is about 150 MPa. In order to achieve the target strength of UHPC, three types of fine aggregates are collected and different physical tests are performed. The test data of sieve analysis of fine aggregate samples are given below:

ASTM Sieve	Sieve opening (mm)	Materials Retained (gm)		
		Sand-A	Sand-B	Sand-C
3 inch	76.2	0	0	0
1.5 inch	38.1	0	0	0
3/4 inch	19.05	0	0	0
3/8 inch	9.5	0	0	0
# 4	4.75	0	0	0
# 8	2.36	70	0	0
# 12	1.7	80	0	0
# 16	1.19	60	250	0
# 30	0.59	80	250	100
# 40	0.425	60	0	0
# 50	0.3	90	0	250
# 100	0.15	50	0	150
# 200	0.075	10	0	0
Pan	-	0	0	0

- a. (i) Complete the calculation including % passing of each sieve and determine the fineness modulus of three types of fine aggregates (Sand-A, Sand-B and Sand-C). [12]
- (ii) Draw the grading curve of three types of fine aggregate samples on a semi-log graph paper and make comments on the curves. Based on three grading curves of the samples, proposed the suitable fine aggregate for the ultra-high performance concrete and justify your selection with proper explanation. [8]

- b. Mix design of ultra-high performance concrete (UHPC) is necessary for beams and cylinders to investigate the flexural and compressive strength as well as durability performance of concrete to ensure the longer service life of the structure.

The specification requirements for the concrete are as follows:

Compressive strength of concrete = 150 MPa

Water to cement ratio = 0.2

Fine aggregate to total aggregate volume ratio = 0.30

Cement content = 1000 kg/m³

Air content = 1% (air-entraining admixture is not used)

10 mm maximum size crushed black stone as coarse aggregate

Uncrushed natural river sand as fine aggregate

The tests on concrete making materials gave the following results:

Specific gravity of Ordinary Portland cement = 3.15

Specific gravity of coarse aggregate = 2.7

Specific gravity of fine aggregate = 2.56

Consider weight basis mix design for the calculation. Assume that the coarse and fine aggregates are in the Saturated Surface Dry (SSD) condition. Superplasticizer as chemical admixture is used which is not considered during the calculation. Determine the following:

- (i) Calculate the amount of cement, coarse aggregate, fine aggregate and water per unit cubic meter of concrete (unit: kg/m³). [15]
- (ii) Estimate the quantity of cement, coarse aggregate, fine aggregate and water required for the casting of 12 beams (size: 3 m x 0.4 m x 0.6 m) and 8 cylinders for compressive strength (size: diameter = 100 mm and height = 200 mm) and 8 cylinders for durability (size: diameter = 150 mm and height = 300 mm) test. Assume 15% extra volume is necessary due to total loss of concrete during casting. [4]
- (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 all beams and cylinders. Assume the density of steel fiber is equal to the density of steel. [1]
- c. In order to ensure the durability of the beam surfaces, 15 mm thick mortar is applied to the exposed surfaces (both sides and bottom face) of the beams. The beams are located inside the room and connected to the ceiling.

The specification requirements for the mortar are as follows:

Compressive strength of mortar = 100 MPa

Water to cement ratio = 0.2

Fine aggregate to cement ratio (weight basis) = 1.2

Air content = 1%

The tests on mortar making materials gave the following results:

Specific gravity of cement = 3.15

Specific gravity of fine aggregate = 2.2

Consider weight basis mix design for the calculation. Superplasticizer as chemical admixture is used which is not considered during the calculation. Determine the following:

- (i) Estimate the amount of each ingredient (cement, fine aggregate and water) of mortar necessary for the plastering work of 12 beams (size: length = 3 m, width = 0.4 m and height = 0.6 m). Assume 16% extra volume of material is necessary due to total loss of mortar during application on the beam surfaces. [6]
- (ii) Explain why to determine the percentage of bulking of sand. What adjustment in fine aggregate volume is necessary, if the bulking of fine aggregate is 20%? Assume unit weight of fine aggregate (with void) = 1500 kg/m³. [4]

QUESTION 2 [10 MARKS]

Sketch the qualitative stress-strain curve of wood, mild steel and concrete. Explain with neat sketch why modulus of elasticity of wood has two different values as compared to steel and concrete.

QUESTION 3 [10 MARKS]

What is hydration of cement? Explain briefly with neat sketch the rate of evolution of heat of Portland Cement.

Or

Summarize the advantages of using blended cement. Using chemical reaction and curve, describe why the long term strength of blended cement beyond a couple of months is higher than Ordinary Portland Cement.

QUESTION 4 [10 MARKS]

How will you determine the splitting tensile strength of concrete? Explain the procedure using schematic diagram and equation. Why tensile strength of concrete is important and how to improve it?

QUESTION 5 [10 MARKS]

Define segregation and the conditions favorable for segregation of concrete. Explain what are effects on concrete performance due to segregation.

QUESTION 6 [10 MARKS]

“Carbonation and chloride attack on concrete structures causes deterioration of the structure and its durability is affected”. Justify this statement with chemical reactions of both attacks and proper comments.