

**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Final Examination, Fall 2017**  
**Programme: B.Sc. Engineering (Civil)**  
**(2<sup>nd</sup> Year 1<sup>st</sup> Semester)**

**Course Title: Bangladesh Studies: Society and Culture**

**Course Code: HSS 211(a)**

**Credit: 2**

**Time: 2 Hours**

**Full Marks: 100**

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There are Six questions. Answer ANY FOUR (4x25)

- |       |  |    |
|-------|--|----|
| 1. a) | Define institution.  | 5  |
|       | b) Distinguish between association and institution.  | 20 |
| 2.    | Explain Marx's most enduring contribution to the history of social thought.                              | 25 |
| 3. a) | Describe the major agencies of socialization.  | 15 |
|       | b) Which agency do you think is most responsible in teaching violent behavior in Bangladesh society?     | 10 |
| 4. a) | What do you mean by political culture?   | 5  |
|       | b) Critically evaluate the major features of political culture in Bangladesh with examples.              | 20 |
| 5. a) | Define social inequality.  | 5  |
|       | b) Evaluate the different natures of social inequality in Bangladesh.                                    | 20 |
| 6. a) | Who are the ethnic minorities?   | 5  |
|       | b) Discuss about the Chakma or the Marma indigenous groups of Bangladesh and their diversified cultures. | 20 |

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**Final Examination, Fall 2017**  
**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. Describe the major causes for Nawab's defeat in the battle of Palashi. 10  
b. Explain the impact of the victory of the East India Company. 15
2. Summarize the Faqir-Sannyasi rebellion as an initial anti-British movement. 25
3. a. Write a brief introduction of Raja Ram Mohon Roy. 5  
b. Examine Raja Ram Mohon Roy as the first modern person of India. 20
4. a. Analyze the background that led the British to partition Bengal in 1905. 15  
b. Discover the reasons that motivated the Muslims to welcome the partition plan. 10
5. Analyze the significance of the Six Point Programme of 1966. 25
6. a. Describe the different phases of the Liberation War of Bangladesh in 1971. 10  
b. Examine the reasons of our victory. 15

**University of Asia Pacific**  
**Department of Basic Sciences & Humanities**  
**Final Examination, Fall-2017**  
**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) If  $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$  and  $C = \begin{bmatrix} 1 & 5 \\ -1 & -2 \end{bmatrix}$  13  
 then prove that  $(AB)C = A(BC)$

(b) If  $A = \begin{bmatrix} 1 & 5 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 5 & 6 \\ 2 & 4 & 0 \end{bmatrix}$  then prove that  $A^T + B = (A + B^T)^T$ . 12

2. (a) Prove that  $\begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(ab+bc+ca)$ . 10

(b) Find the rank of the following matrix using normal form 15

$$A = \begin{bmatrix} 1 & 3 & -2 & -1 \\ 2 & 6 & -4 & -2 \\ 1 & 3 & -2 & 1 \\ 2 & 6 & 1 & -1 \end{bmatrix}$$

3. (a) Solve the following system of linear equations 17

$$\begin{aligned} 2x + 3y + 5z + t &= 3 \\ 3x + 4y + 2z + 3t &= -2 \\ x + 2y + 8z - t &= 8 \\ 7x + 9y + z + 8t &= 0 \end{aligned}$$

(b) Test whether the following set of matrices are linearly dependent or 8

independent  $\left\{ \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \right\}$ .

4. (a) Test whether the following vector form basis of  $\mathbb{R}^3$  or not 13  
 $\{(1, 1, 2), (1, 2, 5), (5, 3, 4)\}$

- (b) Verify Cayley-Hamilton theorem for the following matrix. Hence find 12

$$A^{-1}, \text{ where } A = \begin{bmatrix} 2 & 3 & 3 \\ 1 & 3 & 3 \\ 1 & 2 & 4 \end{bmatrix}$$

5. (a) Show whether the following mappings are Linear or not 10

$$T: \mathbb{R}^2 \rightarrow \mathbb{R}^3, \quad T \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x + 2y \\ -2x + y \\ 2x - 3y \end{bmatrix}$$

- (b) Let  $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$  be a linear transformation, where 15

$T(x, y, z) = (x + 2y - z, y + z, x + y - 2z)$ , then find the basis and dimension of i) Image of T and ii) Kernel of T

6. (a) Calculate the arithmetic mean and median of the frequency distribution given below. Hence calculate the mode using empirical relation between them. 15

Marks	0-20	20-40	40-60	60-80	80-100	100-120	120-140
frequency	4	26	22	10	9	6	3

- (b) Based on the frequency distribution given below calculate quartile deviation 10

Tax paid(lakh)	5-10	10-15	15-20	20-25	25-30	30-35	35-40
frequency	18	30	46	28	20	12	6

7. An analysis of workers resulted in the following distribution 25

Earning(tk)	50-70	70-90	90-110	110-130	130-150	150-170	170-190
frequency	4	8	12	20	6	7	3

Calculate the first four moments about assumed mean. Convert the result into moments about the mean. Find Skewness and Kurtosis and comments on the result showing graph.

8. (a) A pair of dice is rolled. The 36 different possible results are illustrated in the 2-dimensional grid. Use the grid to determine the probability of getting 8  
 i) At least one 4 ii) a sum greater than 9

- (b) A pair of dice is thrown. Find the probability that sum of the points on two dice is 8 or greater if 6 appears on the second toss. 8

- (c) Consider the following density function 9

$$f(x, y) = \begin{cases} \frac{x(1+3y^2)}{4}, & 0 \leq x \leq 2, \quad 0 \leq y \leq 1 \\ 0, & \text{elsewhere} \end{cases}$$

Find  $P[0 < X < 1, \frac{1}{4} < Y < \frac{1}{2}]$

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Semester Final Examination, Fall-2017**  
**Program: B. Sc. Engineering (2<sup>nd</sup> Year/ 1<sup>st</sup> Semester)**

Course Title: Basic Electrical Engineering      Course Code: ECE 201      Credits: 3.00  
 Time: 3.00 Hours      Full Marks: 150

**Instructions:**

- There are **Eight (8)** Questions. Answer any **Six (6)**. All questions are of equal value. Part marks are shown in the margins.
- Non-programmable calculators are allowed.

1. (a) Explain KCL and KVL. Justify them with diagram. [10]
- (b) Develop the equation for  $R_{eq}$  both for series and parallel connections of 3 (Three) resistors of same value ( $R$ ). [5]
- (c) Determine  $v_0$  and  $i$  in the following circuit (Figure 1). [10]

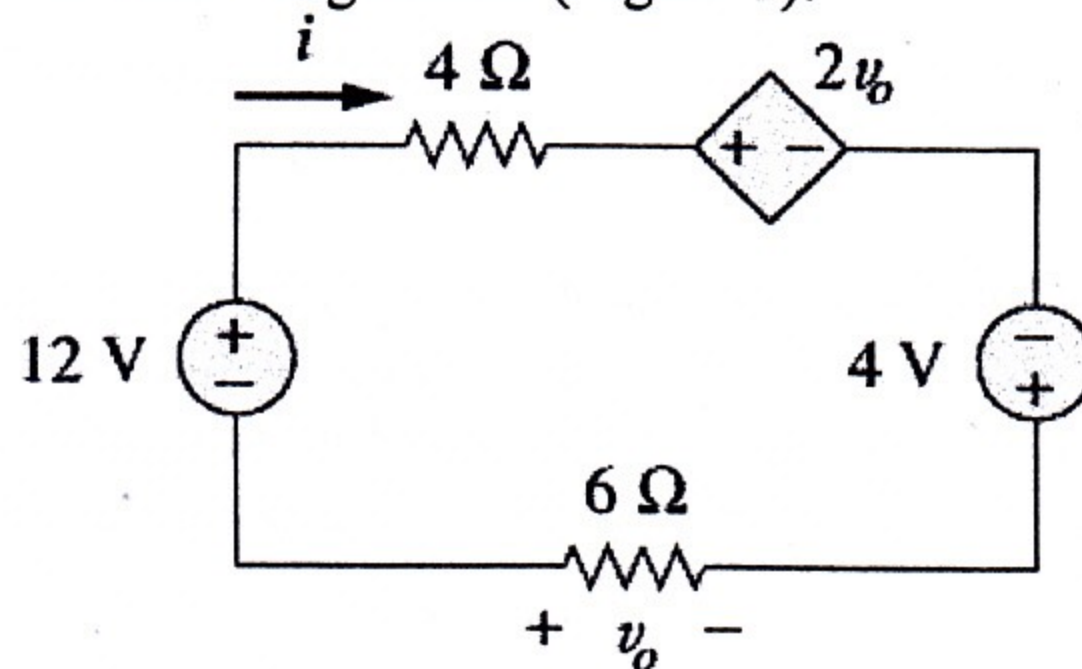


Figure 1

2. (a) Explain Superposition Theorem. [6]
- (b) Write down the applications of Thevenin's Theorem. [4]
- (c) Find the Thevenin's equivalent circuit shown in the figure 2, to the left of the terminal a-b and find the current through  $R_L$ ; when 1)  $R_L = 6\ \Omega$ , 2)  $R_L = 36\ \Omega$ . [15]
3. (a) Explain Super Mesh and Super Node with diagram. [7]
- (b) What do you understand by linearity and non-linearity in circuit elements? [6]
- (c) For the circuit shown in figure 3, find the Node Voltages. [12]

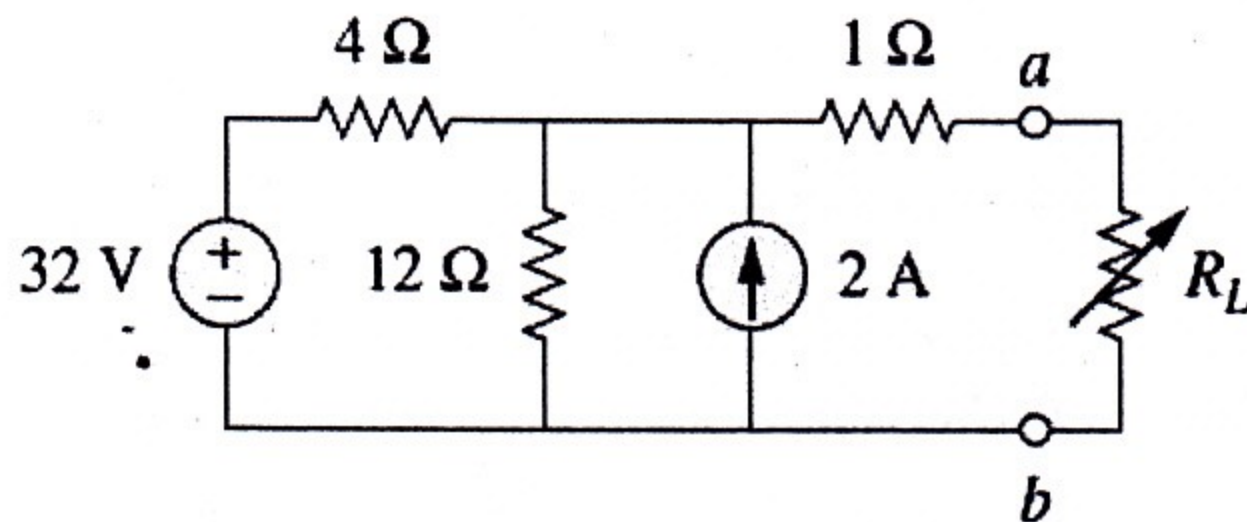


Figure 2

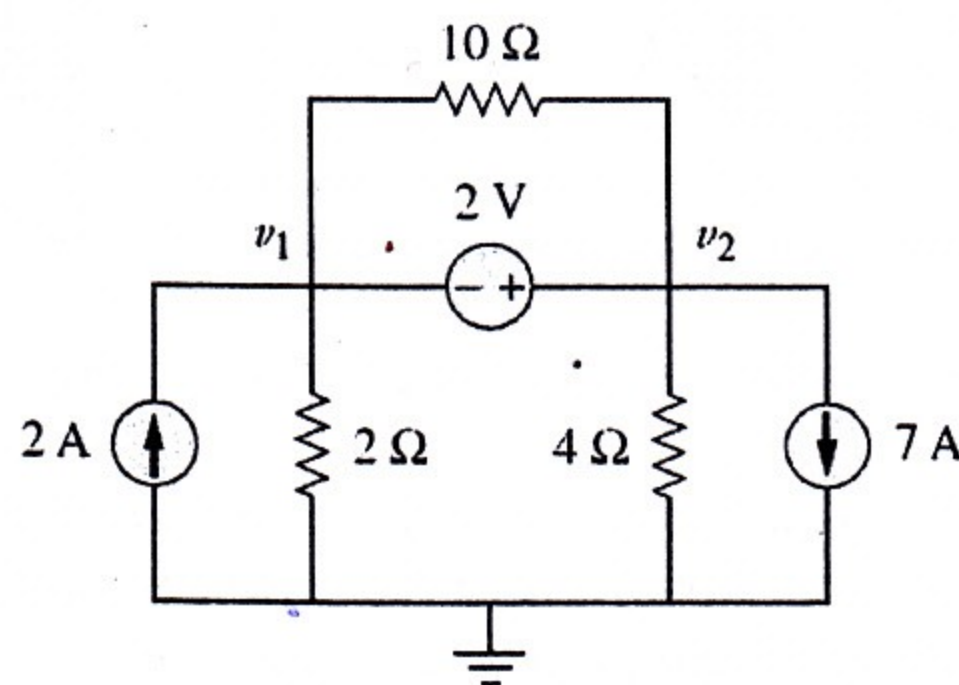


Figure 3

4. (a) Justify Voltage and Current Divider rule for a voltage source of 12V and Current Source of 3A. Consider 2 (two) resistors of  $2k\ \Omega$  and  $3k\ \Omega$  respectively. [10]  
 (b) What do you understand by Potential Difference? Define 'Current' in a circuit. [5]  
 (c) For the circuit in figure 4, find the branch currents  $I_1$ ,  $I_2$  and  $I_3$  using Mesh analysis. [10]

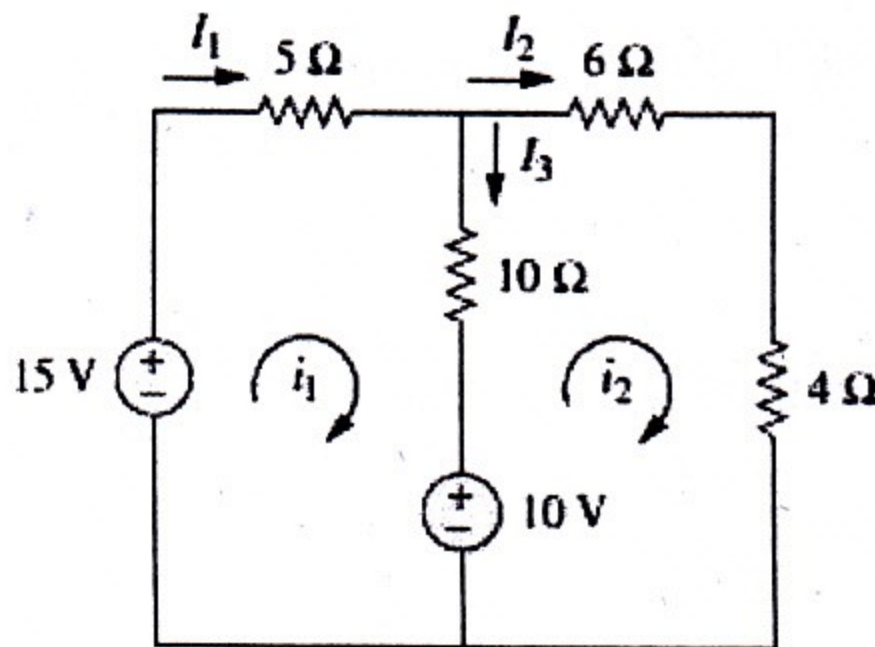


Figure 4

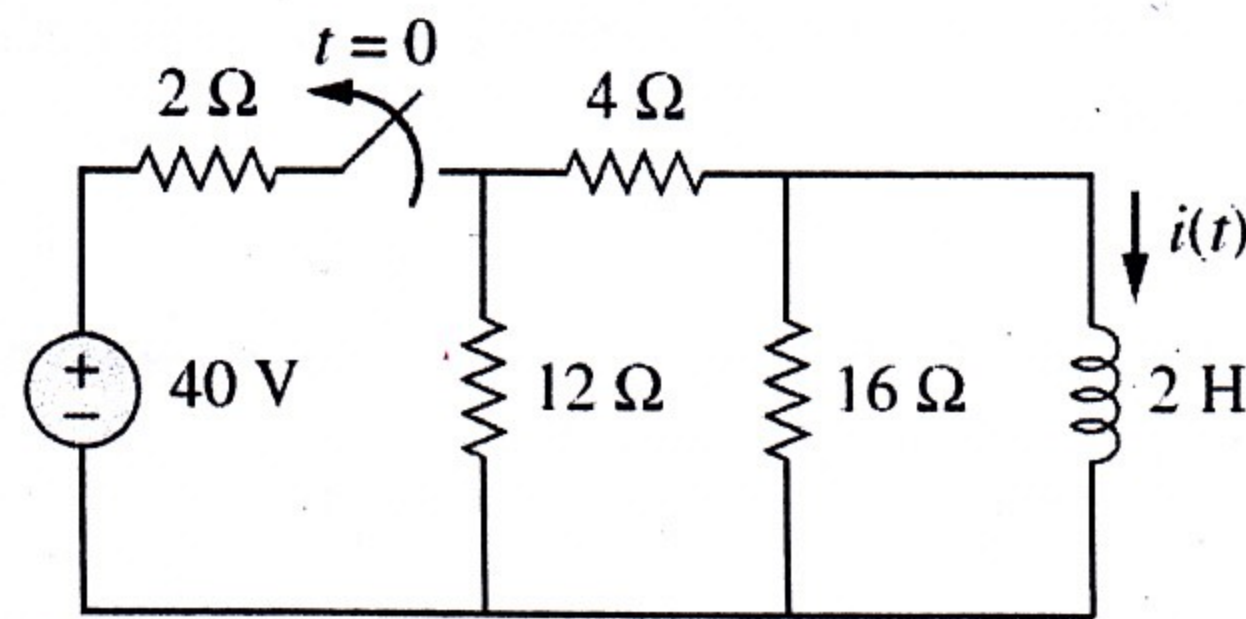
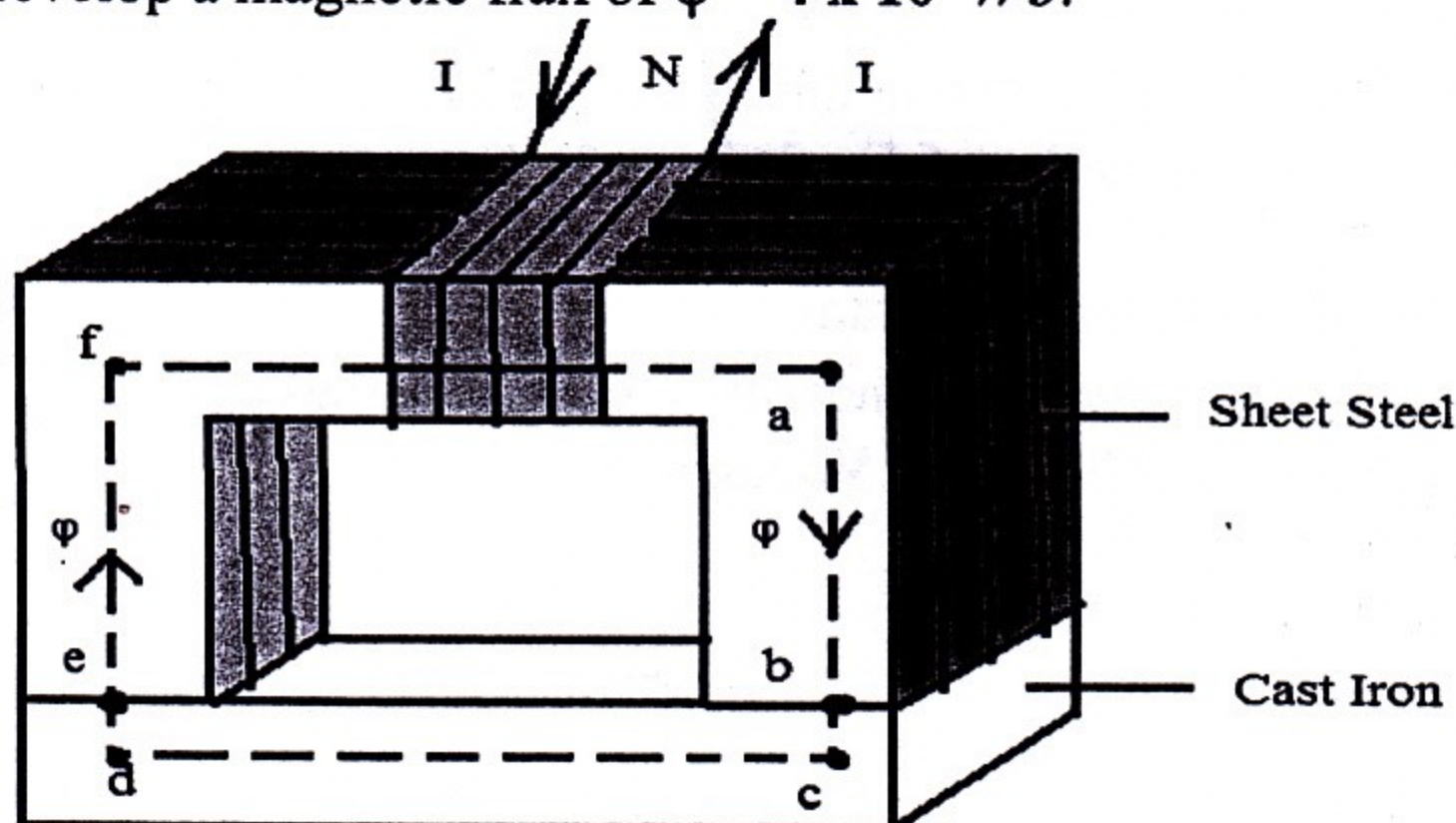


Figure 5

5. (a) Explain how does a Capacitor work? What is a source free  $RC$  circuit? Develop the equation of  $C_{eq}$  in case of series connected capacitors  $C_1$ ,  $C_2$ ,  $C_3$  and  $C_4$  with necessary diagram. [13]  
 (b) The switch in the circuit of figure 5 has been closed for a long time. At  $t = 0$ , the switch is opened. Calculate  $i(t)$  for  $t > 0$ . [12]
6. (a) What is the difference between AC & DC? Write down the characteristics of AC signals. [5]  
 (b) Draw a simple RL series circuit and describe the Phasor relationship of current and voltage in the circuit with diagram. Also, draw the impedance diagram. [12]  
 (c) Construct a series RLC circuit. If  $X_c > X_L$ , draw the Phasor diagram and Impedance diagram of the circuit. [8]
7. (a) Define inductance, reluctance and conductivity. [6]  
 (b) What do you understand by Magnetomotive force (mmf)? Develop the equation for mmf. [6]  
 (c) For the series magnetic circuit given in the figure 6 below, find current  $I$  required to develop a magnetic flux of  $\phi = 4 \times 10^{-4} \text{ Wb}$ . [13]



Here,  $l_{ab} = l_{cd} = l_{ef} = l_{fa} = 4$  inch,  
 Area (throughout) =  $1$  inch<sup>2</sup>,  
 $\phi = 3.5 \times 10^{-4}$  Wb,  $N = 50$   
 Turns,  $H(\text{Steel Sheet}) = 70$   
 At/m and  $H(\text{Cast Iron}) = 1600$  At/m.

Figure 6

8. Write short notes on the following topics with diagram where necessary: [25]
- (a) Hysteresis Curve & Permanent Magnet (d) How to Generate an AC signal  
 (b) Flux density and Relative permeability (e) Use of a triangular wave both in AC & DC  
 (c) Working principle of Inductor

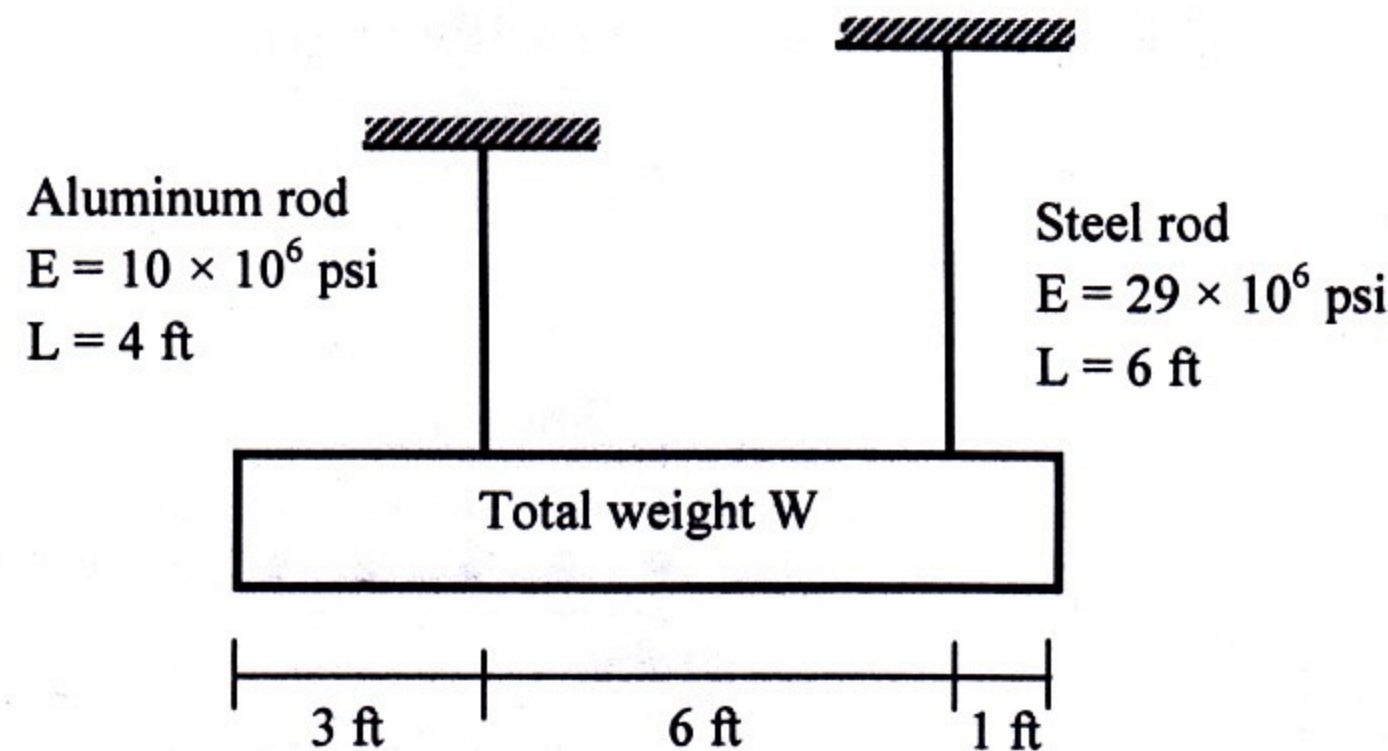
**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Fall 2017**  
**Program: B.Sc. in Civil Engineering**

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

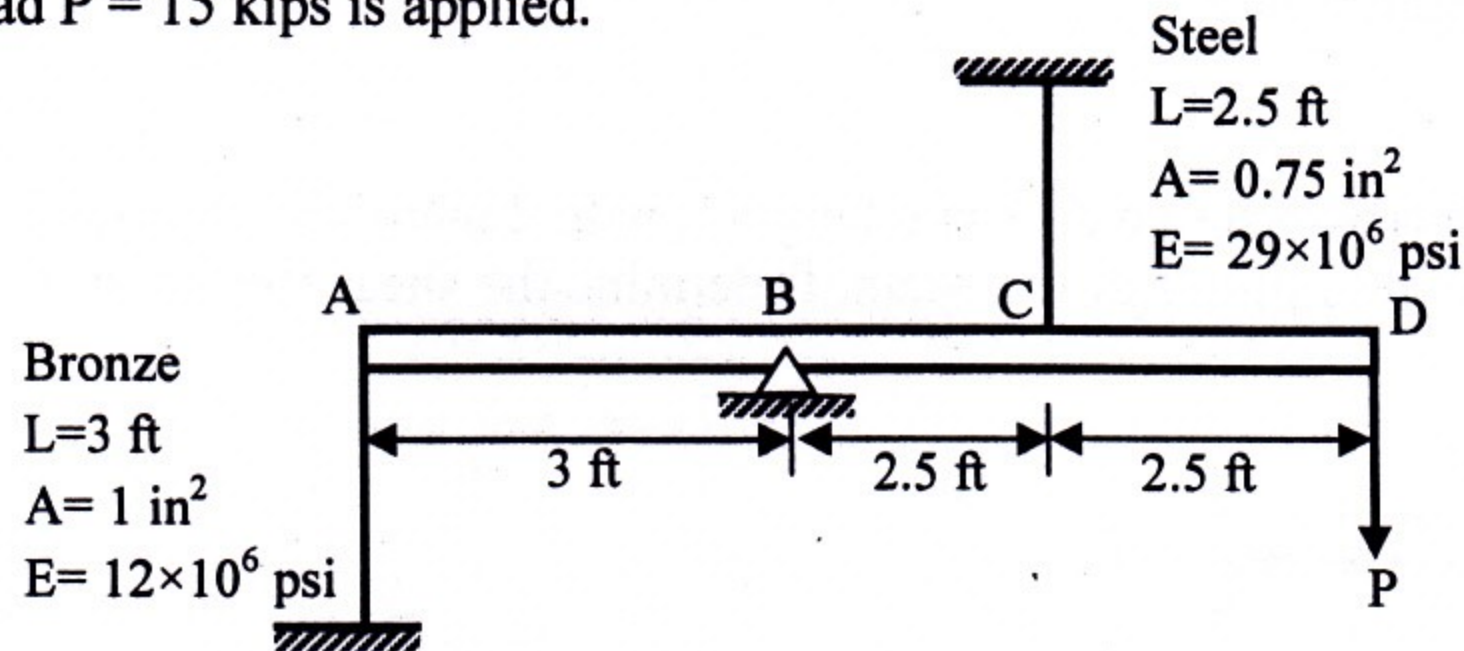
Course Code: CE 211  
 Full Marks:  $10 \times 10 = 100$

*Answer any 10 (Ten) of the following 14 (Fourteen) Questions*  
*The symbols have their usual meanings.*  
*[Assume Reasonable Values for Any Missing Data]*

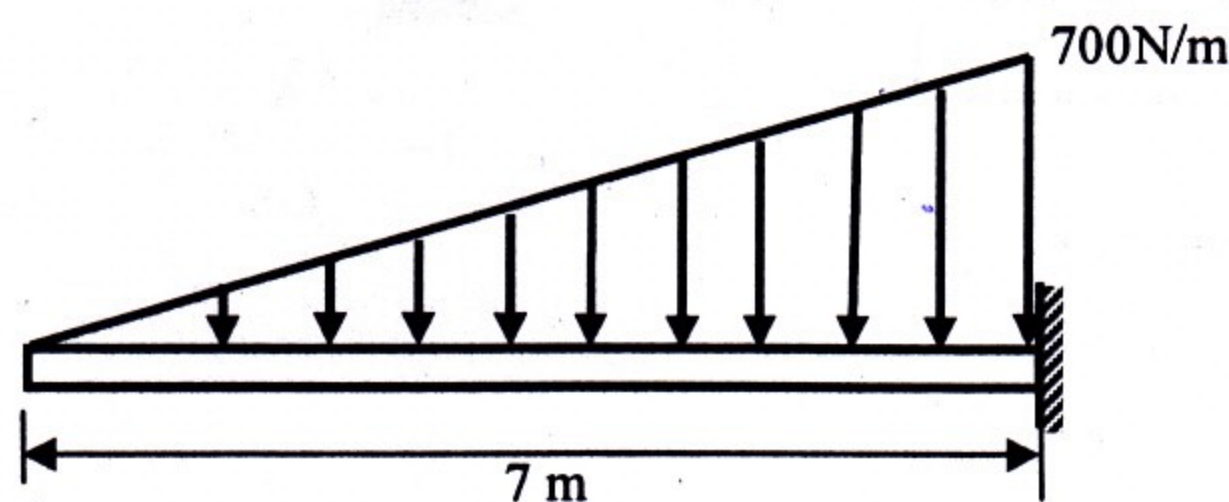
1. A uniform concrete slab of total weight  $W$  is to be attached, as shown in the figure below, to two rods whose lower ends are on the same level. Determine the ratio of areas of the rods so that the slab remains level.



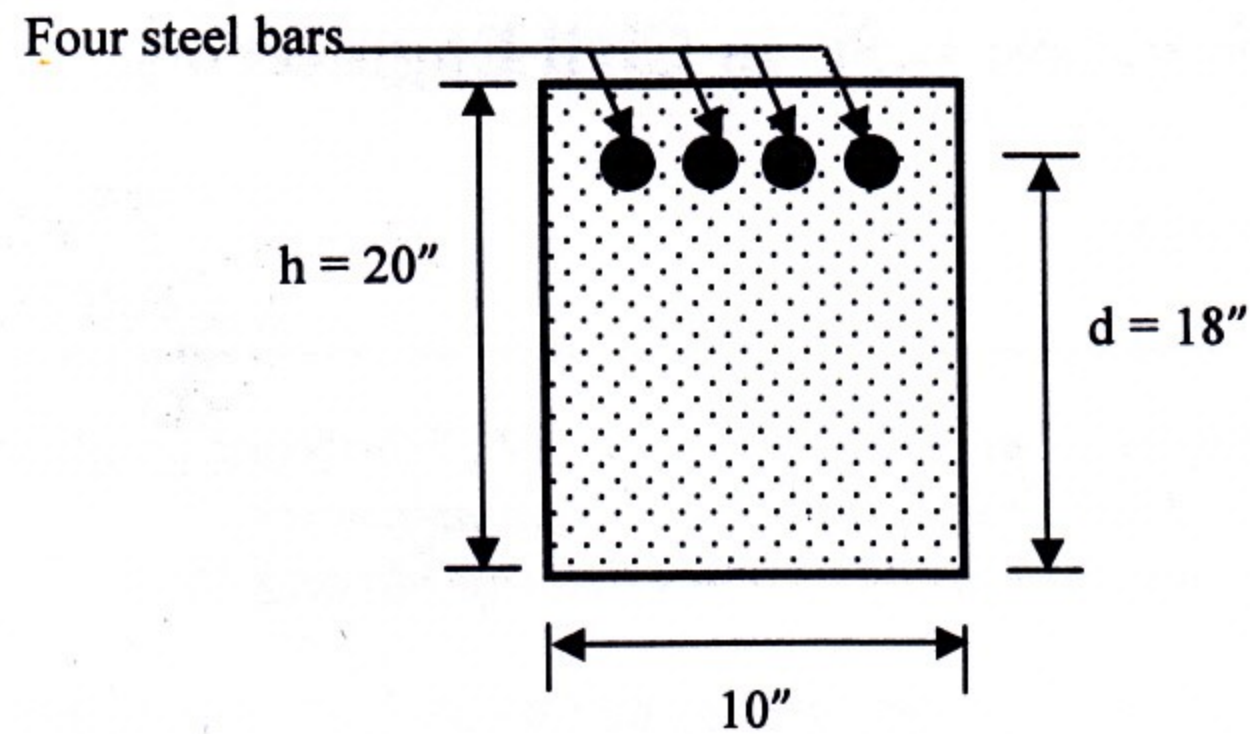
2. The light rigid bar ABCD shown below is pinned at B and connected to two vertical rods. Assuming that the bar was initially horizontal and the rods were stress-free, determine the stress in each rod after the load  $P = 15$  kips is applied.



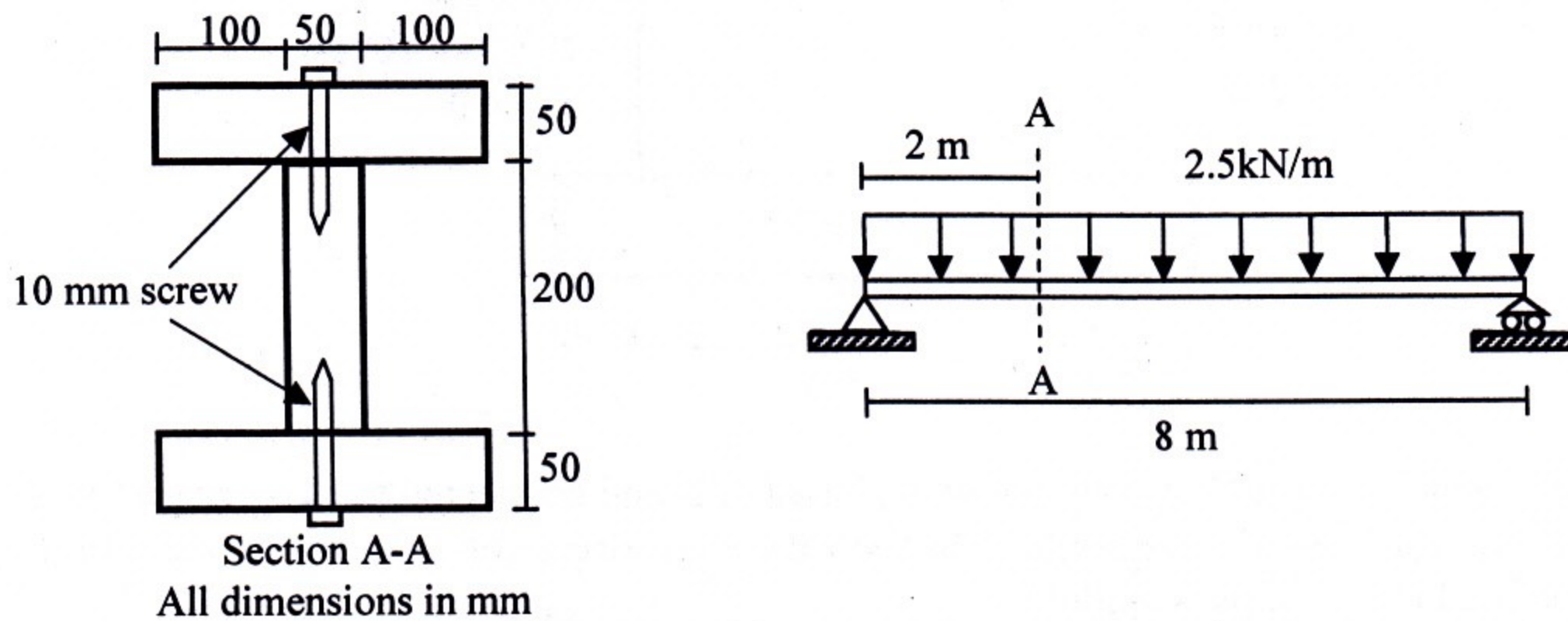
3. A 7 m long cantilever beam with a rectangular section 50 mm wide by 200 mm high and, carries a load that varies uniformly from zero at the free end to 700 N/m at the wall. (a) Compute the magnitude and location of the maximum flexural stress. (b) Determine the type and magnitude of the stress in a fiber 15 mm from the top of the beam at a section 2 m from the free end.



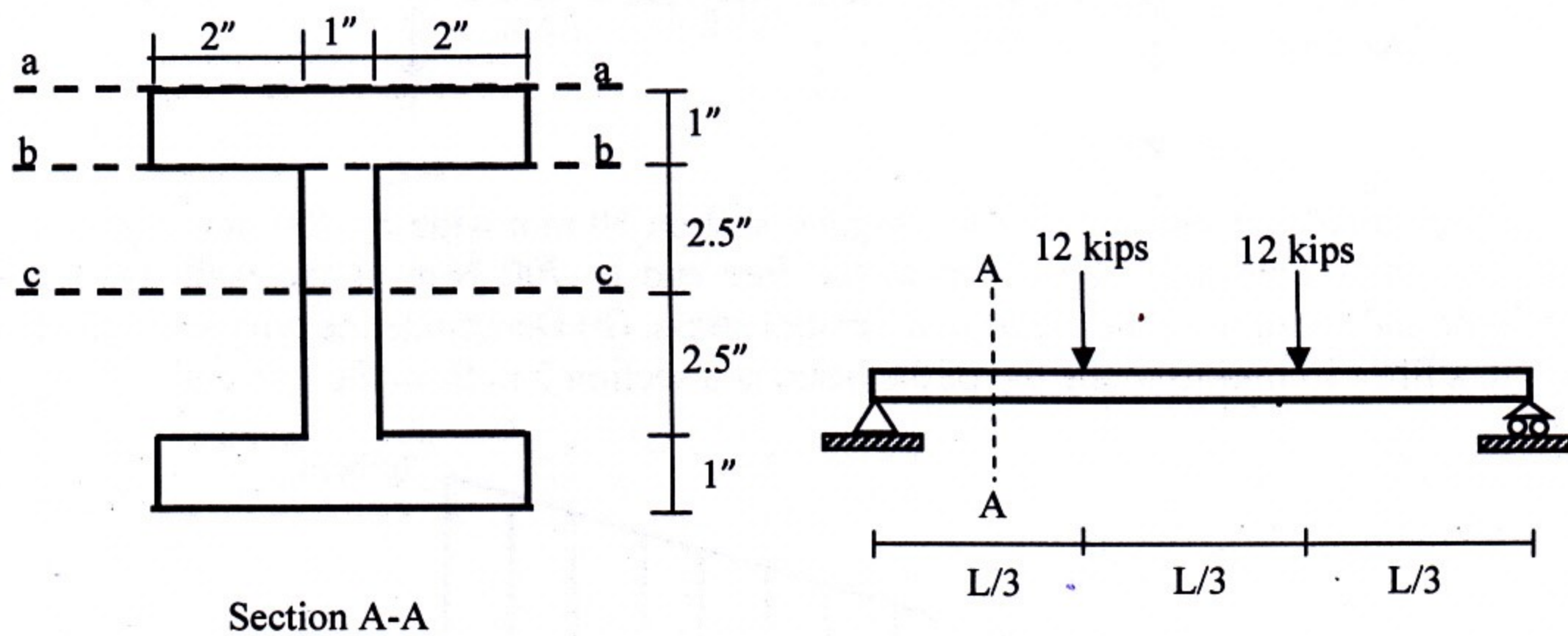
4. Calculate the maximum stress in the concrete and the steel for a reinforced concrete beam with the section shown below if it is subjected to a negative bending moment of 60 kip-ft. The reinforcement consists of four steel bars. Assume cracked section and  $n = 8$ . Diameter of each steel bar is 1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



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

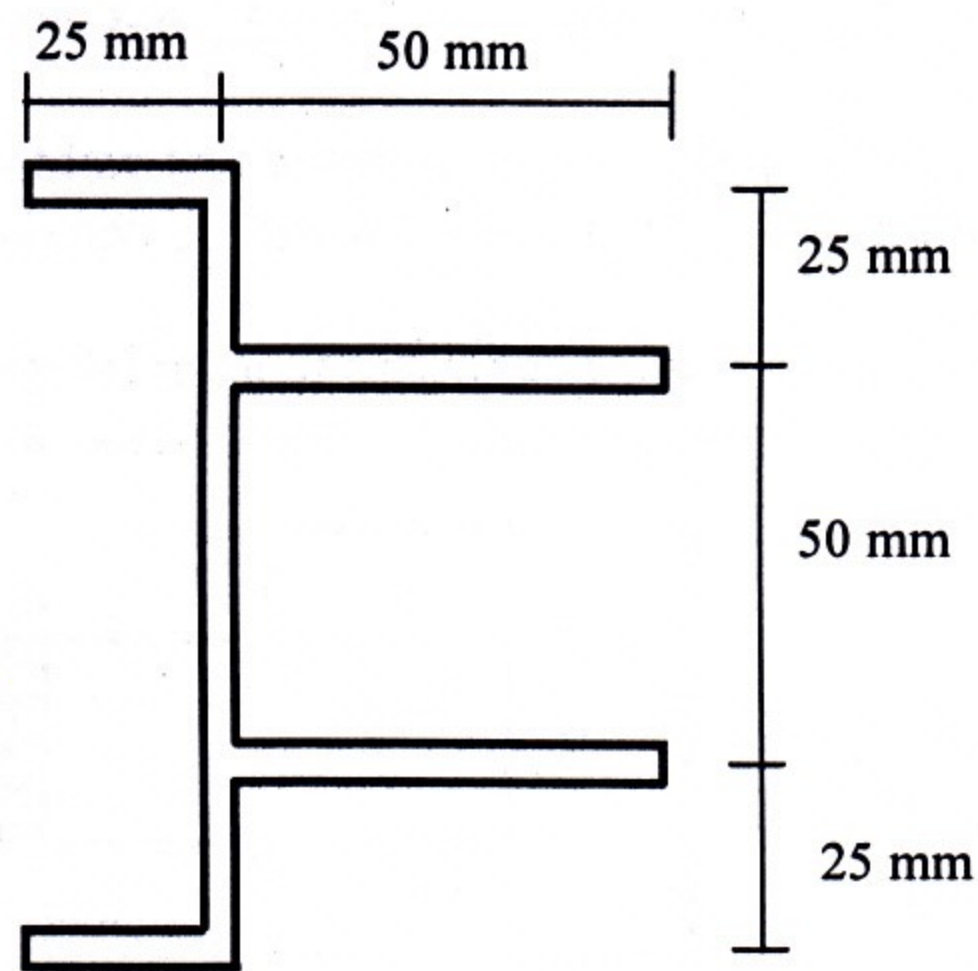


6. An I-beam having the cross-section A-A and length  $L$  with dimensions shown below is loaded with two point loads at one third points of the beam. Determine the shear stresses at section a-a, b-b and c-c.

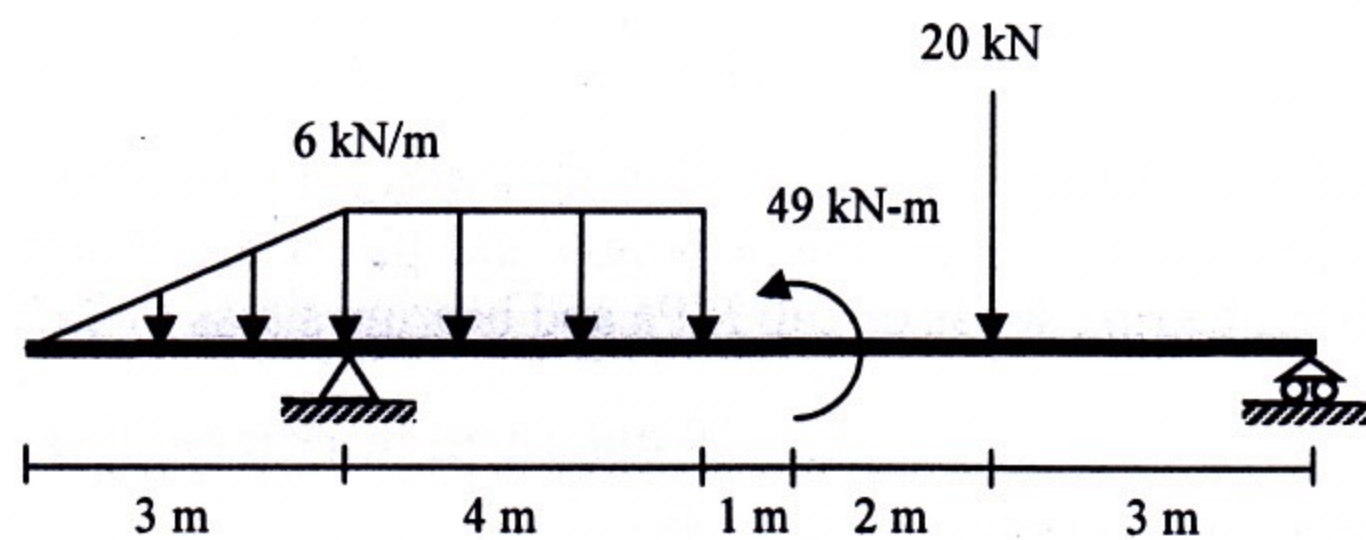




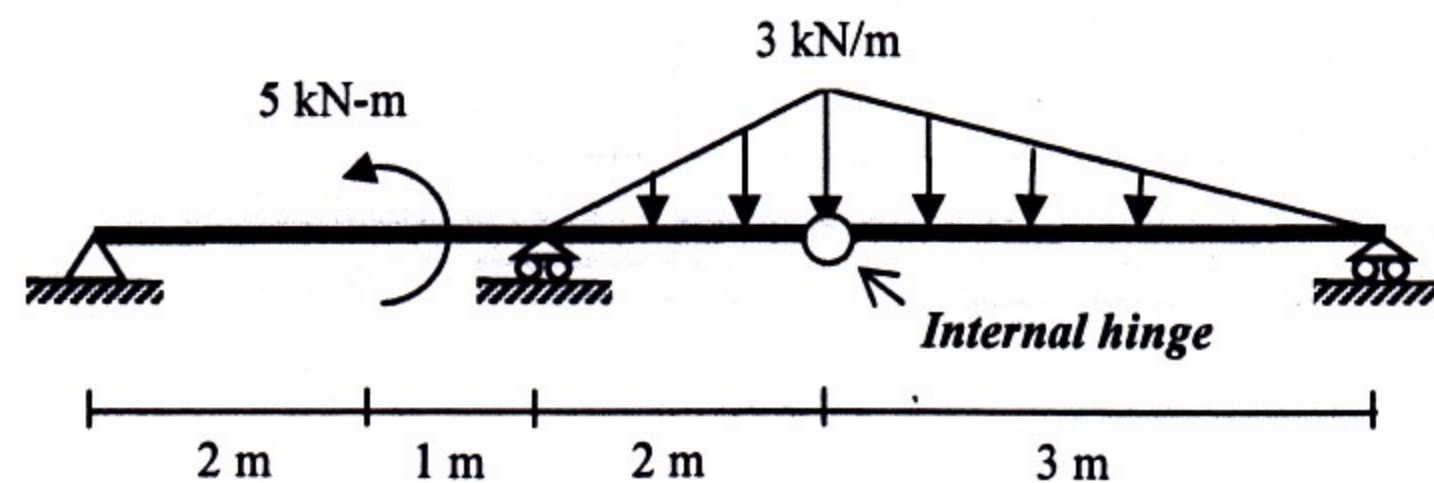
7. (i) Define shear center. (2)  
(ii) The vertical downward shearing force on the thin-walled section shown below is 200 kN. Locate the shear center of the section with respect to the center of the web; also draw the shear flow diagram. Thickness throughout the section is 2.5 mm. (8)



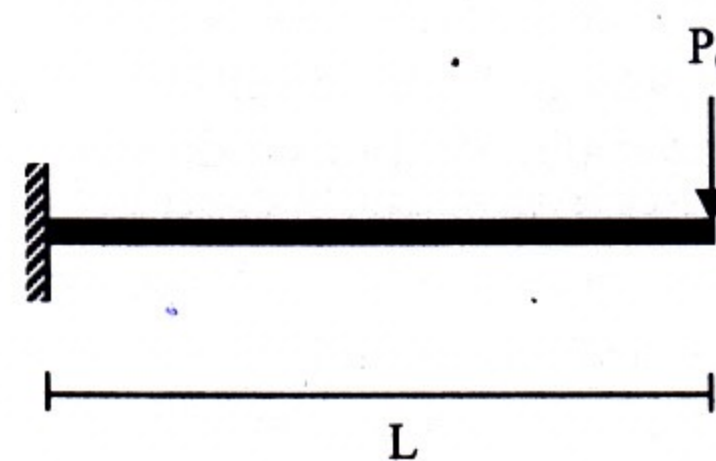
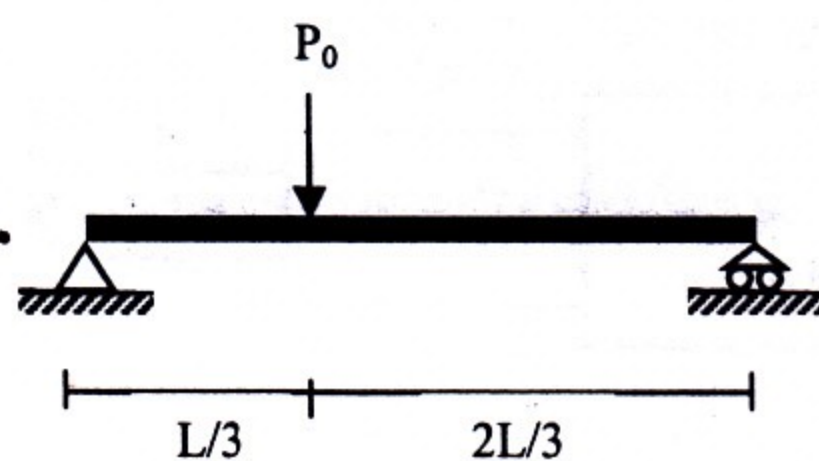
8. Draw shear force and bending moment diagram for the following beam by summation method.



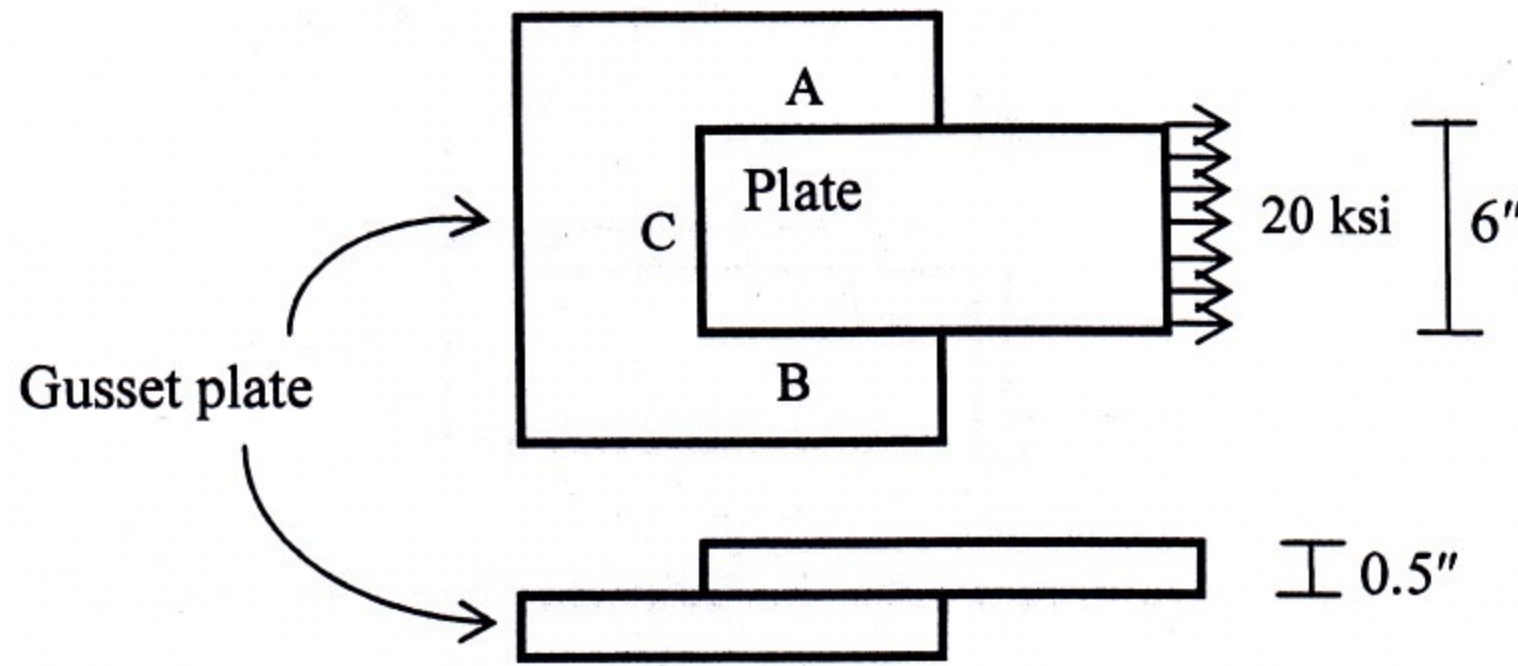
9. Draw shear force and bending moment diagram for the following beam by any convenient method.



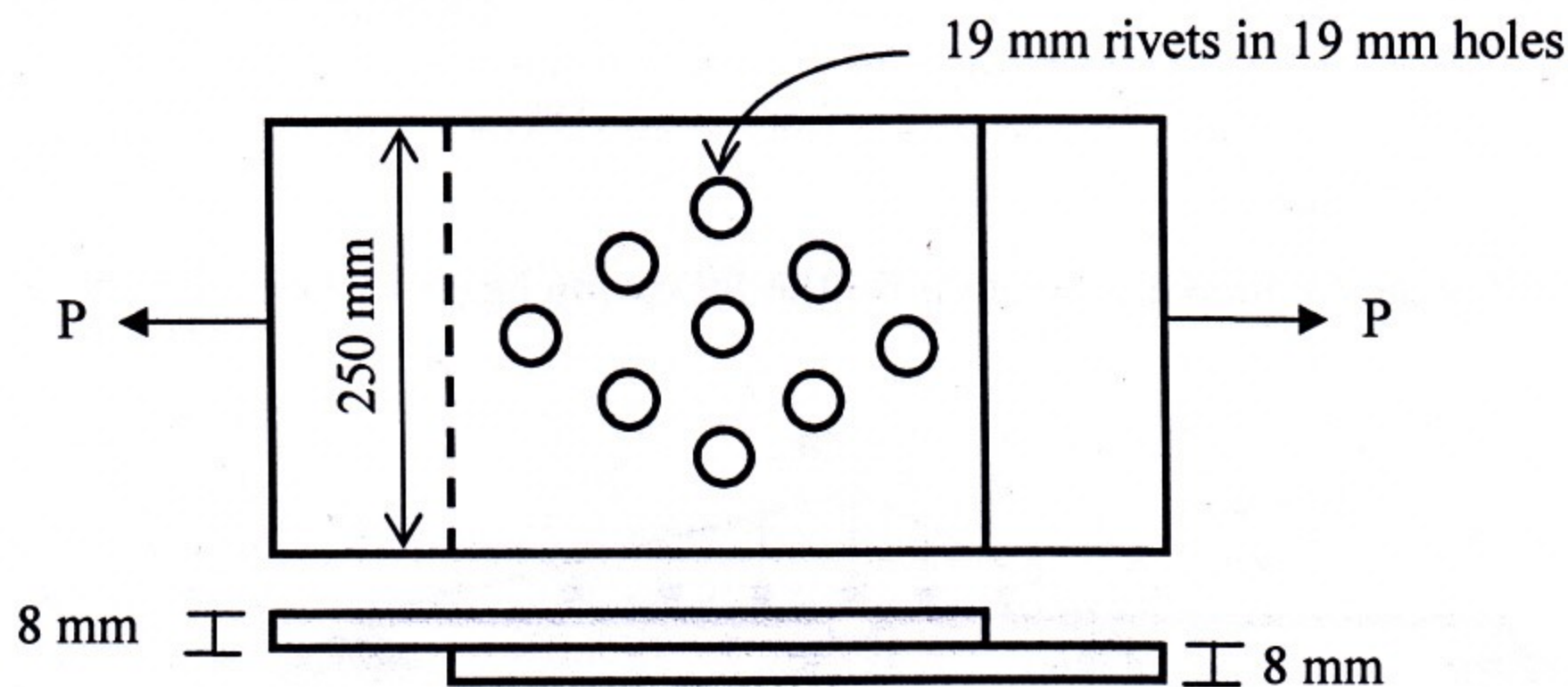
10. Derive equations for shear force and bending moment by singularity function for the following two beams.



11. (a) In a thin-walled cylindrical pressure vessel if the pressure is raised to the bursting point, at which section will the failure occur? Justify your answer.
- (b) Calculate the minimum wall thickness for a cylindrical vessel that is to carry gas at a pressure of 1400 psi. Given: the diameter of the vessel is 2 ft., and the stress is limited to 12 ksi.
12. A plate 6 in. wide and  $\frac{1}{2}$  in. thick 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 A and B sides,
- (b) A, B and C sides, 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.

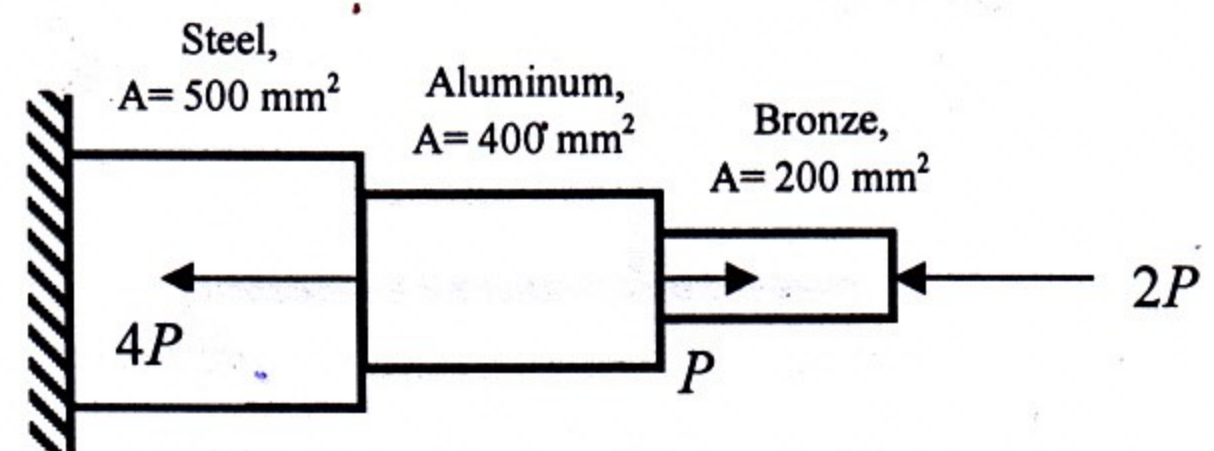


13. Determine the safe load  $P$  on the lap connection (250 mm wide) shown in the following figure if the rivets are of 19-mm diameter (assume 19-mm holes) and plates are 8 mm thick. Use allowable shearing stress of 95 MPa, tearing stress of 140 MPa and bearing stress of 220 MPa.



14. An aluminum rod is rigidly attached between a steel rod and a bronze rod as shown in the following figure. Axial forces ( $4P$ ,  $P$  and  $2P$ ) are applied at the positions indicated.

Find the maximum value of force  $P$  that will not exceed a stress of 140 MPa in steel, 90 MPa in aluminum or 100 MPa in bronze.



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Fall 2017**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Engineering Materials  
 Time: 3 hours

Course Code: CE 201  
 Full Marks: 100 (40 + 6 X 10)

*There are 8 (eight) questions. Question No. 1 is compulsory. In addition, answer any 6 (six) questions from the rest of the questions.*

**Question 1:**

The “Structures in Fire” laboratory will be constructed with the High Performance Concrete (HPC) in the department of civil engineering at UAP. Within this context, the concrete wall with a nominal dimension of 3.0 m X 1.2 m X 0.2 m will be heated on one side over the full length and height of the wall to determine the fire resistance behavior of the HPC wall. Various experimental studies have shown that the permeability of concrete was identified as one of the key parameters controlling the risk of fire spalling. Hence, the design intrinsic permeability of  $5 \times 10^{-15} \text{ m}^2$  has been chosen to avoid fire spalling of HPC wall.

In order to cast the concrete wall, the fine aggregate sample is collected for the HPC and performed sieve analysis at UAP, the test data are given below:

ASTM Sieve	Sieve opening (mm)	Amount retained (gm)
3 inch	76.20	0
1.5 inch	38.10	0
3/4 inch	19.05	0
3/8 inch	9.50	0
# 4	4.75	0
# 8	2.36	0
# 12	1.70	80
# 16	1.19	80
# 30	0.59	50
# 40	0.425	70
# 50	0.30	45
# 100	0.15	25
# 200	0.075	100
<b>Pan</b>	-	0

- a. (i) Calculate Fineness Modulus (FM) of the fine aggregate (sand) sample. [12]  
 (ii) Draw the grading curve of the fine aggregate sample and make comments on the grading curve.

- b. To get the target strength of HPC and to do the mix design, the porosity, water to cement ratio (W/C), and the amount of cement will be taken from Figure 1 with respect to the intrinsic permeability ( $5 \times 10^{-15} \text{ m}^2$ ) of HPC. Note that  $5 \times 10^{-15} \text{ m}^2$  is equal to  $5\text{E-15 m}^2$ , see Figure 1. No chemical admixture will be used during the concrete mixing. The following necessary data are provided for the HPC mix design:

Sand to total aggregate ratio = 0.35

Specific gravity of fine aggregate (sand) = 2.6

Specific gravity of coarse aggregate (black stone) = 2.7

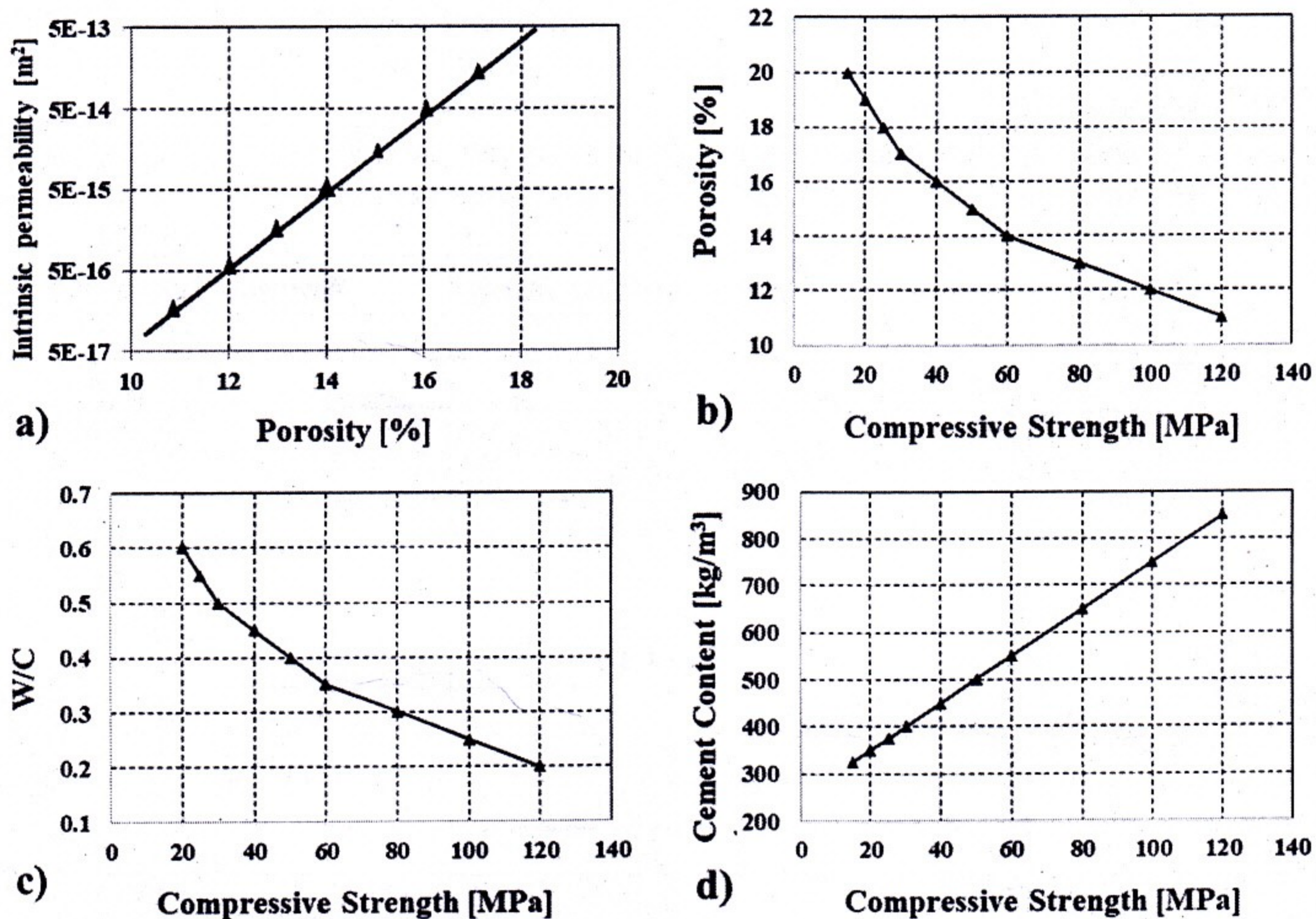
Cement type = Ordinary Portland cement (OPC)

Air content = 2% (air entraining admixture will not be used)

The weight basis mix design has been considered.

- (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 the wall (3 m x 1.2 m x 0.2 m) and 15 cylinders (diameter = 100 mm and height = 200 mm) to monitor the strength of HPC at 7, 14, 28, 60 and 90 days (3 cylinders/test age). Assume 50% extra volume is necessary due to total loss of concrete during casting of the wall and cylinders.



[18]

Figure 1: Intrinsic permeability versus porosity (a), porosity (b), water to cement ratio (W/C) (c), and the cement content (d) as a function of compressive strength of HPC.

- c. Plastering of the wall is necessary to provide extra protection from the environmental actions at all seasons such as sand blown by the wind, washing of acid rain, exposure to blazing sunlight, and carbonization, etc. To this aim, 5 mm thick mortar will be applied to the exterior surface of the wall (3 m x 1.2 m).

[10]

Assume sand to cement ratio (weight basis) = 3, water to cement ratio = 0.40, air content = 2%, specific gravity of sand = 2.6, and cement type = OPC.

- (i) Estimate the amount of each ingredient (cement, sand, and water) of mortar necessary for the plastering work of the exterior surface of the wall. Assume 10% extra volume of material is necessary due to total loss of mortar during application on the wall surface.

**Question 2:**

- a. Define the following mechanical properties of a material: [4]  
(i) Shear strain, (ii) Creep (iii) Poisson's ratio, and (iv) Modulus of elasticity.
- b. Draw qualitative stress-strain curves of concrete, mild steel, glass, and rubber. [4]
- c. Using schematic diagram, make the comparison between ductility and brittleness of the materials. [2]

**Question 3:**

- a. "Brick gets strength during burning", Do you agree or disagree with this statement? Justify your answer. [2.5]
- b. "Drying of brick at ambient temperature before burning is very important", Do you agree or disagree with this statement? Give your opinion. [2.5]
- c. Illustrate the function of frog mark of brick. [2]
- d. Apply the knowledge to explain the causes of efflorescence of brick and how to remove it? [3]

**Question 4:**

- a. "Cement making industry significantly increases the CO<sub>2</sub> in the air, resulting in big negative environmental impacts and then raise the risk of human life", Do you agree with this statement? Based on your knowledge, what is your proposal to reduce the emission of CO<sub>2</sub> from cement making industry? [2]
- b. Why setting time of cement is very important? Justify this statement. [2]
- c. Draw the development of strength of pure compounds of cement: C<sub>2</sub>S, C<sub>3</sub>S, C<sub>3</sub>A, and C<sub>4</sub>AF. Explain hydration of Silicate with chemical reaction. Which is the main strength giving compound and what is the shape and size of that compound? [4]
- d. Based on your knowledge, what is flash setting of cement and how to control it? [2]

**Question 5:**

- a. What is bulking of sand? Discuss how water content and aggregate fineness affects the bulking of sand? [3]
- b. Explain how grading of aggregate affect the fresh and hardened properties of concrete? [3]
- c. Based on your knowledge, what is the main difference between pointing and plastering? [2]
- d. Outline the causes of blistering of plaster. [2]

**Question 6:**

- a. Describe the effect of incorporation of Silica Fume in cement on the fresh and hardened properties of concrete. [5]
- b. Summarize the advantages of using High Performance Concrete (HPC). [3]
- c. "The structures made with lightweight concrete reduce the risk of earthquake damage", Do you agree or disagree with this statement? Justify your answer. [2]

**Question 7:**

- a. How superplasticizer improve the workability of concrete? [2]
- b. Define autogenous shrinkage of concrete. [2]
- c. Identify what are the effects on concrete due to segregation? [2]
- d. Explain the causes of honeycomb of concrete. Based on your knowledge, what are the necessary precautions should be taken to avoid honeycomb of concrete? [4]

**Question 8:**

- a. Describe the deterioration of concrete due to sulfate attack. [4]
- b. Illustrate vulcanization of rubber. [2]
- c. Draw a typical cross section of a timber and explain the process of annual ring formation of the tree. Write the main objective of seasoning of timber? [4]