University of Asia Pacific

Department of Basic Sciences and Humanities

Final Examination, Spring 2016

Programme: B. Sc. Engineering (Civil)

(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 **ANY FOUR** (4x25)

1. Define Social Stratification. Explain any two systems of Social Stratification. 5+20

2. What are the features of Capitalism and Socialism? Elaborate the advantages of Capitalism and Socialism. 10+15

3. Define authority. How does Max Weber classify authority? Discuss. 5+20

4. What do you understand by global cities? What are the traits of the global cities? Briefly discuss about the challenges of urbanization in the developing world? 5+5+15

5. Define family. How is gender inequality related with abuse of children and domestic violence? 5+ 20

6. Distinguish between Karl Marx and Max Weber in their explanation of social class. 25

University of Asia Pacific

Department of Basic Sciences and Humanities

Final Examination, Spring 2016

Program: B.Sc. Engineering (Civil)

2nd year 1st semester

Course Title: Bangladesh Studies: History Course Code: HSS 211(b) Credit: 2.00

Total Time: 2 Hours Full Marks: 100

Answer any **Four.** All questions are of equal value (4 x 25)

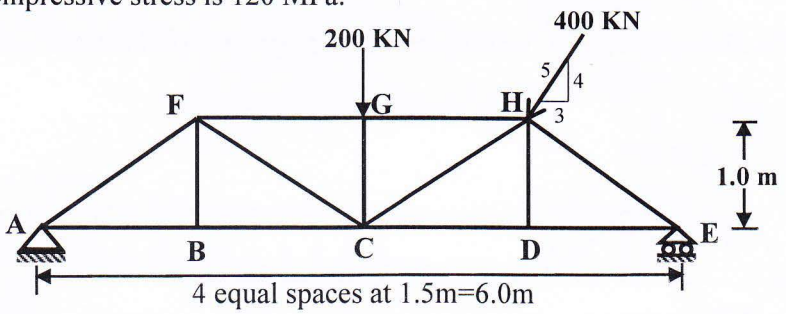
1. What was *permanent settlement*? What were its objectives?
2. Briefly describe the reasons behind the battle of Palashi.
3. Why did Lord Curzon *partition Bengal* in 1905? How did the Muslims and Hindus react?
4. Describe the background and reaction of *Lahore Resolution.*
5. Describe the first phase and significance of *Language Movement.*
6. Explain the *Six Points* of Awami League.

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

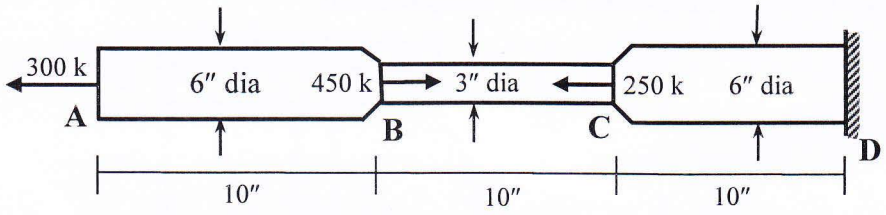
Course Title: Mechanics of Solids I | Course Code: CE 211
Full Marks: 100 (=10×10) | Time: 3 hours

There are **FOURTEEN (14)** questions in this paper. Answer any **TEN (10)** of the following questions. Each question has equal marks.

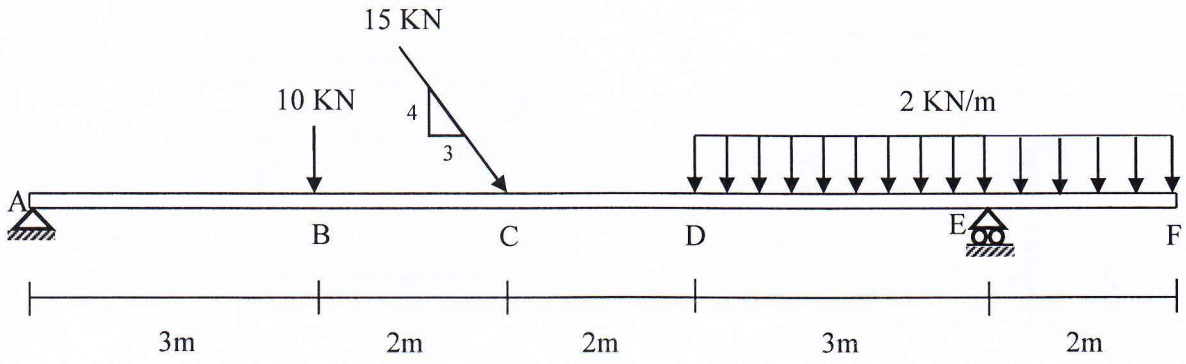
1. Calculate **area of members FC and GH** in the truss shown below to carry an inclined force of 400 KN at H and a concentrated load of 200 KN at G. Given the allowable tensile stress is 140 MPa and the allowable compressive stress is 120 MPa.



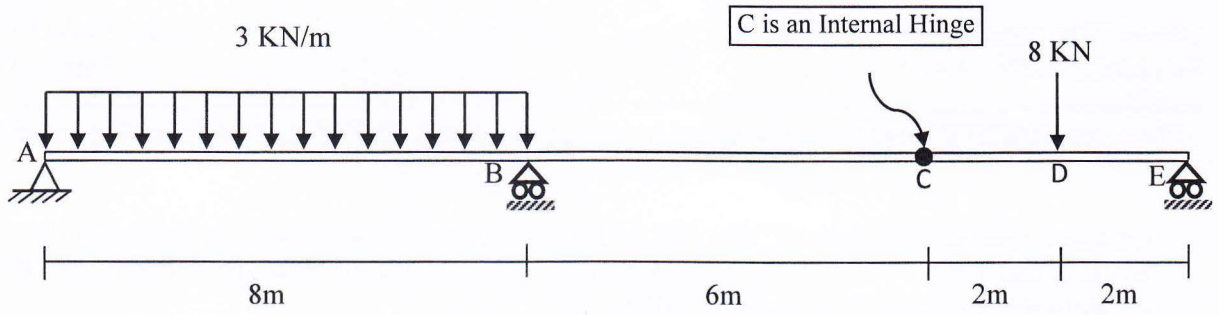
2. Determine **the relative displacement** of point D from A for the elastic steel bar of variable cross section shown below caused by the application of concentrated forces. Let E = 29000 ksi. Also draw the axial strain and axial displacement diagram.



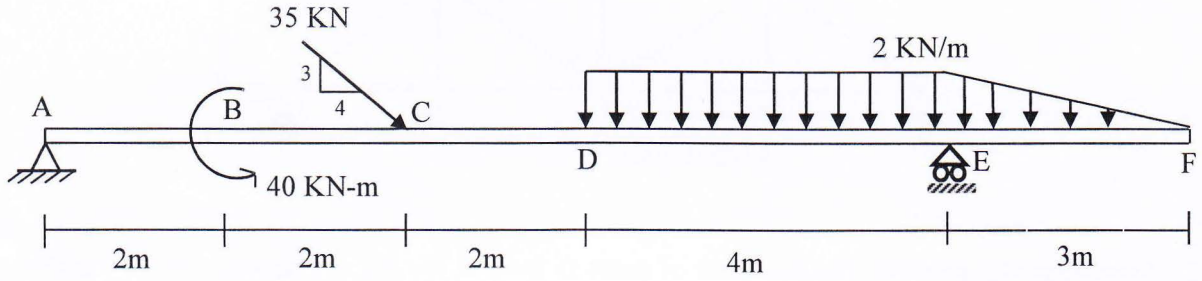
3. Compute the **Support reactions and draw axial force, shear force and bending moment diagrams** for the beam shown below.



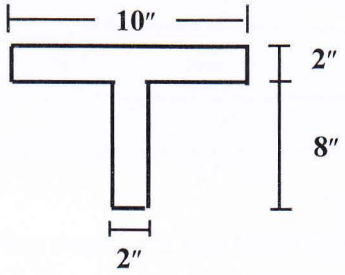
4. Compute the **Support reactions and draw shear force and bending moment** diagrams for the beam shown below.



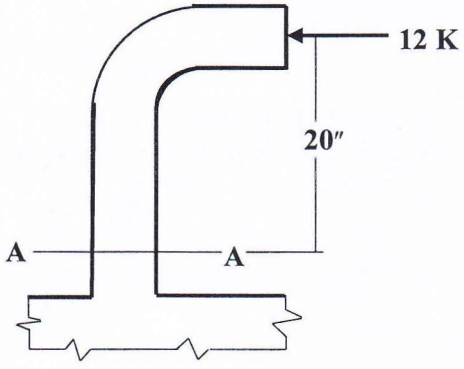
5. Draw **axial force, shear force and bending moment diagrams** for the beam loaded as shown in beam below.

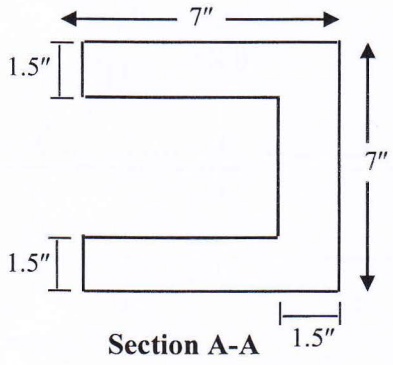


6. What are the **assumptions** used in the derivation of bending formula for beams? Determine the **bending moment capacity** around the centroidal axis for the cross-sectional area with the dimension shown in figure below. The allowable elastic stress is 20 ksi.

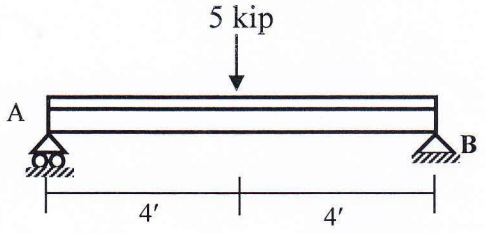


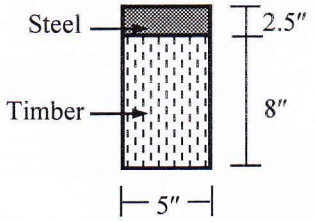
7. Calculate the **maximum tensile and compressive stresses** acting normal to **section A-A** of the machine bracket shown below caused by the applied force of 12 kips.





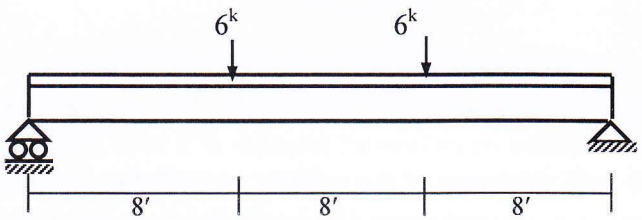
8. A 8ft simple beam as shown in the figure below carries a downward concentrated force of 5 kip. The composite cross-section of the beam is made of steel and timber. What are the **maximum flexural stresses** in the steel and timber? [Given, the modulus of elasticity of steel = 30,000 ksi, modulus of elasticity of timber = 1500 ksi].

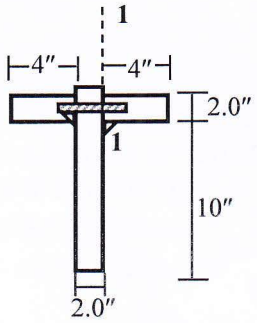




Cross Section

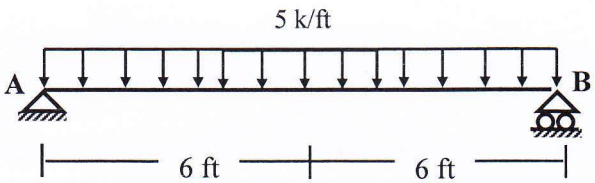
9. Calculate (i) **the flexural shear flow at Level 1-1** of the T-section joined as shown below if the beam is loaded as simply supported. (ii) Calculate **the spacing** of 0.75″ bolts required at the joint to withstand this shear flow. (iii) Calculate **the size of welds** required at the joint. [Given: Allowable shear stress = 20 ksi for both bolts & welds].

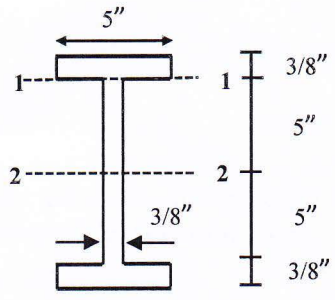




Cross Section

10. An I-beam is loaded as shown below. 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.

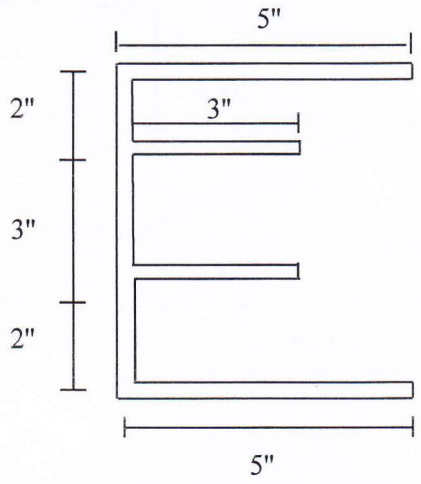




Cross Section

11. (a) Prove that for a cylindrical thin walled pressure vessel, hoop stress (σ_t) is two times of longitudinal stress (σ_L).
(b) Derive the equation of Shear Center for a channel section.

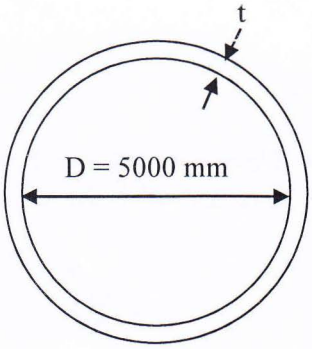
12. Locate **the Shear Center** for the following beam section shown below. Thickness of each segment of the beam is 0.2".



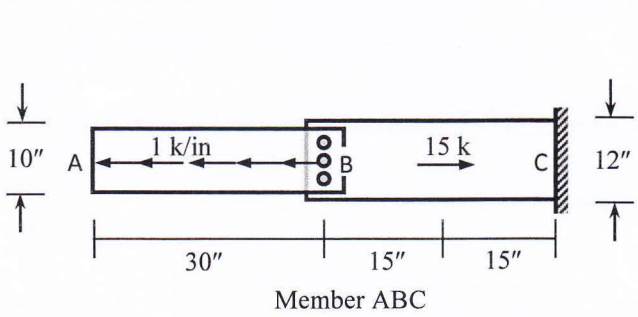
13. For a closed spherical steel pressure vessel of 5000 mm inside diameter as shown in figure below, the maximum membrane stress caused by an internal pressure of 5 MPa is 150MPa.

(i) Determine the **minimum wall thickness** of the cylinder to resist the maximum membrane stress. (ii) Determine the **change** in circumference of the cylinder caused by pressure.

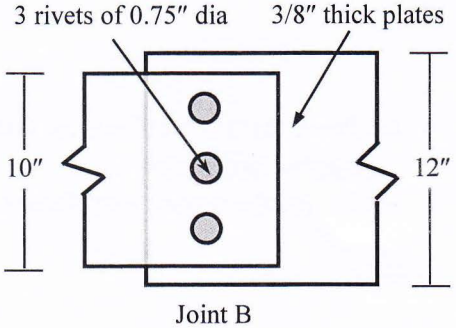
Assume E= 2x 10^{11} Pa and $v = 0.45$.



14. Calculate the **shearing stress** in the rivets and the maximum **tearing and bearing stresses** in the plates at joint B of the structural member ABC loaded as shown below.



Member ABC



Joint B

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

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

Part 1: Answer the following question

Question 1:

a. Characteristic compressive strength of the slab of a residential building is 3000 psi and minimum slump value required for concrete is 150 mm. Design the mix according to ACI volume method using following information. Use the attached tables and given formula. [40]

(i) Coarse aggregate is crushed stone having maximum size 19 mm and fine aggregate is Sylhet sand (FM 2.70)
(ii) Minimum required slump is 175 mm.
(iii) Fine and coarse aggregate has a loose dry density of 1300 kg/m^3 (SSD) and 1500 kg/m^3 (SSD) respectively.
(iv) No admixture is used.
(v) For first trial mix, three cylinders with ACI standard dimensions are cast. Assume 25% loss in cylinder casting.
(vi) Assume reasonable value for missing data, if any.

b. Calculate the cost of concrete per cubic meter. (Assume the cost of 1bag cement = Tk.450, cost of 1 cft Sylhet sand= Tk. 70 and cost of 1cft crushed stone= Tk. 170)

Part 2: Answer any 2(Two) out of 3 questions (2-4)

Question 2:

a. Describe the typical stress-strain responses of steel with different strengths. How to [5]
b. evaluate the Young's modulus from the stress-strain curve of steel?
c. Explain different moisture condition of coarse aggregate. [4]
d. What are the benefits of stone aggregate over brick aggregate in concrete construction works? [4]
e. Explain modulus of resilience, modulus of toughness, and creep. [6]
f. Explain the Field tests of Brick. [3]

Question 3:

a. Describe bulking of sand. [3]
b. Prove that 1 MPa = 145 Psi. [3]
c. "Brick get strength during burning"-How? [2]

d. The Sieve analysis data of a sand sample for a building construction project are summarized below: [14]

ASTM Sieve	Amount Retained (g)
3 inch	0
1.5 inch	0
¾ inch	0
3/8 inch	0
#4	0
#8	80
#12	80
#16	40
#30	80
#40	30
#50	0
#100	90
#200	50
Pan	50

(i) Calculate the FM of the sand sample,
(ii) Draw the grading curve for the sand sample, make comments over the curve.

Question 4:

a. What are the harmful constituents of bricks? How Iron Pyrites affects brick? [5]
b. What do you mean by hydration of cement? Explain hydration process of cement (With Figure). [8]
c. Explain the process of artificial drying of brick. [3]
d. Describe the role of gypsum in cement. [3]
e. Explain the defects in plaster work. [3]

Part 3: Answer any 3(Three) out of 4 questions (5 – 8)

Question 5:

a. What is curing? "Curing is a primary factor for the durability of concrete"-Justify the statement. [4]
b. Define seasoning and felling of timber. List the main causes of timber decay. [5]
c. Discuss the effect of w/c ratio on compressive strength, permeability and durability of concrete. [6]
d. Write a short note on the following components of paint: [4]
(i) Base, (ii) Pigments
e. Explain the reason for applying retarding admixture in a concrete mix. [3]

Question 6:

a. What is spalling of concrete? How does it occur? Illustrate with neat sketches how a spalled area of a floor slab can be repaired with ferrocement. [8]
b. What is platen restraint? What is the effect of it on the compressive strength of [4]

concrete?

c. Differentiate between exogenous and endogenous trees. [2]
d. What is corrosion? Briefly describe the mechanism of corrosion induced by chloride, sulfate and carbonation. [6]
e. What is creep of concrete? How is related to strength of concrete? [2]

Question 7:

a. What is sacrificial thickness? Why is it used? [3]
b. Briefly describe the cathodic protection method as a corrosion preventive measure. [3]
c. What is admixture? How does the application of Plasticizer affect the properties of concrete? [5]
d. "High early strength of concrete can be obtained by using a very fine cement"-Why? [2]
e. Why compressive strength of concrete is inversely related to w/c ratio? [4]
f. Explain the relationship between the compressive and tensile strength of concrete. [2]
g. Draw strength vs time curve for the following concrete with different curing conditions: [3]
   (i) Continuous under water curing
   (ii) 3-day under water curing
   (iii) No curing

Question 8:

a. How Fly Ash Cement (FAC) is different from OPC in terms of imparting compressive strength to concrete? [3]
b. Discuss the salvage value of timber. [3]
c. Compare (i) entrapped air and entrained air, (ii) consistency and workability [4]
d. Define segregation of concrete. What are the main causes of segregation? [4]
e. Discuss the changes of workability of concrete for following situations: [6]
   (i) A fine sand is used instead of a coarse sand.
   (ii) Brick chips are used instead of round shaped shringles
   (iii) w/c ratio is increased at site
f. Write a short note on vulcanization. [2]

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	2.65	-
3	Absorption Capacity	ASTM C127	1.5	%
4	Dry Rodded Bulk density	ASTM C29	1570	kg/m^3
5	Moisture Content of FA in Laboratory		2.5	%

Table 2: Properties of Coarse Aggregate

Sl. No.	Property	Test Method	Value	Unit
1	Bulk Specific Gravity (OD basis)	ASTM C127	2.65	-
3	Absorption Capacity	ASTM C127	1.00	%
4	Dry Rodded Bulk density	ASTM C29	1530	kg/m^3
5	Moisture Content of CA in Laboratory	-	2.5	%

Table 3: Properties of cement

Sl. No.	Property	Test Method	Value	Unit
1	Brand name		Rubi (OPC)	-
2	Clinker		100	%
3	Fly Ash		0	%
4	Compacted Unit Weight		1400	kg/m^3
5	Loose Unit Weight		1200	kg/m^3
6	Specific Gravity of clinker		3.15	

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	0.4 kg more water was added than calculated for first trial mix
Slump measured	100 mm
Measured density of fresh concrete	2390 kg/m^3

Estimating w/c ratio

$$\frac{w}{c} = 1.1734e^{-0.0259f_c'}$$

Where, f_c'=Target Mean Strength in MPa

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

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

Part 1: Answer the following question

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 = 0.40
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) = 3000 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 dry 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, 1550 kg/m^3 and 1200 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 = 95 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.

Part 2: Answer any 2(Two) out of 3 questions (2-4)

Question 2:

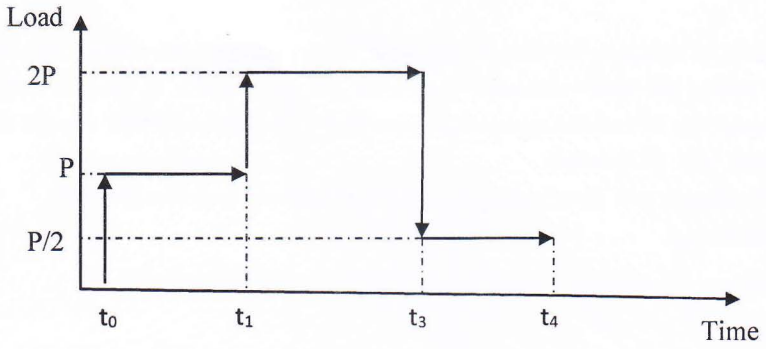
a. Write a short note on pozzolana cement. [2]
b. What is hydration? Describe the hydration process of silicates in cement. [4]
c. Give the characteristics of good bricks. What are the tests that are carried out in the field to determine the quality of good bricks? [5]
d. Write a short note on (i) X ray shielding mortar, (ii) Sound absorbing mortar [3]
e. Write down the speciality of following cements in composition and uses over OPC. [8]
   - Air Entraining Cement
   - Rapid Hardening Cement
   - Low Heat cement

Question 3:

a. Compare (i) over burnt and under burnt bricks, (ii) continuous and intermittent kiln. [4]
b. Compare different types of sand. Which sand is the most suitable for CE works? [4]
c. A mortar is to be placed on a brick wall of 7.5 ft long, 5 ft height and the mortar thickness is 0.5". Sand to cement ratio (by weight) is 3. Assume w/c = 0.5 and air content in mortar is 2%. Estimate the amount of mortar necessary for the wall and the amount of each ingredient of mortar. Assume 20% extra volume of mortar for loss during application. [Sand unit weight = 1350 kg/m^3 with void (SSD)] [8]
d. What is single stage and multi stage loading? Discuss their types with appropriate examples. [6]

Question 4:

a. Define the terms: (i) ductility, (ii) malleability, (iii) brittleness [3]
b. Illustrate with neat sketches the influence of aluminate/sulfate ratio on setting characteristics of the Portland Cement Paste. [8]
c. List the laboratory tests on the properties of cement. Briefly discuss the soundness test. [3]
d. What is pug mill? List the steps in the manufacturing process of bricks. [3]
e. Draw the predicted strain response curve of the elasto-visco-plastic material for the following loading history. [5]



Part 3: Answer any 3(Three) out of 4 questions (5 – 8)

Question 5:

a. Discuss the following factors associated with the strength of concrete: [5]
   (i) Cement content
   (ii) Cement type
   (iii) Aggregate gradation
   (iv) Cement fineness
   (v) Curing

b. Discuss the following factors associated with the workability of concrete: [4]
   (i) Mixture proportion
   (ii) Fineness of cement
   (iii) Fine aggregate to total aggregate ratio
   (iv) Shape of aggregate

c. Write short notes on the followings: [5]
   (i) High density concrete
   (ii) Pervious concrete
   (iii) Self-compacting concrete
   (iv) Fiber reinforced concrete
   (v) High strength concrete

d. Explain different methods of curing of concrete. [4]

e. What is shrinkage? Explain different types of shrinkage of concrete. [4]

Question 6:

a. Explain the seawater attack (chloride, sulphate and CO_2) of concrete with chemical reactions. [8]

b. "W/C ratio is the key parameter related to strength and durability of concrete"-explain briefly. [3]

c. How is corrosion cell formed over the steel bar inside concrete? Explain with anodic and cathodic reactions. [4]

d. What is carbonation? What will happen if concrete is carbonated? [4]

e. Write a short note on vulcanization of rubber. [3]

Question 7:

a. Explain natural and artificial process of rubber production. [3]

b. Draw typical cross-section of an exogenous tree. Write the objectives of seasoning of timber. [5]

c. Explain natural and artificial defects in a tree. Show sketch where necessary. [8]

d. Write short note about: (i) Honey comb, (b) Fridel's salt. [3]

e. What is Ferro-cement? Explain the use of ferrocement in civil engineering works. [3]

Question 8:

a. What is admixture? Explain the reasons for using admixtures. [4]

b. Write a short note on the following: [6]
   i) Accelerating Admixture
   ii) Retarder
   iii) Corrosion inhibitators

c. What are the purposes of using air entraining admixtures in concrete? [2]

d. Define laitance and bleeding. How can bleeding be controlled? [4]

e. What are the major causes of early deterioration of concrete? [6]

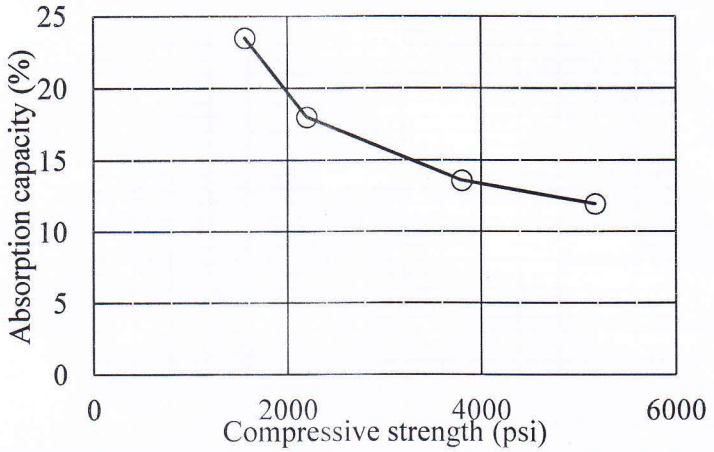


Figure 1: Absorption capacity vs compressive strength relationship

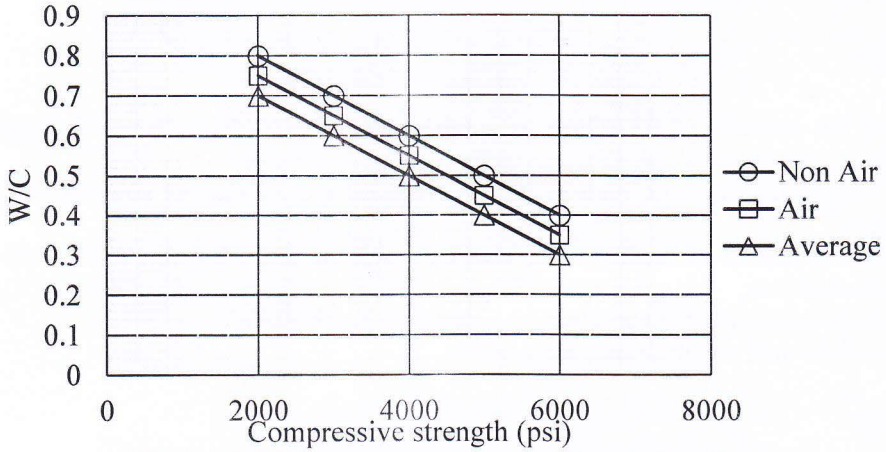


Figure 2: W/C vs compressive strength relationship

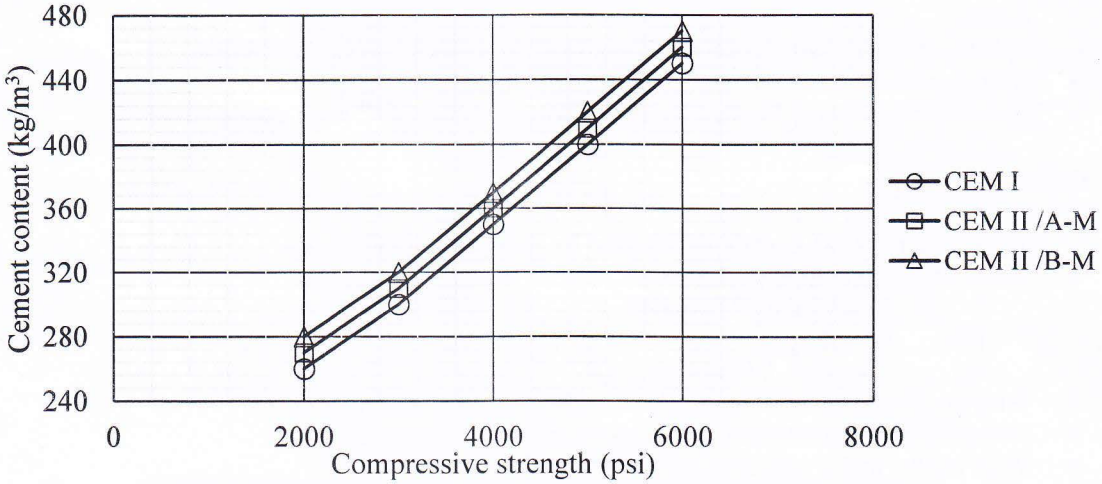


Figure 3: Cement content vs compressive strength relationship

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination, Spring 2016
Program: B.Sc. Engineering (Civil)
2nd Year /1st Semester

Course Title: Mathematics III | Course Code: MTH 201 | Course credit: 3.00
Time: 3hr | Full Marks: 150
Answer any **Six (6)** of the followings

1. (a) Find the regression line of Y *on* X by using the least square method for the following data. Also find the value of Y when $X = 7$. **15**

X_i	1	3	4	6	8	9	11	14
Y_i	1	2	4	4	5	7	8	9

(b) Ten students were ranked as follows by two independent examiners (E1 & E2) according to the marks they obtained in economics. Compute the rank correlation co-efficient and comment on the result. **10**

Student	A	B	C	D	E	F	G	H	I	J
E1	3	5	8	4	7	10	2	1	6	9
E2	6	8	9	7	10	4	1	2	3	5

2. (a) Consider the following function of X and Y **15**

$$f(x,y) = \begin{cases} \dfrac{x + 3xy^2}{4}; & 0 \le x \le 2, \ 0 \le y \le 1 \\ 0 \ ; & elsewhere \end{cases}$$

(i) Find the marginal distributions of $X$and Y.
(ii) Verify that the marginal distributions are also probability distributions
(iii) Compute $P[X + Y < 1]$

(b) Consider the probability mass function **10**

$$f(x) = \begin{cases} \alpha \left(\dfrac{1}{4}\right)^x \ ; & x = 0, 1, 2 \ldots\ldots\ldots \infty \\ 0 \ ; & elsewhere \end{cases}$$

(i) Evaluate α (ii) Find $P[X < 4], P[X = 4]$ and $P[X > 4]$

3. (a) Assuming that half of the population is vegetarian so that the choice of an individual being a vegetarian is 0.5. Assuming that 100 investigators can take a sample of 10 individuals to see whether they are vegetarians. How many investigators would you expect to report that **10**

(i) Three or less were vegetarian
(ii) At most eight were vegetarian
(iii) 5 to 6 were vegetarian

(b) Define standard normal distribution. A certain type of insect survives on the average 3 years with a standard deviation of 0.5 years. Assuming that the lives of the insect are normally distributed. Find the probability that a given insect will survive less than 2.3 years 3+7

if $\varphi(1.4) = 0.9192$

(c) The mean of a binomial distribution is 40 and standard deviation is 6. Calculate n, p *and* q. 5

4. (a) Consider the matrix $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & -2 \\ 0 & 1 & 4 \end{bmatrix}$. Calculate 13

(i) All the co-factors of A
(ii) Adjoint matrix of A
(iii) Inverse of A (if exists)

(b) Consider the complex matrices 12

$A = \begin{bmatrix} 1 & 2+i \\ i & 0 \end{bmatrix}, B = \begin{bmatrix} 2 & -i \\ 0 & 3 \end{bmatrix}$ *and* $f(x, y) = x^2 - 2xy - y^2 + 1$ then find $f(A, B)$.

5. (a) Solve the system of linear equations using Gauss-Jordan method 15

$$x + y + 2z = 8$$
$$-x - 2y + 3z = 1$$
$$3x - 7y + 4z = 10$$

(b) Show that the following system of linear equations has infinitely many solution. Write the general solution of the system also show a particular solution. 10

$$p + q - r = 1$$
$$-p + q = -1$$
$$-2q + r = 0$$

6. (a) Define rank of a matrix. Find the basis and dimension of the vector space V where, 2+13

$$\boldsymbol{u} = (1, -2, 5, -3), \quad \boldsymbol{v} = (2, 3, 1, -4) \quad \textit{and} \quad \boldsymbol{w} = (3, 8, -3, -5)$$

(b) Express if possible the vector $\mathbf{v} = (1, -2, 5)$ as a linear combination of vectors 10

$$\boldsymbol{x} = (0, 3, 6), \quad \boldsymbol{y} = (-2, 6, 6) \textit{ and } \boldsymbol{z} = (3, -3, 3)$$

7. (a) Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 1 & 2 \\ 4 & -1 \end{bmatrix}$. 15

(b) Show that the vectors are linearly independent 10

$$\boldsymbol{u} = (1, 2, 3), \quad \boldsymbol{v} = (2, 5, 7) \quad \textit{and} \quad \boldsymbol{w} = (1, 3, 5)$$

8. (a) Show that the following linear operator on $\mathbb{R}^3$ defined by 15

$$T(x, y, z) = (x - 3y - 2z,\ y - 4z,\ z)$$

is invertible also find T^{-1}.

(b) Show that the following transformation $T: \mathbb{R}^3 \to \mathbb{R}^2$ is not a linear transformation. 10

$$T(x, y, z) = (x + 1, y + z)$$

University of Asia Pacific

Department of Civil Engineering

Semester Final Examination, Spring-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.

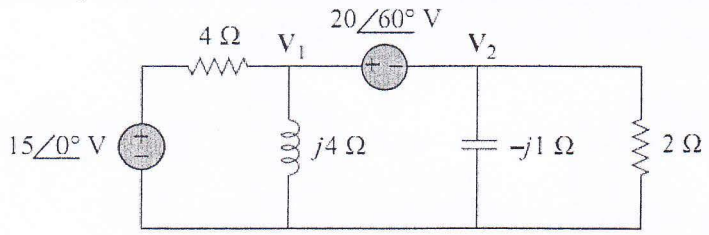
1. (a) The voltage $v = 12\cos(60t + 45°)$ is applied to a 0.1-H inductor. Find the steady state current through the inductor. 5

   (b) Find the amplitude, phase, period, angular frequency and frequency of the sinusoid 10

   $$v(t) = 16\cos(50t + 60°)$$

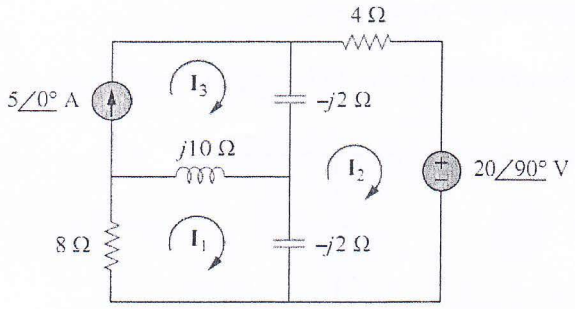
   (c) Calculate the phase angle between v1 =− 10 cos(ωt + 50◦) and v2 = 12 sin(ωt − 10◦). State which sinusoid is leading. 10

2. (a) Calculate V_1 and V_2 of the following circuit using nodal analysis. 12



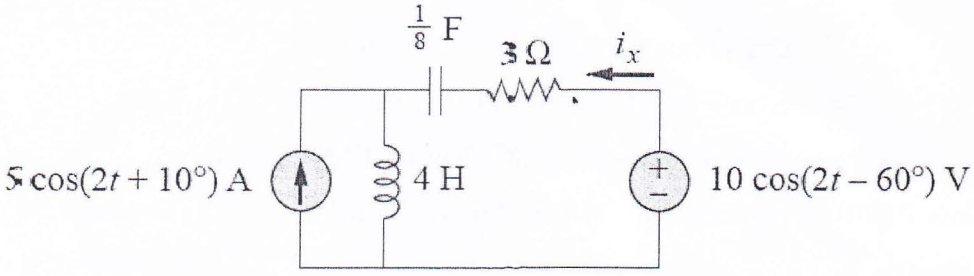
Circuit diagram for question 2(a)

   (b) Determine currents I_1, I_2, I_3 of the following circuit using mesh analysis. 13



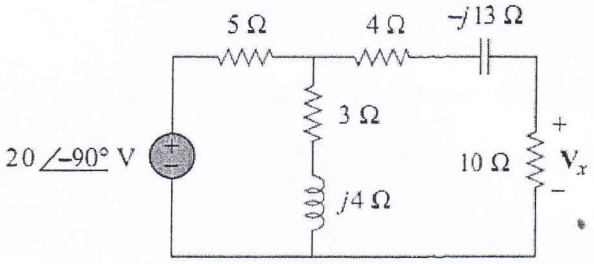
Circuit diagram for question 2(b)

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



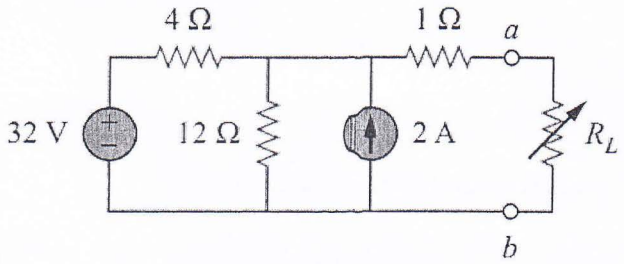
Circuit diagram for question 3(a)

(b) Calculate v_x in the following circuit using the method of source transformation. 12



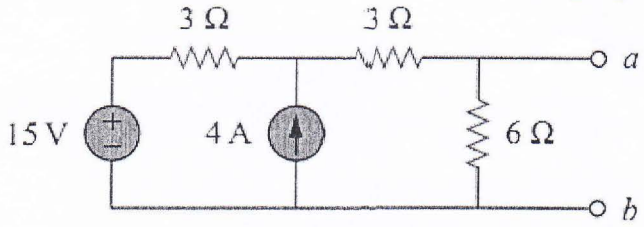
Circuit diagram for question 3(b)

4. (a) Find the Thevenin equivalent in following circuit to the left of the terminals a-b. Then find the current through R_L = 6,16 and 36 Ω. 13



Circuit diagram for question 4(a)

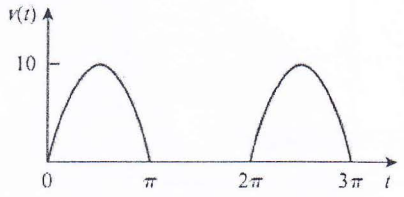
(b) Find the Norton equivalent circuit for the following figure. 12



Circuit diagram for question 4(b)

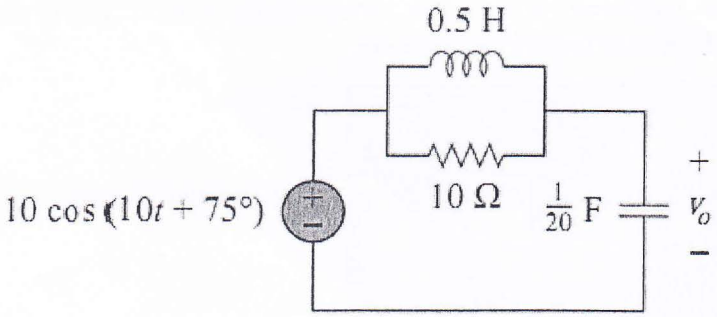
5. (a) Find the rms value and the amount of average power dissipated in a 10-Ω Resistor for the following waveform where 13

$$v(t)=\begin{cases} 10sint & 0<t<\pi \\ 0 & \pi<t<2\pi \end{cases}$$



Waveform for question 5(a)

(b) Calculate v_o in the following circuit. 12



Circuit diagram for question 6(b)

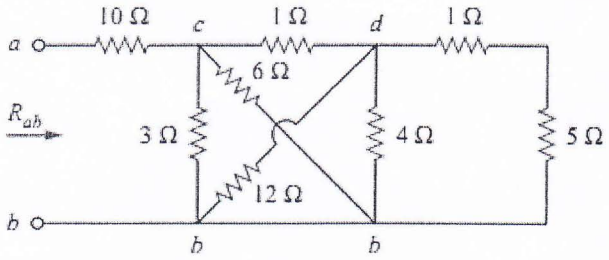
6. (a) If the voltage and current at the terminals of a circuit are 13

$$v(t) = V_m \cos(\omega t + \theta_v)$$
$$i(t) = I_m \cos(\omega t + \theta_i)$$

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

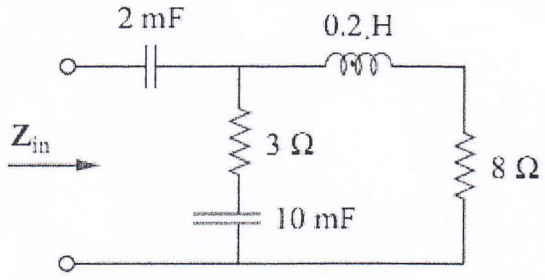
(b) State and prove Maximum Power Transfer Theorem. 12

7. (a) Calculate the equivalent resistance Rab in the circuit in following figure. 12



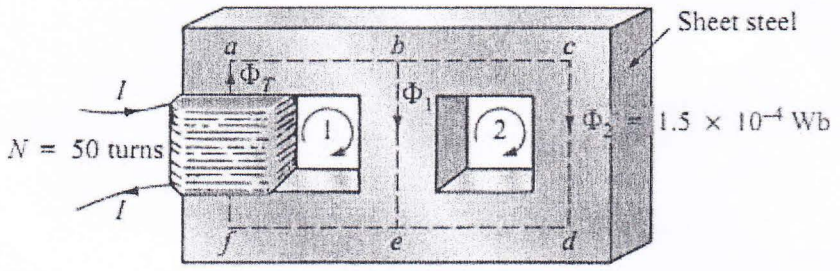
Circuit diagram for question 7(a)

(b) Find the input impedance of the circuit in following figure. Assume that the circuit operates at $\omega = 50$ rad/s. 13



Circuit diagram for question 7(b)

8 (a) Determine the current I required to establish a flux of 1.5×10^{-4} Wb in the section of the core indicated in the following figure. 18



$l_{bcde} = l_{efab} = 0.2$ m
$l_{be} = 0.05$ m
Cross-sectional area = 6×10^{-4} m^2 throughout

Required B-H data table

B(T)	.25	0.5	0.78	0.97	1.05	1.08	1.12	1.16	1.2	1.22
H(At/m)	40	80	120	160	200	240	280	320	360	400

(b) Write short notes on (i) flux density (ii) magnetizing force (iii) permeability 7