University of Asia Pacific

Department of Basic Sciences and Humanities

Final Examination, Fall 2016

Programme: B.Sc. in Civil Engineering

(2nd Year 1st Semester)

Course Title: Bangladesh Studies: Society and Culture **Course Code: HSS 211(a)**

Credit: 2.00

Time: 2 Hours **Full Marks: 100**

There are **SIX** questions. Answer **FOUR** (4x25)

1. a) What do you understand by economy? 5
   b) Name different economic systems. 5
   c) Discuss the features of capitalism and socialism. 15

2. a) Define social mobility. 5
   b) Discuss different types of social mobility with examples. 20

3. a) What is global economy? 5
   b) What are the consequences of the global economy? 20

4. a) Define social stratification. 5
   b) Distinguish between class and caste. 20

5. a) How do you define family? 5
   b) Discuss different patterns of families in recent time. 20

6. a) What do you mean by authority and power? 5
   b) What are the types of government? Briefly discuss. 20

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination Fall 2016
Program: B.Sc in Civil Engineering

Course Title: Bangladesh Studies: History
Time: 2 hours

Course code: HSS 211(b)
Full Marks: 100

Answer any four (4x25=100)

1. What was Permanent Settlement? What were its objectives?
2. Write down an article on Pundit Iswar Chandra Vidyasagar.
3. Who proposed Lahore Resolution? Explain the background of Lahore Resolution. What was its reaction?
4. Describe the second phase of Language Movement. What was the significance of Language Movement?
5. Explain Six Point Program.
6. Describe war strategies in the Liberation War of Bangladesh.

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination Fall 2016
Program: B. Sc in Civil Engineering

Course Title: Mathematics III — Course No. MTH 201

Time: 3.00 Hour — Full Marks: 150

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

1. (a) A random variable X has the following functional form **13**

$$f(x)=\begin{cases} kx, & 0<x<4 \\ 0, & otherwise \end{cases}$$

Determine k for which $f(x)$ is a density function and find P (1<X<2), P(X>2).

(b) Define probability distribution and continuous distribution function. Let X and Y have the following distribution **12**

$$f(x,y)=\begin{cases} x^2+\frac{xy}{3}, 0\le x\le 1, 0\le y\le 2 \\ 0, \quad otherwise \end{cases}$$

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

2. (a) **18**

	X=0	X=1	X=2	X=3	sum
Y=0	0	1/8	2/8	1/8	4/8
Y=1	1/8	2/8	1/8	0	4/8
sum	1/8	3/8	3/8	1/8	1

Suppose that X, Y have the above joint probability distribution. Find marginal distribution of X and Y.

(b) Use a 2-D grid to illustrate the sample space for tossing a coin and rolling dice simultaneously. From this grid determine the probability of **7**
a) getting a head b) getting a tail and a 5 c) getting a tail or a 5

3. (a) The profits earned by 100 companies are given below: **12**

profit	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Company no	4	8	18	30	15	10	8	7

Calculate Quartile Deviation.

(b) Calculate Coefficient of variance for the following data **13**

profit	10-20	20-30	30-40	40-50	50-60
Company no	8	12	20	6	4

4. **(a)** Define square matrix, transpose matrix, invertible matrix, diagonal matrix, with examples. **12**

(b) For $A=\begin{bmatrix}2 & -1 & -1\\ 1 & -2 & 1\\ 1 & -1 & 2\end{bmatrix}$, find A^{-1} **13**

5. **(a)** Find rank of $A=\begin{bmatrix}2 & 3 & 5 & -3 & -2\\ 3 & 4 & 3 & -1 & -3\\ 5 & 6 & -1 & 3 & -5\end{bmatrix}$ **12**

(b) Solve the following system of equations **13**

$$2x+3y+5z+t=3$$
$$3x+4y+2z+3t=-2$$
$$x+2y+8z-t=8$$
$$7x+9y+z+8t=0$$

6. Define linear combination, linear dependence, linear independence of vectors.

Show whether the following vector form basis of $\Re^3$ or not {(1, 2, 1), (2, 1, 0), (1, -1, 2)} **25**

7. Find Eigen values, Eigen vectors and $p^{-1}Ap$ for $A=\begin{bmatrix}2 & -2 & 1\\ 2 & -8 & -2\\ 1 & 2 & 2\end{bmatrix}$, where p is an invertible matrix. **25**

8. **(a)** Show that the mapping $T:\Re^3 \to \Re^2$ defined by $T(x,y,z)=(2x+y+z,\ 3x+2y+4z)$ is a linear transformation. **10**

(b) Let $T:\Re^3 \to \Re^3$ be a linear transformation, where $T(x,y,z)=(x+2y-z,\ y+z,\ x+y-2z)$, then find the basis and dimension of image and kernel of transformation. **15**

University of Asia Pacific

Department of Civil Engineering

Semester Final Examination, Fall-2016

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

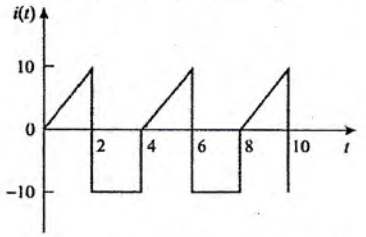
There are **Eight** Questions. Answer any **Six**. Figures in the right margin indicate marks.

1. (a) Find the phase angle between $i_1 = -4\sin(377t + 25°)$ and $i_2 = 5\cos(377t - 40°)$ Does i_1 lead or lag i_2? 10

   (b) If voltage $v = 6\cos(100t - 30°)$ is applied to a 50 μF capacitor, calculate the current through the capacitor. 5

   (c) Given the sinusoid $5\sin(4\pi t - 60°)$, calculate its amplitude, phase, angular frequency, period, and frequency. 10

2. (a) Determine the rms value of the current waveform in following figure. 13

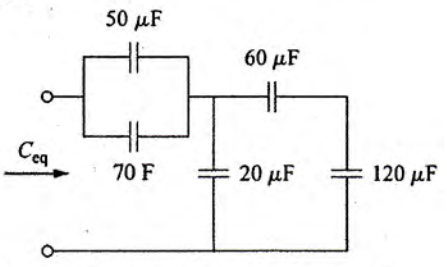


Waveform for question 2(a)

If the current is passed through a 2- resistor, find the average power absorbed by the resistor.

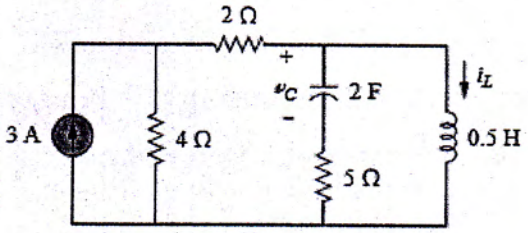
   (b) A series-connected load draws a current $i(t) = 4\cos(100\pi t + 10°)$ A when the applied voltage is $v(t) = 120\cos(100\pi t - 20°)$ V. Find the apparent power and the power factor of the load. Determine the element values that form the series-connected load. 12

3. (a) Find the equivalent capacitance seen at the terminals of the circuit in the following figure 10



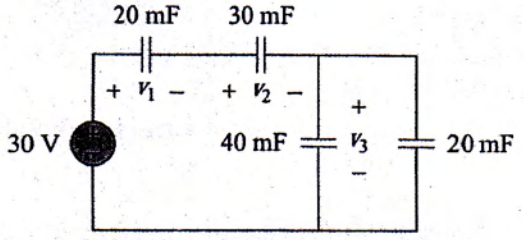
Circuit diagram for question 3(a)

(b) Find v_c and i_L and the energy stored in capacitor and inductor in the following circuit under dc condition. 15



Circuit diagram for question 3(b)

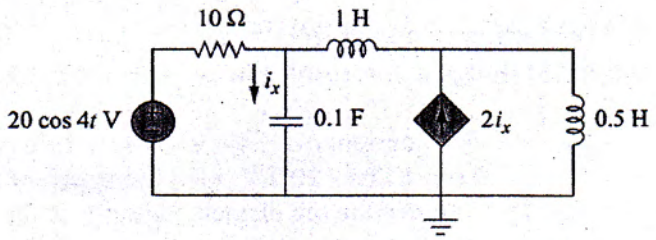
4. (a) For the circuit of following figure, find the voltage across each capacitor. 13



Circuit diagram for question 4(a)

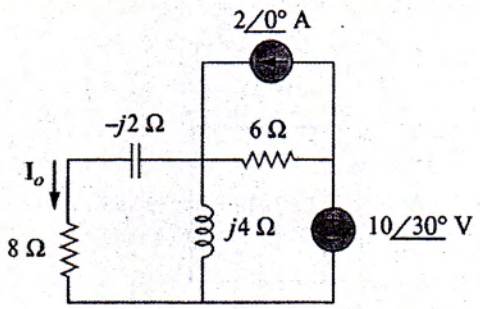
(b) The terminal voltage of a 2-H inductor is $v = 10(1-t)$ V. Find the current flowing through it at $t = 4$ s and the energy stored in it within $0 < t < 4$ s. Assume $i(0) = 2$ A 12

5. (a) Find i_x in the circuit of following figure using nodal analysis. 12



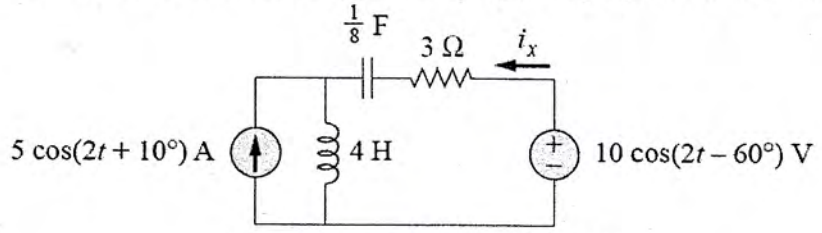
Circuit diagram for question 5(a)

(b) Find **Io** in the following figure using mesh analysis. 13



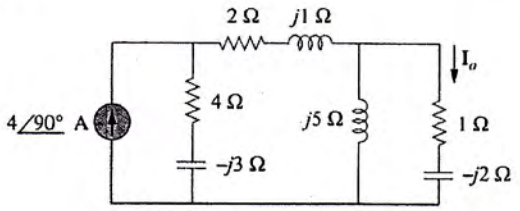
Circuit diagram for question 5(b)

6. (a) Calculate i_x in the following circuit using the superposition theorem. 13



Circuit diagram for question 6(a)

(b) Find **Io** in the circuit of following figure using the concept of source transformation. 12



Circuit diagram for question 6(b)

7. (a) If the voltage and current at the terminals of a circuit are 13

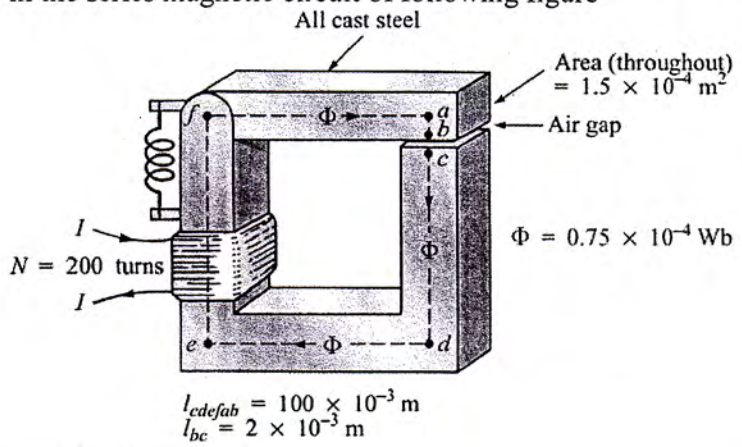
$$v(t) = V_m \cos(\omega t + \theta_v) \text{ and } i(t) = I_m \cos(\omega t + \theta_i)$$

Show that , average power, $P = \frac{1}{2} V_m I_m \cos(\theta_v - \theta_i)$.

What will be the apparent power and power factor of the system

(b) State and prove Maximum Power Transfer Theorem. 12

8. (a) Find the value of I required to establish a magnetic flux of $\emptyset = 0.75 \times 10^{-4}$ Wb in the series magnetic circuit of following figure 13



Required B-H data table

B(T)	0.1	0.2	0.3	0.4	0.5	0.6	0.7
H(A-t/m)	105	160	200	230	280	330	410

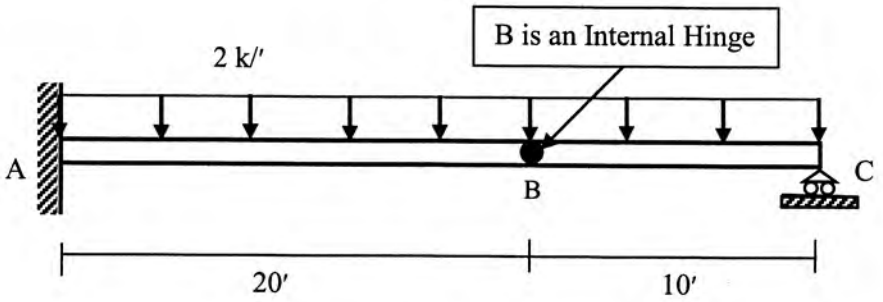
(b) Write short notes on (i) flux density (ii) magnetizing force (iii) permeability (iv) magnetomotive force 12

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall-2016
Program: B.Sc. Engineering (Civil)

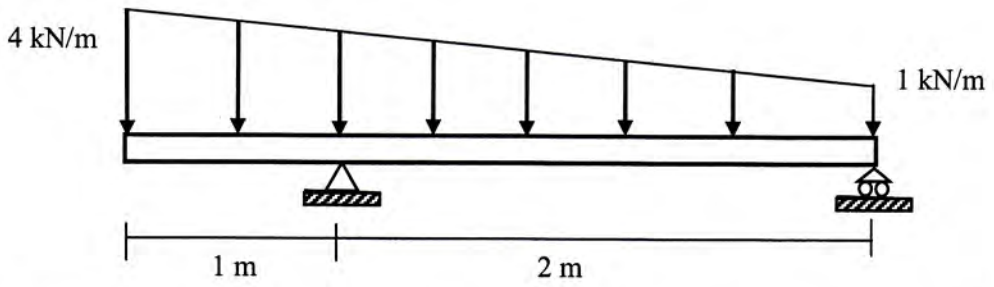
Course Title: Mechanics of Solids I | Course Code: CE 211 (A)
Full Marks: 100 (= 10×10) | Time: 3hours

[Answer **any 10 (ten)** of the following 14 questions]

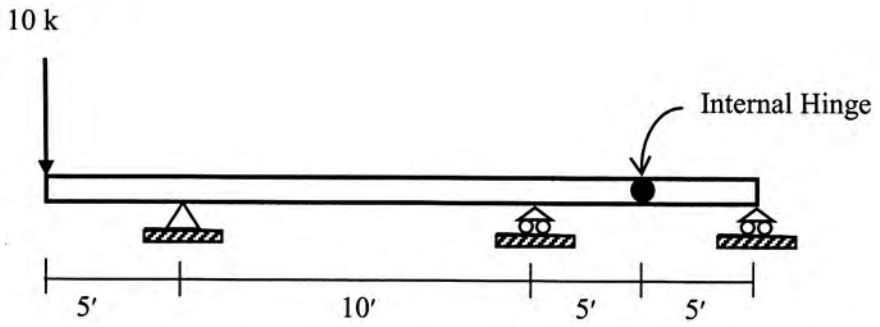
1. Calculate the support reactions and draw the shear force and bending moment diagram for the beam loaded as shown below. *B* is an internal hinge.



2. Derive the complete equations of shear force and bending moment of the beam shown below.

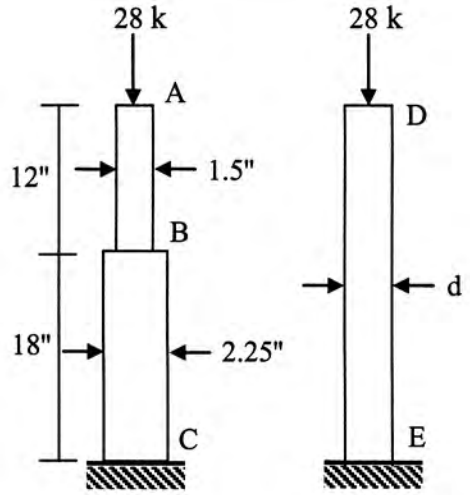


3. Using singularity function, derive the equations of shear force and bending moment of the beam loaded as shown below.

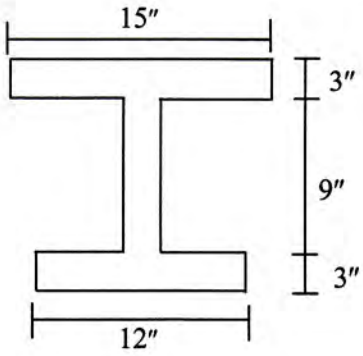


4. (a) Prove that for a cylindrical thin walled pressure vessel, hoop stress (σ_t) is two times of longitudinal stress (σ_L).
   (b) Consider a steel cylindrical pressure vessel of radius 1000 mm having a wall thickness of 10 mm. Determine the hoop stress and longitudinal stress caused by an internal pressure of 0.8 MPa. Also determine the change in radius. (Given: E_{steel} = 200 GPa, Poisson's Ratio = 0.30)

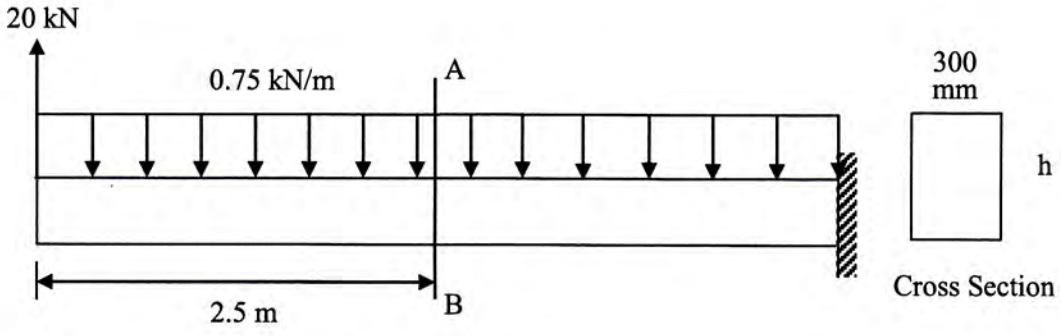
5. The aluminum rod ABC consisting of two cylindrical portions AB and BC is to be replaced with a cylindrical steel rod DE of same overall length. What is the minimum required diameter (d) of the steel rod if both of the rods are to undergo same vertical deformation ($E_{Aluminum} = 10\times10^6$ psi, $E_{steel} = 29\times10^6$ psi)?



6. Determine the bending moment capacity around the centroidal axis for the cross-sectional area with the dimension shown in figure below. The ultimate bending stress for tension and compression is 50 ksi and 45 ksi respectively . (Assume the factor of safety to be 2.5)

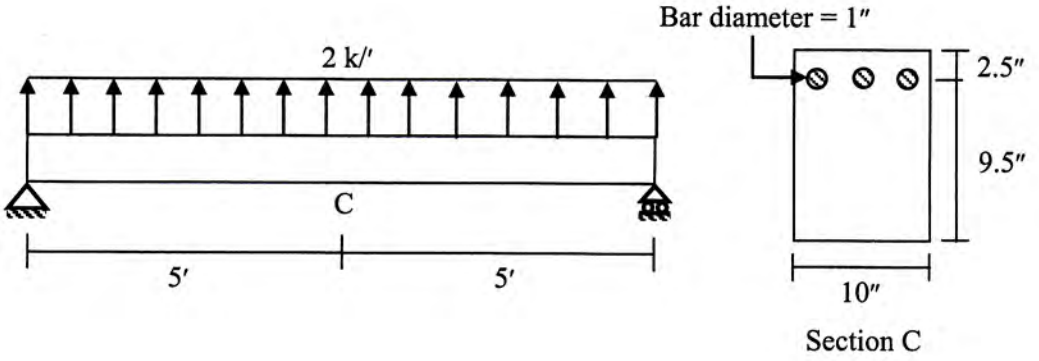


7. A 300 mm by 400 mm wooden cantilever beam weighing 0.75 kN/m carries an upward force of 20 kN at the free end, as shown in the following figure. Calculate 'h' if the allowable bending stress is 10 MPa at section AB located at 2.5 m away from the free end.

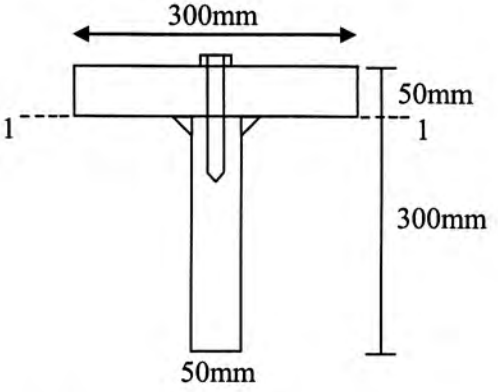


8. Justify the following statement:
"The bending stress and flexural shear stress over a rectangular cross-section vary linearly and parabolically respectively."

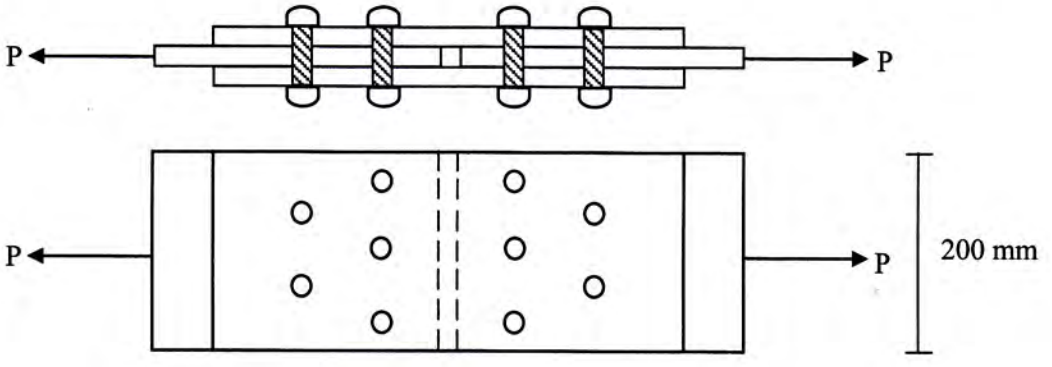
9. The cross-sectional area of the simply supported beam loaded as shown below is made of Reinforced Concrete. Draw the flexural stress diagram over the section C shown below. Assume the section to be uncracked. [Given, E_{Steel} = 30,000 ksi, $E_{Concrete}$ = 3000 ksi].



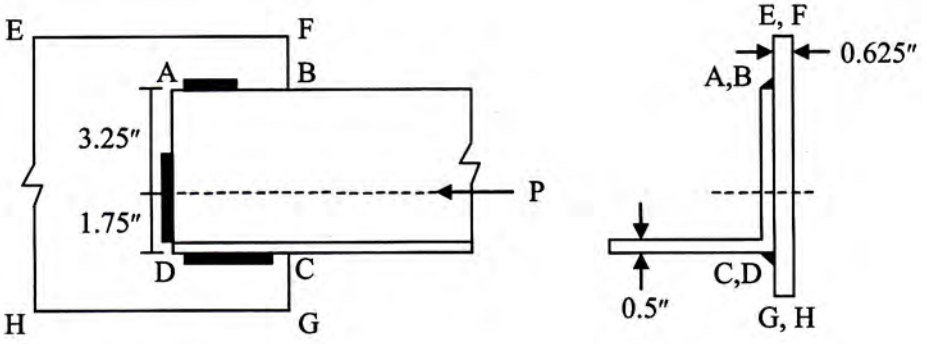
10. Two wooden planks forming a T section of a beam as shown in the following figure transfers a constant vertical shear of 2500 N. Calculate the,
(i) Flexural shear flow at Level 1-1 of the T-sections joined as shown below
(ii) Spacing of 10 mm dia bolts required at the joints to withstand the shear flow.
(iii) Thickness of welds required at the joints.
[Given: Allowable shear stress = 100 MPa].



11. Calculate the maximum shearing, tearing and bearing capacity in the riveted joint shown below. The allowable shearing, tearing and bearing stresses are 140, 180 and 380 MPa respectively. (Main plate thickness = 20 mm, Cover plate thickness = 15 mm, Diameter of bolt = 22 mm, Diameter of hole = 25 mm.)



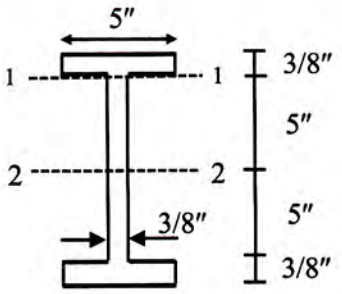
12. In the following welded connection shown below, a 0.5″ thick L section ABCD is connected to a 0.625″ thick plate EFGH.
    (a) The lengths of 3/8″ weld joint required on sides AB and CD are 4.25″ and 7.75″ respectively. Calculate the axial force that passes through the centroid of ABCD.
    (b) Calculate the lengths of 3/8″ weld joint required on sides AB and CD when a transverse weld AD = 2.75″ is used.



Front View

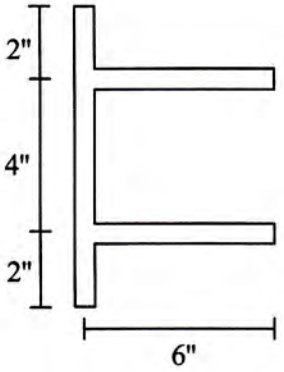
Side View

13. An I-beam shown below is loaded as the simply supported beam shown in question 9. Determine the shear stresses at the levels 1-1 and 2-2 as indicated. Also draw the shear stress diagram over the cross section. Neglect the weight of the beam.



Cross Section

14. Locate the shear center for the following beam section shown below. Thickness of each segment of the beam is 0.2".



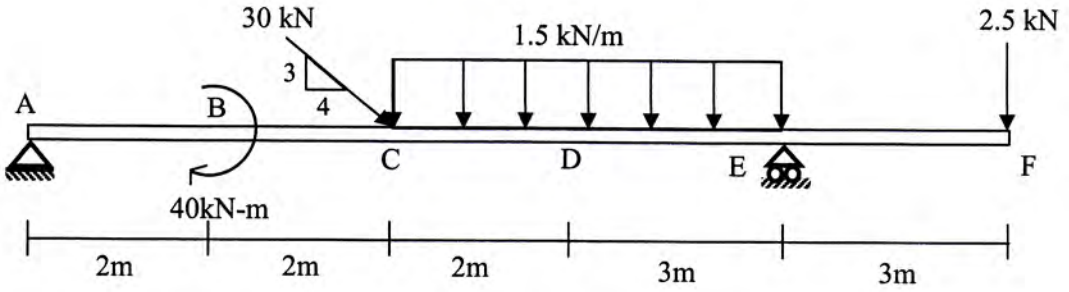
University of Asia Pacific
Department of Civil Engineering
Final Examination Fall-2016
Program: B.Sc. Engineering (Civil)

Course Title: Mechanics of Solids I
Full Marks: 100 (=10×10)

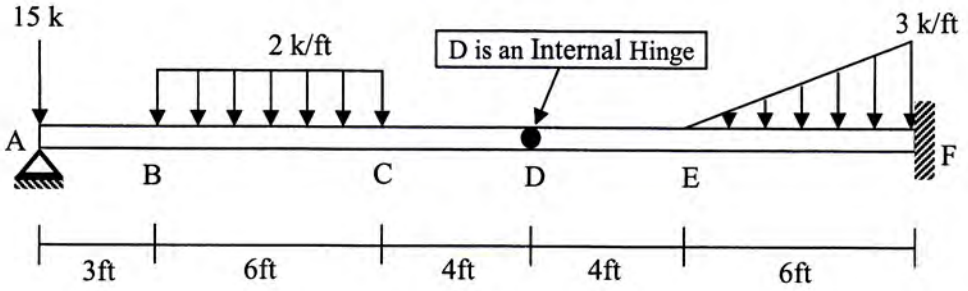
Course Code: CE 211(B)
Time: 3 hours

[Answer **any 10 (ten)** of the following 14 questions]

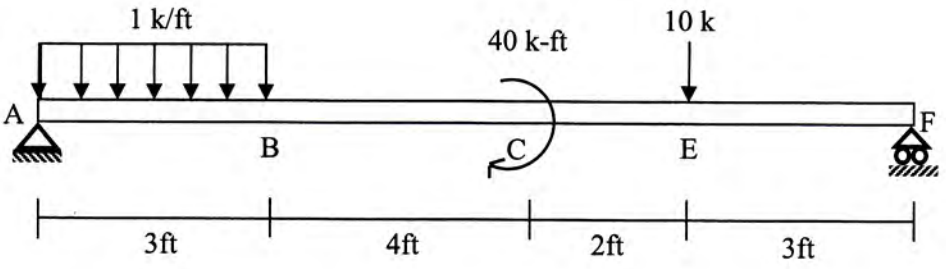
1. Draw the Axial Force, Shear Force and Bending Moment diagrams for the beam loaded as shown below.



2. Draw the Shear Force and Bending Moment diagrams for the beam loaded as shown below.

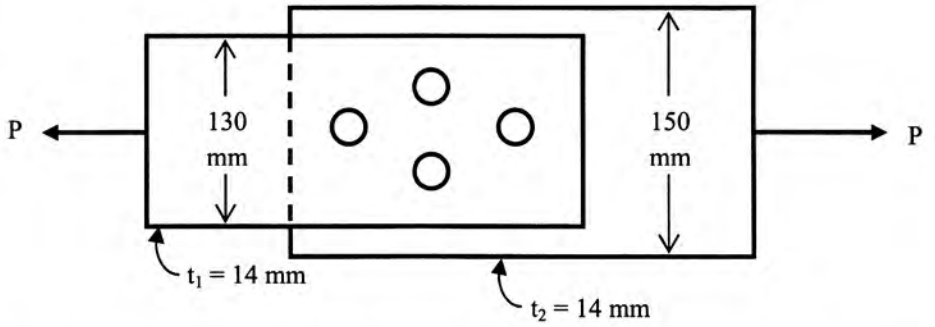


3. Use Singularity function to derive the equations of shear force and bending moment for the beam loaded as shown below and determine the shear force and bending moment at E.

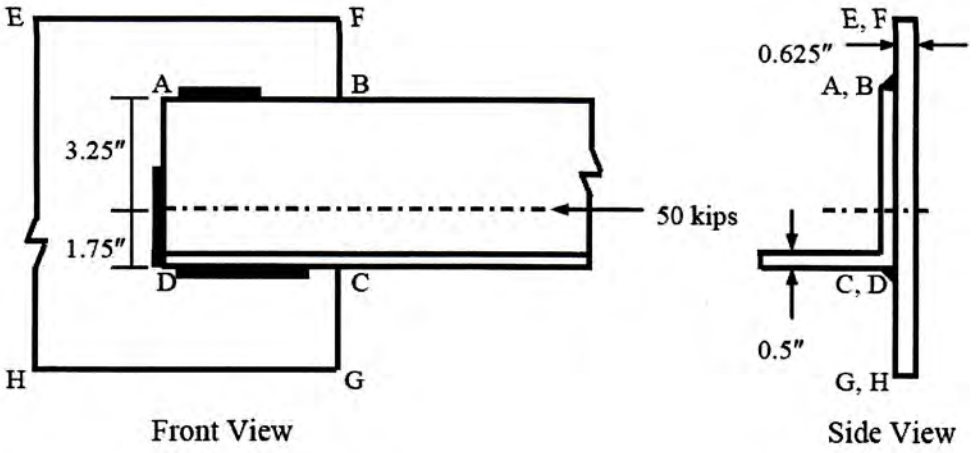


4. Derive the relationship between circumferential stress and longitudinal stress of a thin walled pressure vessel.

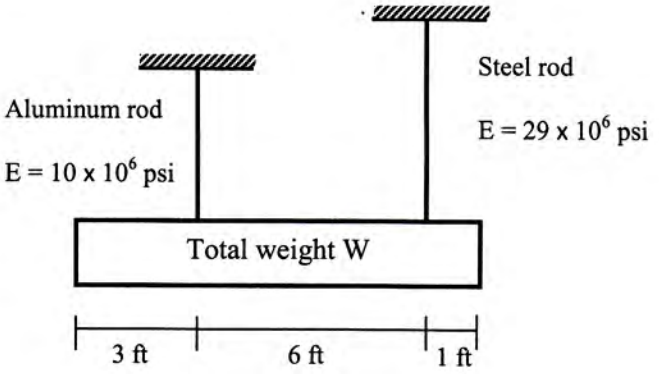
5. Two plates are joined by four rivets 25 mm in diameter as shown below. Calculate the allowable load P if the allowable shearing, tearing and bearing stresses are 80, 90 and 120 MPa respectively. (Assume holes for rivets are also 25 mm in diameter).



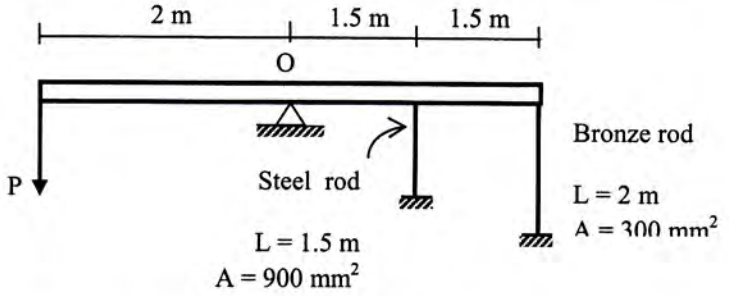
6. In the figure shown below, calculate the length of 3/8-inch weld joints required on sides (i) AB and CD only, (ii) AB, AD and CD to connect the 0.5" thick channel section ABCD to the 0.625" thick plate EFGH. Axial force of 50 kips passes through centroid of ABCD [Given: Allowable shear stress = 16 ksi].



7. A uniform concrte slab of total weight W is to be attached, as shown in the figure below, to two rods whose lower ends are on the same level. Determine the ratio of areas of the rods so that the slab remains level.

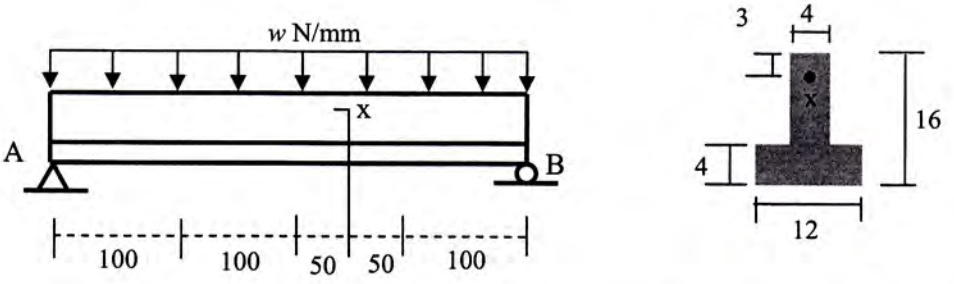


8. As shown below, a rigid bar with negligible mass is pinned at O and attached to two vertical rods. Assuming that the rods were initially stress-free, what maximum load P can be applied without exceeding stresses of 150 MPa in the steel rod and 70 MPa in the bronze rod?

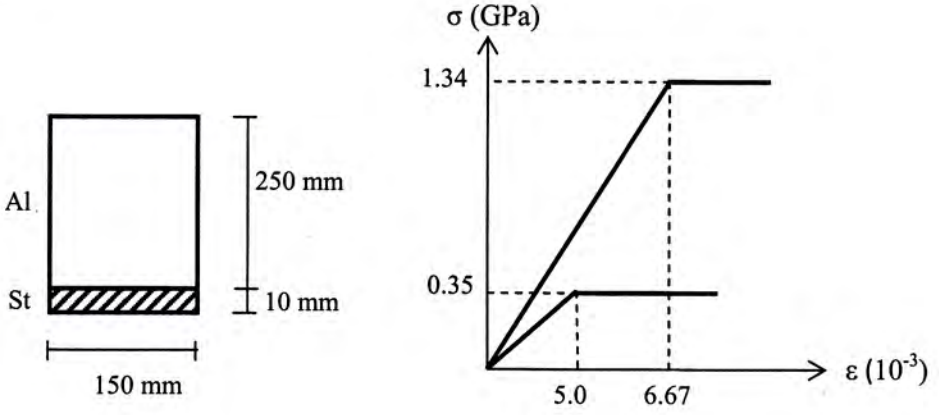


9. A cylindrical pressure vessel is fabricated from steel plate that has a thickness of 20 mm. The diameter of the pressure vessel is 450 mm and its length is 2.0 m. Determine the maximum internal pressure that can be applied if the longitudinal stress is limited to 140 MPa and circumferential stress is limited to 60 MPa.

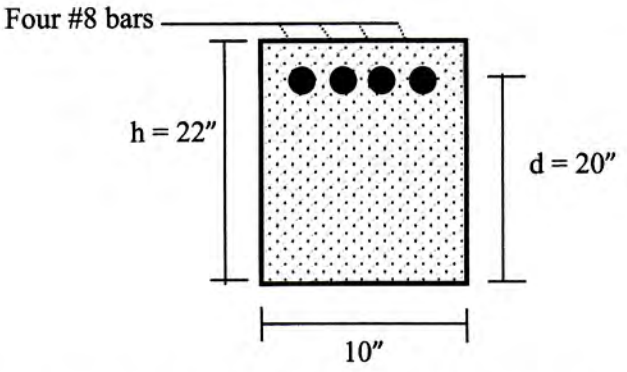
10. An inverted small steel T beam is supported at A and B as shown below. What is the value of uniformly distributed force w if a strain gauge attached at x point measures 0.0002 mm/mm when the load is applied. All dimensions are in mm. [E = 200 GPa]



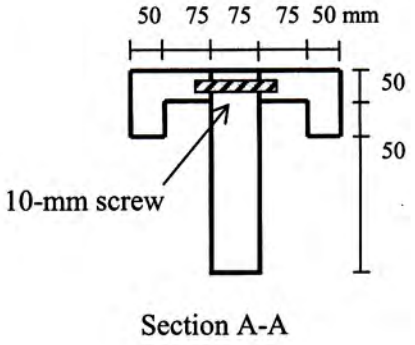
11. Consider a composite beam of the cross-sectional dimensions shown below. The upper 150x250 mm part is aluminum while the lower 150x10 mm strap is steel. If the beam is subjected to a bending moment of 30 kN-m around horizontal axis, what are the maximum stresses in the steel and aluminum?



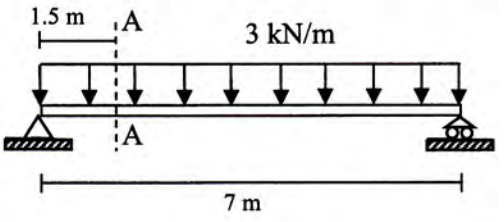
12. Determine the maximum stress in the concrete and the steel for a reinforced concrete beam with the section shown below if it is subjected to a negative bending moment of 50 kip-ft. The reinforcement consists of four #8 steel bars. Assume cracked section and n = 8.



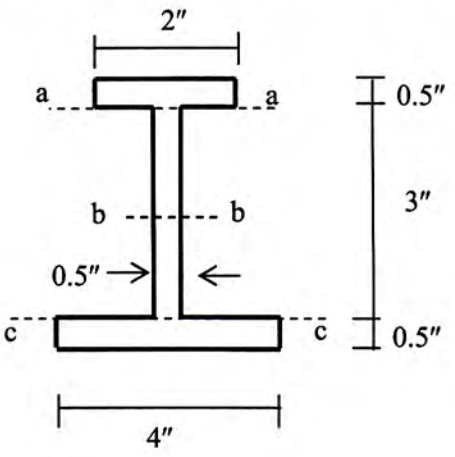
13. A simple beam on 7-m span carries a load of 3 kN/m including its own weight. Specify the spacing of 10-mm screw (as shown) necessary to fasten the parts together. Assume that allowable shear capacity for 10-mm screw is 2 kN.



Section A-A



14. A beam having the cross section with dimension shown below, transmits a vertical shear V = 7 kip. Determine the shear stress at section a-a, b-b and c-c. Section b-b is at neutral axis.



University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Materials | Course Code: CE 201(A)
Time: 3 hours | Full Marks: 150

Part 1: Answer all the questions

Question 1:

A 6 in. thick concrete slab shown in Figure 1 is supposed to support an overhead concrete tank of a residential building in Dhaka. The volume and size of tank requires for 4000 psi design strength of the supporting slab. [40]

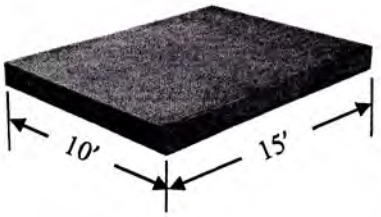


Figure 1

a. Determine the first lab trial mix as per ACI volume method with following information as well as necessary tables (Tables 1-6) and formula.
   i. Cement is ordinary Portland Composite cement and Coarse aggregates are stone chips.
   ii. No admixture is to be used in the process.
   iii. Slump value required for concrete is 4 in.
   iv. For first trial mix, three cylinders with ACI standard dimensions are cast. Assume 30% loss in cylinder casting.

b. Compute the quantity of cement, sand and stone chips required for casting the slab.

c. Calculate the total cost of casting materials. [Assume, cost of 1 bag cement = 450 BDT, 1 cft sand = 50 BDT, 1 cft stone chips = 160 BDT]

Question 2:

a. Discuss the changes in strength of concrete for the following situations: [4]
   (i) Fly Ash cement (FAC) is used instead of OPC.
   (ii) Cement with high fineness is used.
   (iii) 3/4 in. down grade CA is used instead of 1 in. down grade.
   (iv) Warm water is used in the concrete production during summer.

b. Discuss the following factors associated with the workability of concrete: [4.5]
   (i) Fineness Modulus
   (ii) Air entrainment
   (iii) w/c ratio

c. Write short notes on the followings: [4.5]
   (i) Cold joint
   (ii) Vulcanization
   (iii) Light weight concrete

d. Discuss the changes in the properties of fresh concrete for following situations: [6]
   (i) Normal Concrete + Superplasticizer
   (ii) Normal Concrete + Superplasticizer – water
   (iii) Normal Concrete + Superplasticizer + Retarder
   (iv) Normal Concrete + Superplasticizer – cement

e. What is maturity of concrete? Briefly state its application and limitation. [3]

Part 2: Answer any 2(Two) out of 3(Three) questions (3-5)

Question 3:

a. For a bridge construction project which requires high strength concrete, the recommended FM for sand is 3.10. From a nearby market, two sand samples (Sand 1 & Sand 2) are collected. The samples were sent to the concrete laboratory of UAP for sieve analysis. The sieve analysis data are given below.

Sieve	Amount retained (g)	
	Sand 1	Sand 2
#8	70	80
#12	70	0
#16	70	80
#30	70	80
#40	70	0
#50	0	0
#100	0	0
#200	45	0
PAN	45	0

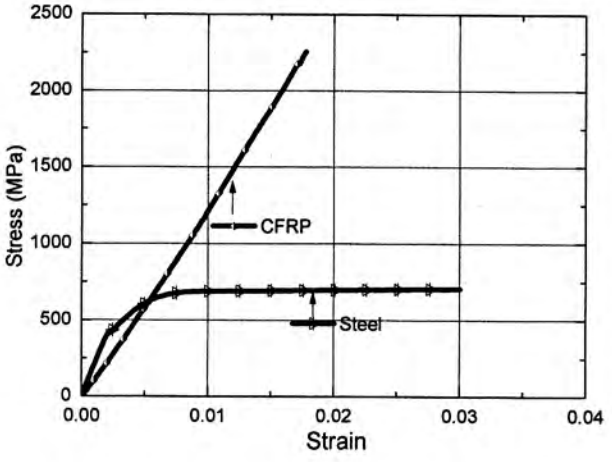
(i) Calculate FM for both the sand samples. [10]
(ii) In what proportions, the sand samples are to be mixed to get the recommended FM? [5]

b. Draw a typical stress strain diagram of mild steel and indicate different parts of this diagram. [2]
c. Define the terms: (i) creep, (ii) malleability, (iii) ductility [3]
d. Compare fly ash cement and slag cement. [2]

Question 4:

a. Why bricks are dried before burning? [2]
b. Explain the causes of dampness in the brick wall. [2]
c. What is hydration of cement? Describe the hydration process of cement with chemical reactions. [5]
d. Explain the hydration rate of different compounds in clinker of cement with time. What changes are to be made in the clinker for making rapid hardening cement, quick setting cement and low heat cement? [6]
e. Explain bulking of sand. [4]

f. Determine the Young's modulus of the steel and CFRP from the following graph: [3]



Question 5:

a. Briefly state the harmful effects of excess sand, clay and lime in brick earth. [5]
b. Write short notes on CEM II A-L, and CEM II B-S cement as per BDS EN 197-1:2003. [2]
c. Illustrate different types of multi-stage loadings with neat sketches and give examples of each kind. [3]
d. Compare different types of moisture condition in aggregates. [3]
e. Compare hydraulic and non-hydraulic cement. [2]
f. Illustrate with neat sketches the influence of the aluminate/sulfate ratio on setting characteristics of the Portland Cement paste. [5]
g. Write the functions of all the chambers used in a Hoffman Kiln at a given instant. [2]

Part 3: Answer any 2(Two) out of 3(Three) questions (6 – 8)

Question 6:

a. Briefly state the advantages of using ferrocement. [3]
b. "w/c ratio is a key parameter related to the durability of concrete."-Explain the statement. [3]
c. Explain the mechanism of Cathode Protection method as a corrosion protective measure and briefly state its advantages and disadvantages. [4]
d. Write a short note on following topics: [4]
(i) Over-compaction, (ii) Synthetic Rubber
e. Distinguish between (i) distemper and varnish, (ii) entrapped and entrained air [4]
f. Describe with neat sketches the microstructure of concrete made with low w/c and high w/c ratios. [4]

Question 7:

a. Explain the concrete corrosion process induced by chloride. [3]
b. What is spalling? What are the causes of spalling? How can you prevent it? [6]
c. "Workability is the inverse of compaction energy"- explain the statement. [3]

d. What do you mean by "Zero slump"? What does it indicate? Mention the slump value of fresh concrete for normal design standard. [3]
e. Briefly state the different methods of curing with their applicability. [3]
f. Identify the following chemicals as different components of paint and briefly discuss their functions in paint. [4]
(i) Iron Oxide, (ii) Linseed oil, (iii) Tarpentine Oil, (iv) Aluminium

Question 8:

a. Draw a flowchart showing step by step procedure from concrete casting to testing. [3]
b. Write a short note on the following: [6]
   i) Sacrificial Thickness
   ii) Carbonation
   iii) Natural Seasoning
c. What is bleeding? How does it differ from segregation? How can you minimize bleeding? [6]
d. Explain the concept of characteristic strength. [2]
e. Draw a typical cross section of exogenous trees and explain the process of annual ring formation in these types of trees. [5]

Necessary Tables for Question No. 1

Table 1: Properties of Fine Aggregate

Sl. No.	Property	Test Method	Value	Unit
1	Bulk Specific Gravity (OD basis)	ASTM C127	2.52	-
2	Apparent Specific Gravity (OD basis)	ASTM C127	2.60	-
3	Absorption Capacity	ASTM C127	1.50	%
4	Dry Rodded Unit Weight	ASTM C29	1570	kg/m^3
5	Moisture Content of FA in Laboratory		3.50	%
6	Fineness Modulus (FM)	ASTM C136	2.80	
7	Loose Unit weight		1300	kg/m^3

Table 2: Properties of Coarse Aggregate

Sl. No.	Property	Test Method	Value	Unit
1	Bulk Specific Gravity (OD basis)	ASTM C127	2.62	-
2	Apparent Specific Gravity (OD basis)	ASTM C127	2.68	-
3	Absorption Capacity	ASTM C127	1.00	%
4	Dry Rodded Unit Weight	ASTM C29	1530	kg/m^3
5	Moisture Content of CA in Laboratory	-	0.5	%
6	Maximum Size	-	25	mm
7	Loose Unit weight		1400	kg/m^3

Table 3: Properties of cement

Sl. No.	Property	Value	Unit
1	Brand name	supercrete (composite)	-
2	Clinker	85	%
3	Fly Ash	15	%
4	Compacted Unit Weight	1400	kg/m^3
5	Loose Unit Weight	1100	kg/m^3
6	Specific Gravity of clinker	3.15	
7	Specific Gravity of fly ash	2.40	

Table 4: ACI recommended dry rodded bulk volume of coarse aggregate per unit volume of concrete

Max size of agg	**FM of fine aggregate**			
mm	**2.40**	**2.60**	**2.80**	**3.00**
9.5	0.50	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
19	0.66	0.64	0.62	0.60
25	0.71	0.69	0.67	0.65
37.5	0.75	0.73	0.71	0.69
50	0.78	0.76	0.74	0.72
75	0.82	0.80	0.78	0.76
150	0.87	0.85	0.83	0.81

Table 5: ACI recommended mixing water content for 1 m^3 fresh concrete

Max size of aggregate (mm)	10	12.5	20	25	40	50	70	150
Slump Value (mm)	**Amount of mixing water in kg per 1 m^3 concrete**							
25 to 50	207	199	190	179	166	154	130	113
75 to 100	228	216	205	193	181	169	145	124
150 to 175	243	228	216	205	190	178	160	-
Entrapped air (%)	3	2.5	2	1.5	1	0.5	0.3	0.2

Table 6: First Trial Mix Result

Water Added	0.25 kg more water was added than calculated for first trial mix
Slump measured	125 mm
Measured density of fresh concrete Cylinder	2370 kg/m^3

Estimating w/c ratio

ACI recommended w/c ratio for normal strength concrete, $w/c=1.1734e^{-0.0259f'_T}$;

where, f'_T = Target Mean Strength

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Materials | Course Code: CE 201(B)
Time: 3 hours | Full Marks: 150

Part 1: Answer all the questions

Question 1:

Concrete mix design is required for slabs of a building project on the following data: [40]

Volume ratio of sand to total aggregate = 0.38
Air Content = 1% (air entraining admixture is not used)
Cement type = CEM II A-M
Specific gravity of coarse aggregate (SSD) = 2.1
Specific gravity of fine aggregate (SSD) = 2.55
Design compressive strength (28 days) = 4000 Psi
Aggregate type = Bricks chips
Dosage of superplasticizer = 8 ml/kg of cement if w/c is less than 0.50
The coarse aggregate was SSD in the site.

The following graphs are provided:

- Variation of compressive strength with absorption capacity of brick aggregate used.
- Variation of compressive strength with w/c
- Variation of cement content with compressive strength (28 day) for different types of cement.

Calculate the following:

(i) Calculate unit contents based on the given data.
(ii) Calculate the unit weight of the proposed mix.
(iii) Calculate the actual water content of the proposed mix.
(iv) Calculate the volume ratio of the mix. Assume unit weights of cement, sand (SSD) and coarse aggregate (SSD) with void are 1410 kg/m^3, 1600 kg/m^3 and 1250 kg/m^3 respectively.
(v) Calculate the cost of concrete for one meter cubic meter. Assume the cost of one bag cement is 450 taka, 1 cft sand = 40 taka, 1 cft brick chips = 110 taka. (Consider loss)
(vi) Estimate the materials in volume and weight required to cast for a slab of size 25 ft width, 5 in depth, and 18 ft length.
(vii) Explain the advantages and disadvantages of weight based mix proportion and volumetric mix design.

Question 2:

a. Discuss the changes in strength of concrete for the following situations: [4]
   (i) Fly Ash cement (FAC) is used instead of OPC.
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c. Write short notes on the followings: [4.5]
   (i) Cold joint
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d. Discuss the changes in the properties of fresh concrete for following situations: [6]
   (i) Normal Concrete (s/a=0.45) +Superplasticizer
   (ii) Normal Concrete (s/a=0.35) + Superplasticizer
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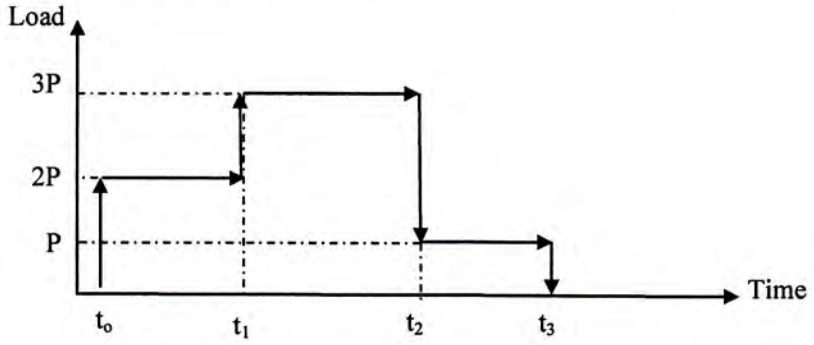
e. Explain bulking of sand. [3]
f. Draw the predicted strain response curve of the elasto-plastic (E-P) material for the following loading history. [5]



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