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 (4x25)

1.	a)	Define socialization and re-socialization.	5
	b)	Discuss the role of mass media and educational institutions in the process of socialization.	20
2.	a)	Define migration.	2.5
	b)	Briefly discuss the types of migration.	2.5
	c)	Discuss the causes of migration from rural to urban in Bangladesh.	20
3.	a)	State what you understand by social control.	5
	b)	Discuss the role of religion and law as the agencies of social control.	20
4.	a)	Define authority.	5
	b)	Describe the characteristics of traditional, legal and charismatic authority.	20
5.	a)	Define family.	5
	b)	Critically discuss the Changing nature of family structure in Bangladesh.	20
6.		Discuss in some details any two of the following.	12.5 x 2
	a)	Various stages of the scientific method	
	b)	Violence against women in Bangladesh	
	c)	Urban and Rural culture in Bangladesh	

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall 2018
Program: B. Sc. Engineering (Civil)
(2nd Year 1st Semester)

Course code: HSS 211(b)   Course Title: Bangladesh Studies: History   Credit: 2.00
Total Time: 2.00 hrs.   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. Describe the popular conceptions about Sirajuddaula, Mir Jafar and the Battle of Palashi.   10

    b. Analyze the character of Nawab Sirajuddaula in light of contemporary research based on new evidences.   15

2.   Describe the land revenue experiments in Bengal which led to the Permanent Settlement.   25

3. a. Evaluate the role of Raja Rammohan Roy in abolishing *sati*.   15

    b. Discuss the role of Iswar Chandra Vidyasagar in introducing Widow Remarriage Bill.   10

4. a. "In 1905, the leadership mainly came from eastern Bengal, now it is from western Bengal. In 1905, the organizer was the Government of India, now the organizers are the Bengalis themselves. In 1905, the problem was political now communal." Explain this statement.   15

    b. Explain the reasons behind the failure of United Independent Bengal Movement.   10

5. a. Describe the two phases of the Language Movement.   20

    b. Briefly mention the importance of Language Movement.   5

6.   Briefly describe the events from 1966 which led the Independance Movement of Bangladesh.   25

Course Title: Mathematics-III   Course Code: MTH 201
Time: 3.00 Hour.   Full Marks: 150

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

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

    (b) Let $T : \Re^3 \rightarrow \Re^3$ be a linear transformation defined as follows. Then find kernel and image of the transformation $T(x, y, z) = (x - y, y - x, x - z)$.   **15**

2. (a) Find eigen values and associated eigen vectors of $A = \begin{pmatrix} -14 & 12 \\ -20 & 17 \end{pmatrix}$.   **15**

    (b) If $A = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix}$ then find A^{-1}, A^{-2}, A^{-3} using Cayley Hamilton Theorem.   **10**

3. (a) Show that $v = (5, 6, 0)$ is a linear combination of vectors $v_1 = (1, 2, 0)$, $v_2 = (3, 1, 2)$ and $v_3 = (4, -1, 0)$.   **12**

    (b) Show that vectors $(1, 1, -1)$, $(1, 2, 3)$ and $(4, 5, -3)$ are linearly independent.   **13**

4. (a) Using Gaussian Elimination method solve the following system of linear equations $\begin{cases} x + y + z = 1 \\ 3x - y - z = 4 \\ x + 5y + 5z = -1 \end{cases}$ **17**

    (b) Find the basis and dimension of the set of vectors $\{(1, -2, 5, -3), (2, 3, 1, -4), (3, 8, -3, -5)\}$ **8**

5. (a) Find the median of the numbers 20 18 22 27 25 12 15. 5

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

Marks	0-20	20-40	40-60	60-80	80-100	100-120	120-140
No. of students	4	26	22	10	9	6	3

6. (a) The profits earned by 100 companies are given below: 15

Profits	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Company number	4	8	18	30	15	10	8	7

Calculate Q_1, Q_2, Q_3.

   (b) Calculate mean deviation for the following data 10

Sales(Lakhs)	10-20	20-30	30-40	40-50	50-60
No.of days	3	6	11	3	2

7. (a) In a bag there are 4 red, 5 white and 6 black balls. A ball is chosen at random. 5
       What is the probability that the ball will be

       i) Red   ii) white   iii) red or black   iv) orange   v) red or white or black

(b) A random variable X has the following functional form   **10**

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

    i)   Determine k for which $f(x)$ is a density function

    ii)   Find $P(1<X<2)$ and $P(X>2)$

(c) Find the marginal densities of X and Y from the following joint density function   **10**
and verify that marginal distribution are also probability distribution.

$$f(x,y) = \begin{cases} \dfrac{1}{8}(6-x-y), & 0 < x < 2,\, 2 < y < 4 \\ 0, & otherwise \end{cases}$$

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

Profit(Lakh)	10-20	20-30	30-40	40-50	50-60
No. of companies	18	20	30	22	10

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, Fall-2018

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 $i_2=5\cos(377t - 40°)$ 12
Does i_1 lead or lag i_2?

   (b) Determine $v_o(t)$ in the following circuit.   13

60 Ω

$20 \cos(4t - 15°)$ 10 mF   5 H $+$ v_o $-$
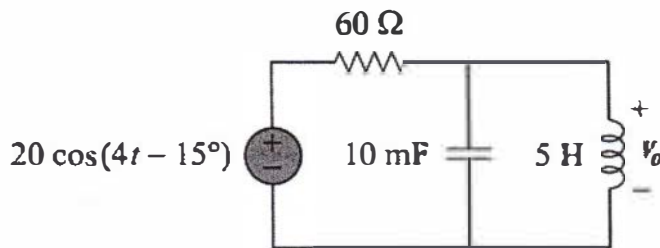
Circuit diagram for question 1(b)

2. (a) The waveform shown in the following figure is a half-wave rectified sine   12
wave. Find the rms value and the amount of average power dissipated in a
10-Ω resistor.

$v(t)$

10

0   π 2π 3π t
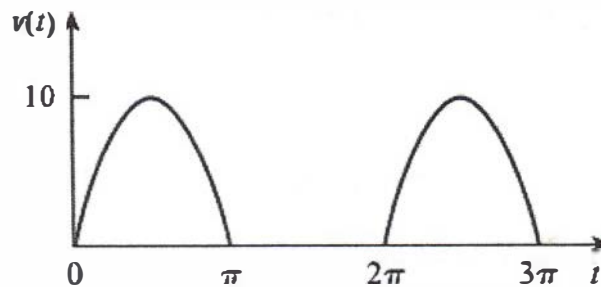
Waveform for question 2(a)

   (b) Obtain the power factor and the apparent power of a load whose impedance   13
is $\mathbf{Z} = 60 + j40$ Ω when the applied voltage is $v(t) =150 \cos(377t + 10°)$ V.
Also, determine the element values that form the series-connected load,

3. (a) Prove with necessary figure that the equivalent capacitance of series 12
connected capacitors is the reciprocal of the sum of the reciprocals of the
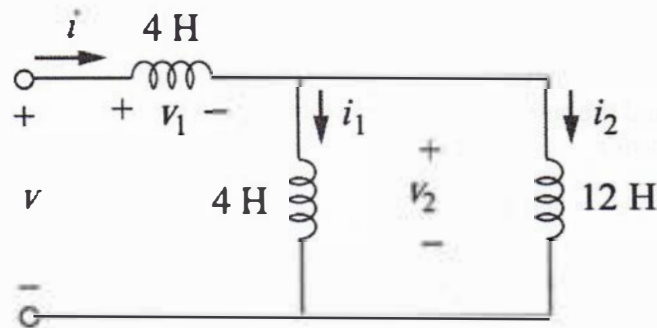individual capacitances

(b) Find the voltage across each of the capacitor in the following circuit. 13
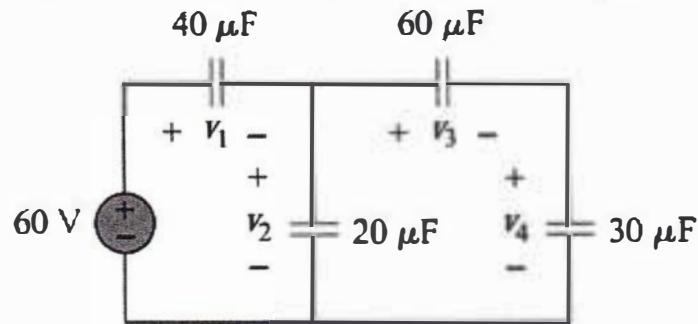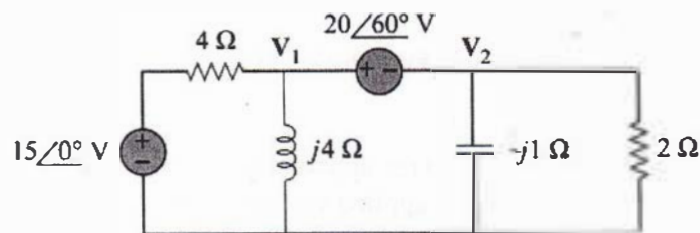

Circuit diagram for question 3(b)

4. (a) The current through a 0.1-H inductor is $i(t) = 10te^{-5t}$ A. Find the voltage 8
across the inductor and the energy stored

(b) For the following circuit, $i(t) = 4(2-e^{-10t})$ mA. If $i_2(0)=-1mA$, find: (a) $i_1(0)$; 17
(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) Compute V_1 and V_2 using nodal analysis in the circuit of following figure. 12

Circuit diagram for question 5(a)

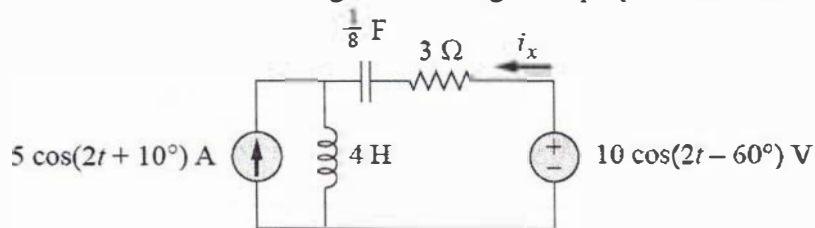(b) Calculate current Io in the following figure using mesh analysis.　　　13

10Ω　I_o

$-j4 \Omega$　　$j8 \Omega$

$2\underline{/0°}$ A

$50\underline{/0°}$ V

5Ω　　$-j6 \Omega$
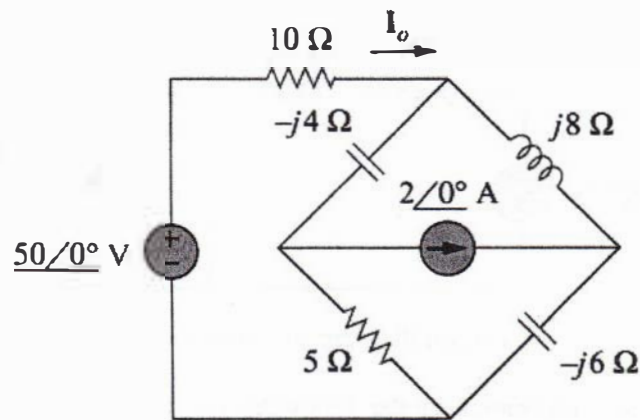
Circuit diagram for question 5(b)

6. (a) Calculate i$_x$ in the following circuit using the superposition theorem.　　　13

$\frac{1}{8}$ F　3Ω　i_x
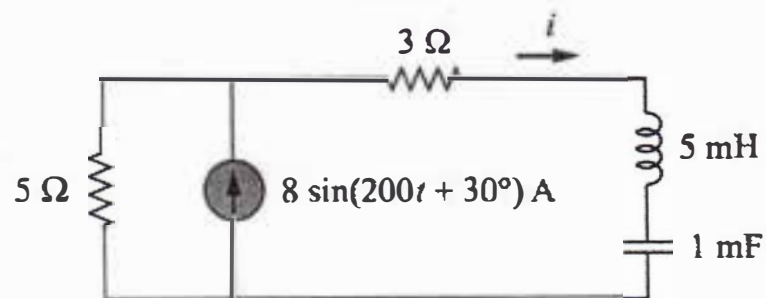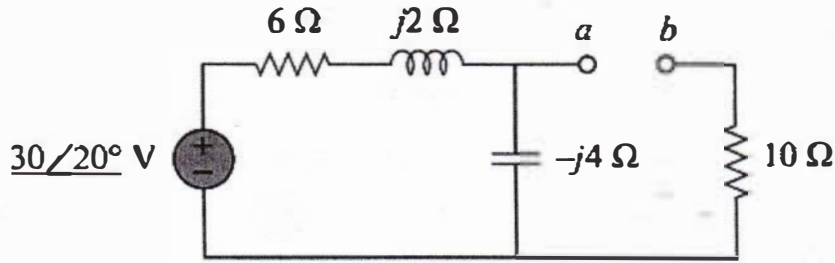
$5 \cos(2t + 10°)$ A　　4 H　　$10 \cos(2t - 60°)$ V

Circuit diagram for question 6(a)

(b) Using source transformation, find i in the following circuit.　　　12

3Ω　i

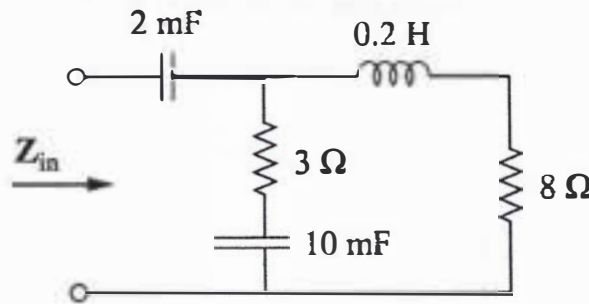5Ω　　$8 \sin(200t + 30°)$ A　　5 mH

1 mF

Circuit diagram for question 6(b)

7. (a) Find the Thevenin equivalent at terminals *a-b* of the following circuit.   13

Circuit diagram for question 7(a)

(b) Find the input impedance of the following circuit. Assume that the circuit   12
operates at $\omega=50$ rad/s

Circuit diagram for question 7(b)

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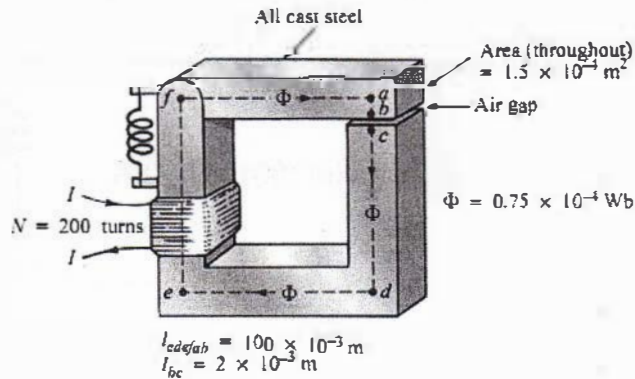
Circuit diagram for question 8(a)

Required B-H table

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) magnetizing force (iii) permeability   12

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B.Sc. in Civil Engineering

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

Course Code: CE 211
Full Marks: 10 × 10 = 100

Answer any 10 (Ten) of the following 12 (Twelve) Questions
The symbols have their usual meanings.
[Assume Reasonable Values for Any Missing Data]

1. The aluminum rod ABC consisting of two cylindrical portions A B and BC is to be replaced with a cylindrical steel rod DE of same overall length, as shown in *Fig. 1.* What is the required diameter (d) of the steel rod if both of the rods are to undergo same vertical deformation?
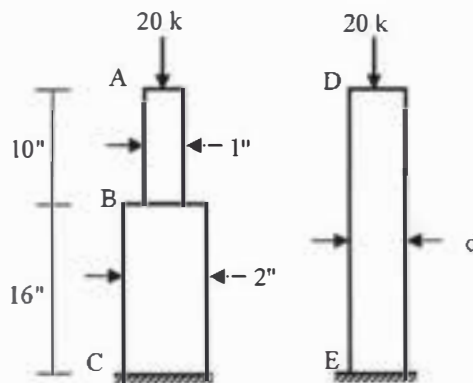   Given, $E_{Aluminum} = 10 \times 10^6$ psi, $E_{Steel} = 29 \times 10^6$ psi.

Fig. 1

2. A rigid bar with negligible mass is pinned at O and attached to two vertical rods, as shown in *Fig. 2.* Assuming that the rods were initially stress-free, determine what maximum load P can be applied without exceeding stresses of 150 MPa in the steel rod and 70 MPa in the bronze rod?
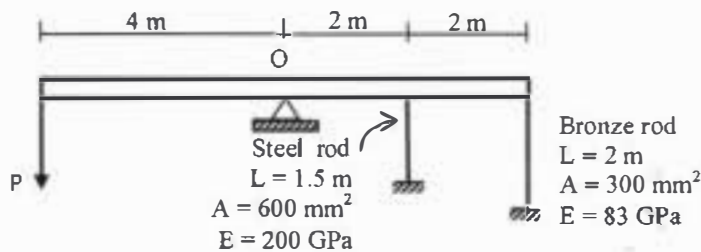

Fig. 2

3. Determine the magnitude of the uniformly distributed load, *w*, on the simply supported beam as shown in *Fig. 3(a)*, if the maximum allowable tensile and compressive bending stresses in the cross-section as shown in *Fig. 3(b)* are 60 ksi and 36 ksi respectively.
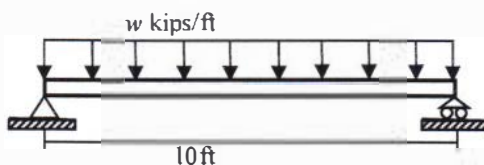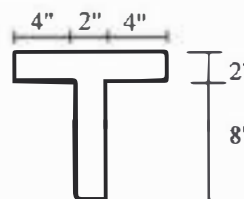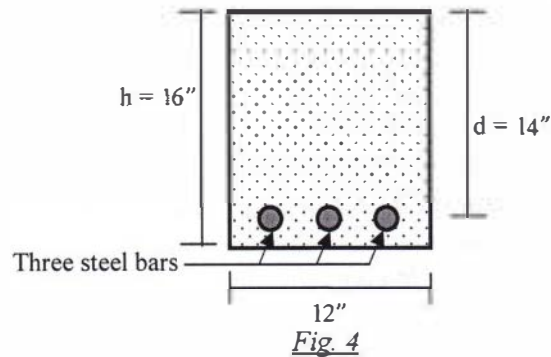

Fig. 3(a)

Fig. 3(b)

4. Calculate the maximum stress in concrete and steel for a reinforced concrete beam with the section shown in *Fig. 4*, if it is subjected to a positive bending moment of 45 kip-ft. The reinforcement consists of three steel bars. Assume cracked section and n = 8. Diameter of each steel bar is 1 inch.

Fig. 4

5. An I -beam having a length of 10 m and cross-section A-A with dimensions shown in *Fig. 5* is subjected to an uniformly distributed load of 2 kN/m. Determine the shear stresses at levels a-a, b-b and c-c of the cross-section. Given, level b-b is at neutral axis.

Section A-A

Fig. 5
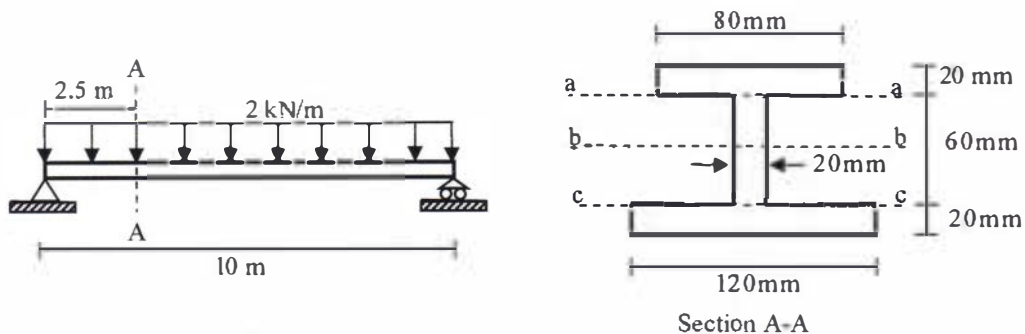
6. A cylindrical steel pressure vessel 400 mm in diameter with a wall thickness of 20 mm, is subjected to an internal pressure of 4.5 MPa.
   (a) Calculate the tangential and longitudinal stresses in the steel. (4)
   (b) To what value may the internal pressure be increased if the stress in the steel is limited to 120 MPa? (4)
   (c) If the pressure is raised to the bursting point of the vessel, in which section will the failure occur? Justify your answer with free-hand sketch. (2)

7. Draw Shear Force and Bending Moment diagrams for the following beam loaded as shown in *Fig. 6*.

Fig. 6
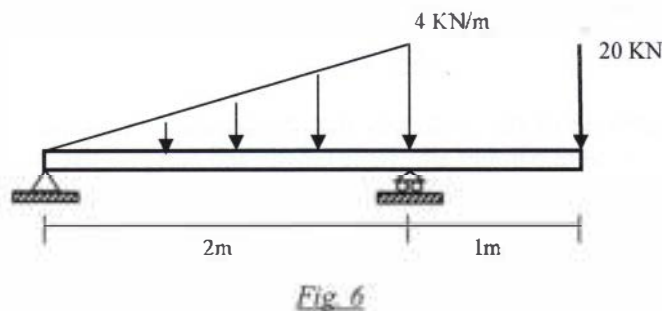
8. Draw Shear Force and Bending Moment diagrams for the beam loaded as shown in *Fig. 7*. Note, *B* is an internal hinge.
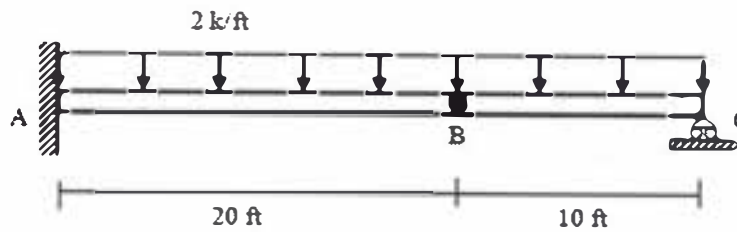
2 k/ft

A

B

C

20 ft   10 ft

Fig. 7

9. Derive the complete equations of Shear Force and Bending Moment of the beam shown in *Fig 8*.

2 KN/m

20 KN

1 KN/m

1 m   2 m

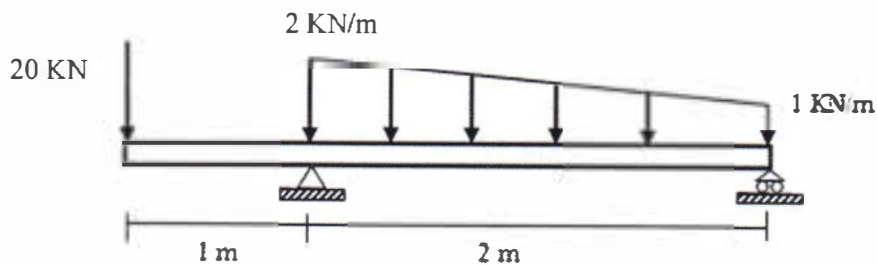*Fig. 8*

10. Use singularity functions to derive the equations of Shear Force and Bending Moment of the beam shown in *Fig. 9*.

10 K

Internal hinge
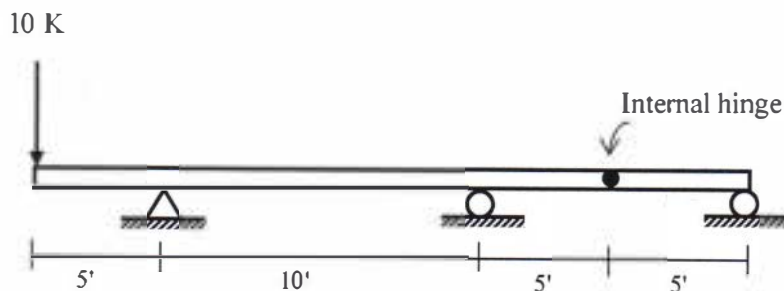
5'   10'   5'   5'

Fig. 9

11. Two plates are joined by four rivets 25 mm in diameter as shown in *Fig. 10*. 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).

P

130 mm

150 mm

P

Thickness, t_1 = 14 mm

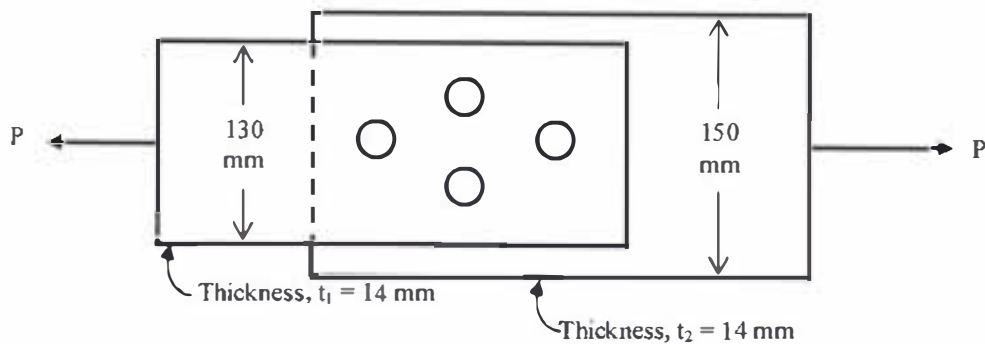Thickness, t_2 = 14 mm

Fig. 10

12. As shown in *Fig. 11*, 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.
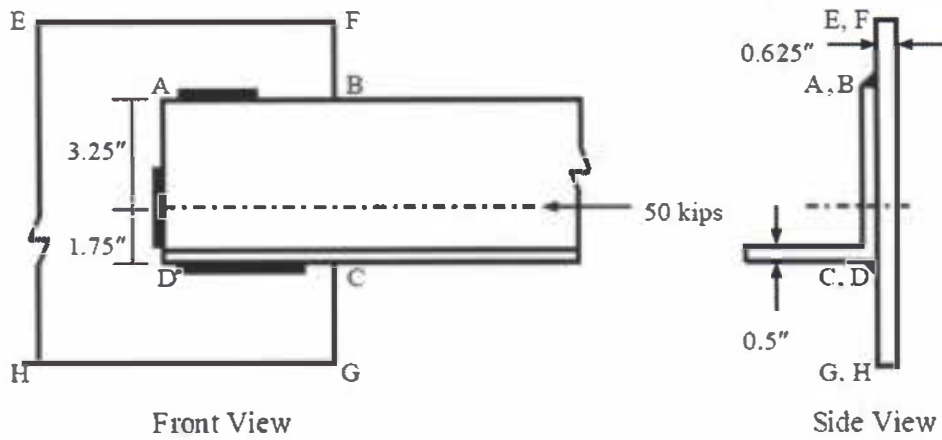   [Given: Allowable shear stress = 16 ksi].

Front View   Side View

Fig. 11

Course Title: Engineering Materials	Course Code: CE 201
Time: 3 hours	Full Marks: 100 (50 + 5 x 10)

Answer all questions.

QUESTION 1 [50 MARKS]

The demand of ferrocement is increasing globally due to its low self-weight, efficiency in construction time, and cost-effectiveness. However, due to the lack of data on fire behavior of ferrocement beams, an undergraduate thesis is launched at UAP. In order to identify the good quality material and to finalize the mix design, the materials 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-X	Sand-Y
3 inch	76.2	0	0
1.5 inch	38.1	0	0
3/4 inch	19.05	0	0
3/8 inch	9.5	0	0
# 4	4.75	0	0
# 8	2.36	0	100
# 12	1.7	0	100
# 16	1.19	0	40
# 30	0.59	200	60
# 40	0.425	240	40
# 50	0.3	0	40
# 100	0.15	0	60
# 200	0.075	50	10
Pan	-	10	0

a. (i) Calculate Fineness Modulus (FM) of both Fine Aggregate (FA) samples. [15]

(ii) Draw the grading curve of fine aggregate samples. Based on the grading curves, proposed the suitable fine aggregate for the casting of concrete beams and justify your selection with proper explanation.

b. In order to investigate the fire behavior of ferrocement beams, four concrete beams of [20] width 0.2 m, height 0.3 m, and length 2 m will be constructed at UAP. In this thesis work, the brick aggregate will be used as coarse aggregate. The design **abrasion resistance of brick aggregate is 40%** has been considered to achieve the target strength of concrete. The **water to cement ratio (W/C)** will be taken from **Figure 1** with respect to the abrasion resistance of brick aggregate. No chemical admixture will be used during concrete mixing. The following necessary data are provided for the mix design:

Fine aggregate to total aggregate volume ratio = 0.45
Specific gravity of fine aggregate = 2.6
Specific gravity of coarse aggregate = 2.0
Specific gravity of cement = 3.15
Amount of cement = 350 kg/m^3
Air content = 2% (air entraining admixture is not used)

Consider weight basis mix design for the calculation.

(i) Calculate the amount of cement, coarse aggregate, fine aggregate, and water per unit cubic meter of concrete.

(ii) Estimate the quantity of cement, coarse aggregate, fine aggregate, and water required for the casting of 4 beams (0.2 m x 0.3 m x 2 m) and 9 cylinders (diameter = 100 mm and height = 200 mm) and 9 cubes (150 mm x 150 mm x 150 mm) to monitor the strength of concrete at 7, 14 and 28 days (3 specimens for each test age). Assume 30% extra volume is necessary due to total loss of concrete during casting.
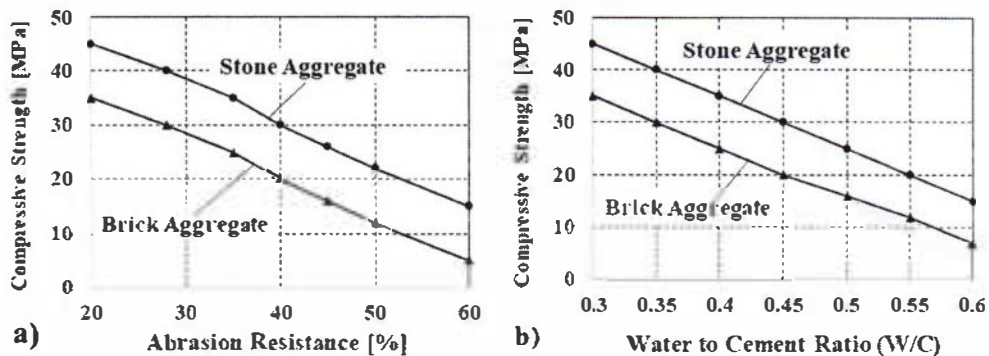

Figure 1: Compressive strength as a function of abrasion resistance (a) and water to cement ratio (b) of brick and stone aggregates, respectively.

c. In order to apply the ferrocement technique on the concrete beams, 15 mm thick mortar [15] will be applied all around the surfaces (0.2 m/0.3 m x 2 m) of four concrete beams. Note that the beams will be prepared in the lab and not attach with slab/floor (i.e., all surfaces will be free to work). The following data are provided:

Fine aggregate to cement ratio (weight basis) = 2
Water to cement ratio = 0.45; Air content = 2%
Specific gravity of fine aggregate = 2.6
Specific gravity of cement = 3.15

(i) Estimate the amount of each ingredient (cement, fine aggregate, and water) of mortar necessary for the application of ferrocement of 4 beams and 9 cubes (50 mm x 50 mm x 50 mm) to monitor the strength of ferrocement mortar at 7, 14 and 28 days (3 specimens for each test age). Assume 30% extra volume of material is necessary due to total loss of mortar during application on the beam surfaces and penetration of mortar through the steel weir mesh of ferrocement technique.

(ii) 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/m^3.

QUESTION 2 |10 MARKS|

a. Using the schematic diagram, explain the creep and creep recovery of concrete. [4]
Or
   Sketch qualitative stress-strain curves of concrete, mild steel, glass, and rubber.

b. Explain the function of Silica (SiO_2) and Iron Oxide (Fe_2O_3) in clay brick. [4]

c. Illustrate the function of frog mark of brick. [2]

QUESTION 3 |10 MARKS|

a. Show hydration reaction of silicate and identify the main strength giving compound of cement. Provide the shape and size of that compound. [3]

b. Summarize the advantages and disadvantages of high fineness cement. [4]

c. Define gauged mortar and surkhi mortar. [3]

QUESTION 4 |10 MARKS|

a. "Self-compacting concrete has recently gained popularity not only in abroad but also in Bangladesh". Explain this statement with a proper explanation. [5]
Or
   "Pervious concrete could re-fill the underground water level and reduce the flood problem of Dhaka city". Explain why.

b. "All high-performance concrete is high strength concrete but all high strength concrete is not high-performance concrete". Justify this statement. [2]

c. "Water to cement ratio is the key parameter related to strength and durability of concrete". Justify this statement. [3]

QUESTION 5 |10 MARKS|

a. "Cube strength is greater than cylinder strength". Report the reason with proper mechanisms. [4]

b. Identify the difference between accelerator and retarder as a chemical admixture. [3]

c. Describe the disadvantages of concrete containing silica fume as a binder. [3]

QUESTION 6 |10 MARKS|

a. Apply the knowledge to explain the mechanism of chloride-induced corrosion of steel embedded in concrete. [4]

b. List the characteristic of ideal paint. [3]

c. Report the main causes of the early decay of timber. [3]
Or
   Sketch a typical cross-section of timber and show different parts of it.