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**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Final Examination, Fall 2022**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Bangladesh Studies: Society and Culture

Time: 2 hours

Credit Hours: 2

Course Code: 211(a)

Full Marks: 100

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[There are **SIX** questions. Answer **FOUR** questions including **questions 5 and 6**.  
Figures in the right margin indicate marks.]

1. Describe how the Functionalists view a society. Discuss how the French Revolution influenced the society. 25

**OR**

2. Briefly discuss the contributions of Auguste Comte or Karl Marx in the development of sociology. 25

3. a) Distinguish between  
i. socialization and gender socialization, 10  
ii. voluntary re-socialization and involuntary re-socialization.

- b) Describe socialization throughout various stages of the life-course. 15

**OR**

4. a) Explain the roles of invention, discovery and diffusion in culture. 10

- b) Identify and discuss about the common elements of culture. 15

5. a) Define family of orientation and family of procreation. 5

- b) What do you know about marriage and divorce? 5

- c) Give reasons why the rate of divorce is rising in Bangladesh. 15

6. a) Define social mobility. 5

- b) Describe the types of social mobility with suitable examples. 20

**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Repeat Examination, Fall 2022**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Bangladesh Studies: History  
Time: 2 hours

Credit Hour: 2

Course Code: HSS211(b)  
Full Marks: 100

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Answer **ANY FOUR**. Figures in the right margin indicate marks.

1. Explain the reasons and results of the Battle of Palassy. 25
2. Discuss the results of the Permanent Settlement. 25
3. Discuss the Language Movement and its significance. 25
4. Discuss the reforms of Raja Rammohon Roy. 25
5. Narrate elaborately the points of Six Points Demand of 1966. 25
6. Write an article on the Liberation War of Bangladesh. 25

**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Final Examination, Fall-2022**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Mathematics-III  
Time: 3.00 Hours

Credit Hours: 3.00

Course Code: MTH 201  
Full Marks: 150

There are **eight** questions. Answer **six** questions including **Q1, Q2, Q3** and **Q4**. All questions are of equal values, indicated in the right margin.

1. a. Show whether the transformation is linear or not 10

$$T: \mathbb{R}^2 \rightarrow \mathbb{R} : T(x, y) = xy.$$

- b. Find the rank and nullity of the linear transformation defined as follows 15

$$T: \mathbb{R}^3 \rightarrow \mathbb{R}^3, T(x, y, z) = (x + 2y, y - z, x + 2z).$$

2. Find the eigenvalues and eigenvectors of  $A = \begin{pmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{pmatrix}$ . 25

3. a. Test whether the following set is linearly dependent or independent 12

$$\{(1, 1, 2), (1, 0, 1), (2, 1, 3)\}.$$

- b.  $A = \begin{pmatrix} 2 & 1 \\ -1 & -2 \end{pmatrix}, A_1 = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}, A_2 = \begin{pmatrix} 1 & 1 \\ -1 & 0 \end{pmatrix}, A_3 = \begin{pmatrix} 1 & -1 \\ 0 & 0 \end{pmatrix}$ . Show that A cannot be expressed as a linear combination of  $A_1, A_2$  and  $A_3$ . 13

4. a. Solve the following system of linear equations 12

$$x - 4y + 5z = 8$$

$$3x + 7y - z = 3$$

$$x + 15y - 11z = -14.$$

- b. Find the parametric solution of the system 13

$$x + 2y - z = 2$$

$$2x + y + z = 1$$

$$x + 5y - 4z = 5.$$

5. a. Calculate mean and median of the frequency distribution given below. Hence calculate the mode using empirical relation. 20

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

- b. Calculate median for the following data 20, 18, 22, 27, 25, 12, 15. 5

**OR**

6. a. Calculate standard deviation for 10, 68, 90, 40, 50, 35, 28. 5

- b. Calculate mean deviation and then calculate quartile deviation using relation between them. 20

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	6	5	8	15	7	6	3

7. Calculate Kurtosis for the following distribution. 25

class	0-20	20-40	40-60	60-80	80-100
frequency	18	22	30	20	10

**OR**

8. a. Based on the frequency distribution given below calculate mean deviation. 10

Score	10	75	80	45	55
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- b. Calculate quartile deviation for the following data. 15

Profit (Lakhs)	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of companies	8	3	6	2	5	4	7



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Semester Final Examination, Fall – 2022**  
**Program: B.Sc. in CE (2<sup>nd</sup> Year, 1<sup>st</sup> Semester)**

Course Title: Basic Electrical Engineering  
 Time: 3 hours

Course Code: ECE 201

Credit Hours: 3.00  
 Full Marks: 150

[There are six questions. Answer any four including Q1-Q4. Figures in the right margin indicate marks]

1. Solve the indicated currents and voltage of figure 1 [25]

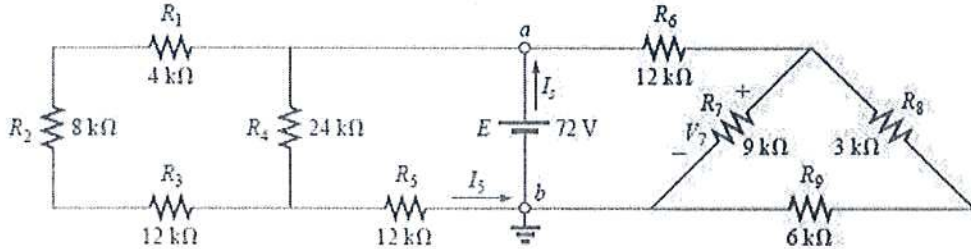


Figure 1

2. a. Using nodal analysis, solve the node voltages  $V_a$ ,  $V_b$  and  $V_c$  in figure 2. [12.5]

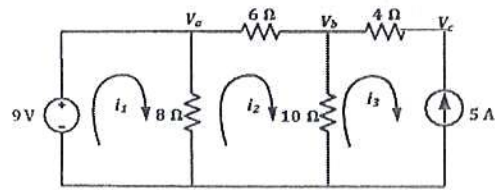


Figure 2

3. a. Construct the equivalent capacitance  $C_{eq}$  in figure 3. [12.5]

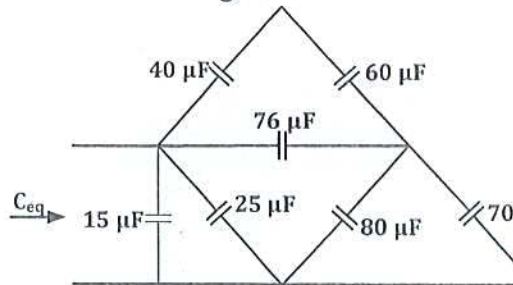


Figure 3

- b. For figure 4, interpret the value of  $i_o$  and  $v_o$ . [12.5]

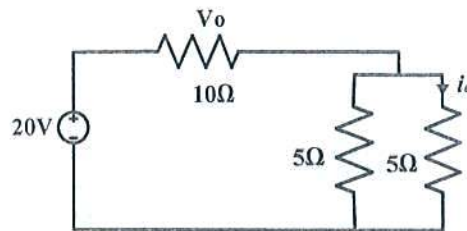


Figure 4

4. For the series magnetic circuit given in the figure 5, find: [25]
- the current  $I$  required to develop a flux of  $\phi = 8 \times 10^{-4} \text{ Wb}$ .
  - Determine  $\mu_r$  of the materials.

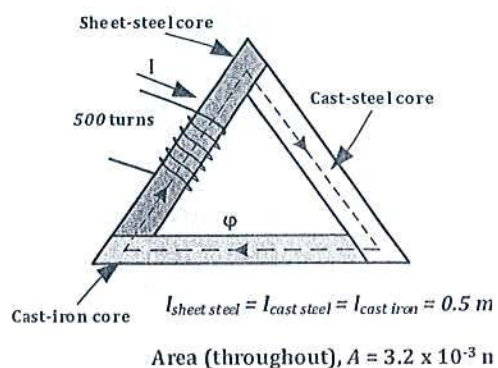


Figure 5

5. For the network of Figure 6- [25]
- Solve the voltage  $V_C$  using the voltage divider rule.
  - Identify the current  $I_s$ .

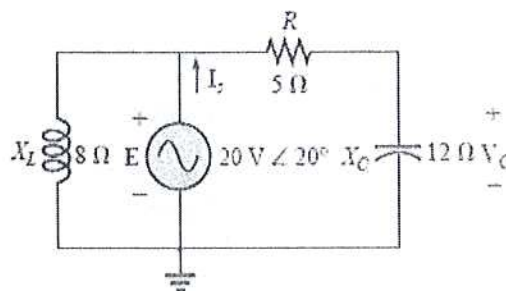


Figure 6

OR

6. For the network of Figure 7- [25]
- Identify the current  $I_s$
  - Identify the voltage  $V_{R2}$

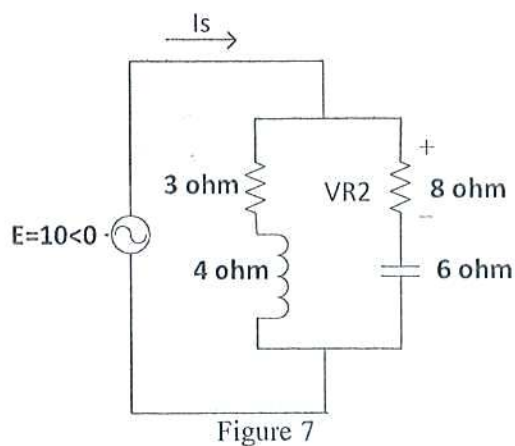


Figure 7

7. a. The current through an capacitive reactance,  $X_C = 5 \Omega$  is given by, [12.5]
- $$i = 40 \sin(100t + 20) \text{ A}$$
- Develop the expression for the voltage,  $v$ .
  - Construct  $v$  and  $i$  on the same axis.

- b. Solve the average and the R.M.S value of the wave shape given in figure 8.

[12.5]

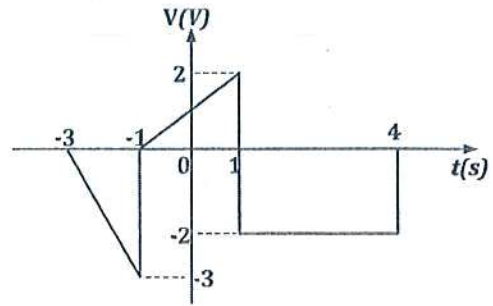


Figure 8

OR

8. For the circuit given in Figure 9, identify:

[25]

- i)  $Z_T$
- ii)  $I_s$
- iii)  $I_1$
- iv)  $v_c$
- vi) Power factor

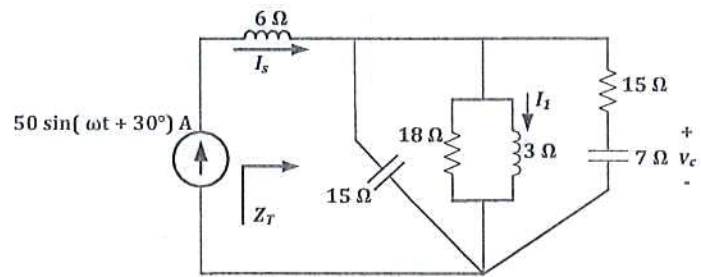
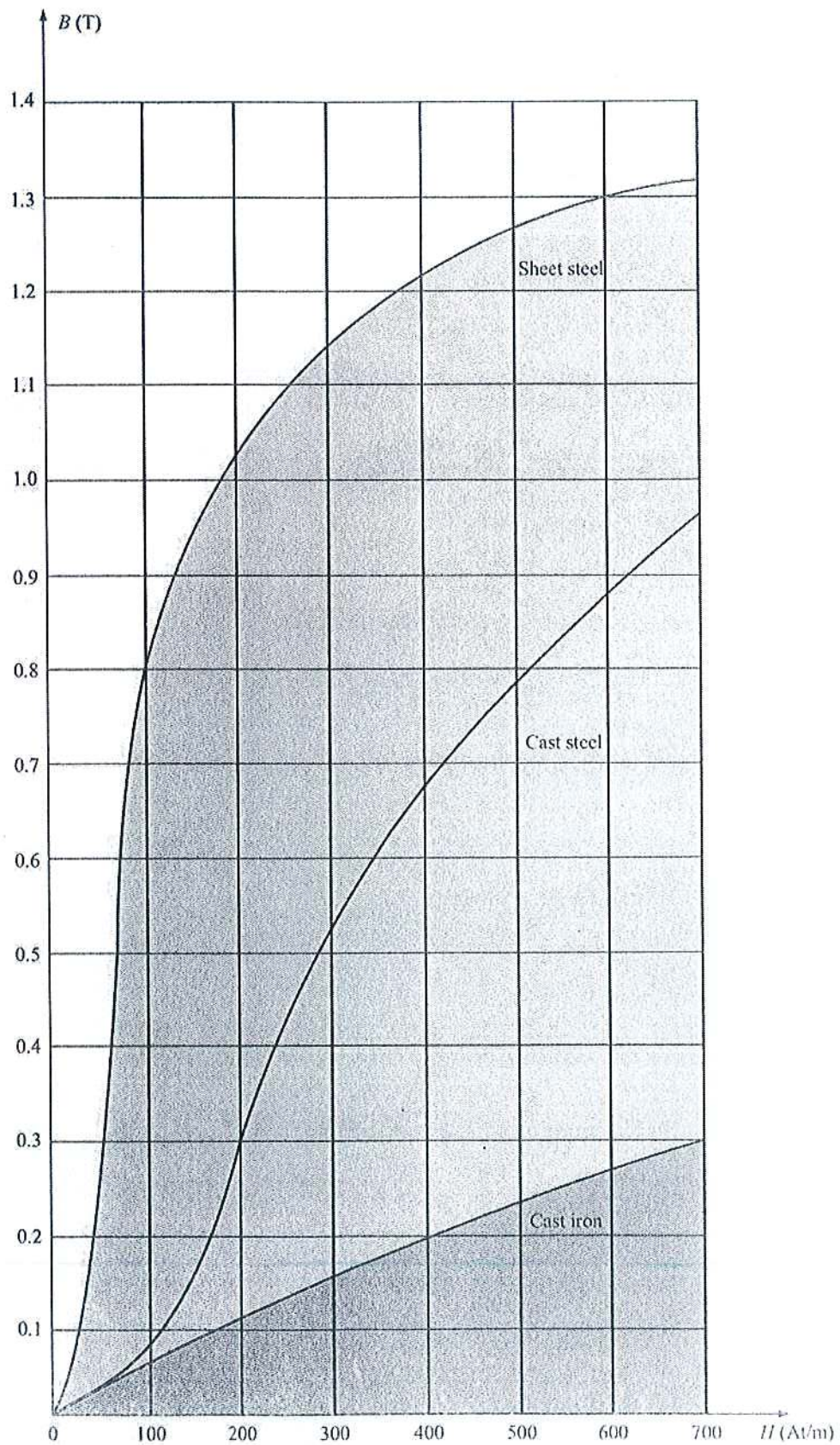


Figure 9





**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Fall 2022**  
**Program: B.Sc. Engineering (Civil)**

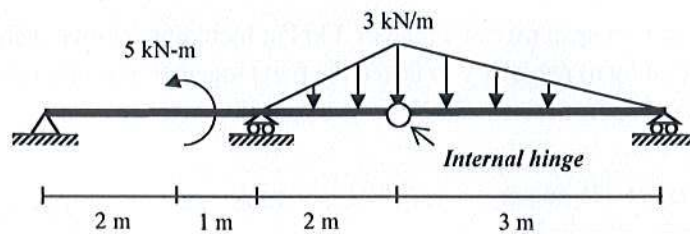
Course Title: Mechanics of Solids I  
 Time: 3:00 hours

Credit Hour: 3.0

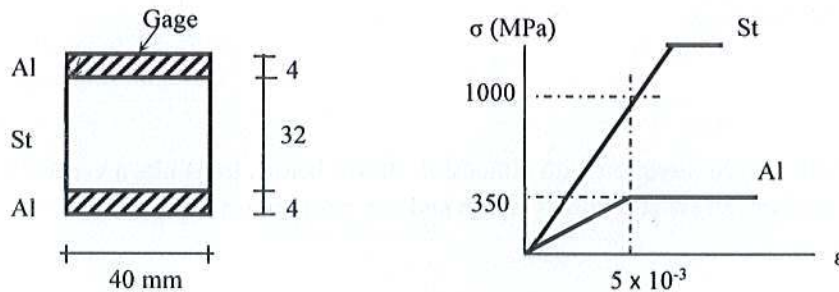
Course Code: CE 211  
 Full Marks:  $9 \times 10 = 90$

*Answer all Questions*  
*The symbols have their usual meanings.*  
*[Assume Reasonable Values for Any Missing Data]*

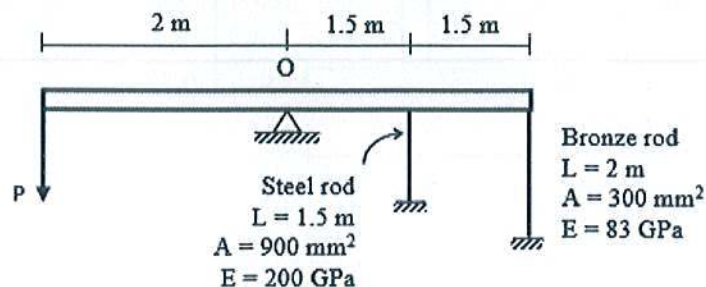
1. Draw shear force and bending moment diagram for the following beam by any convenient method.



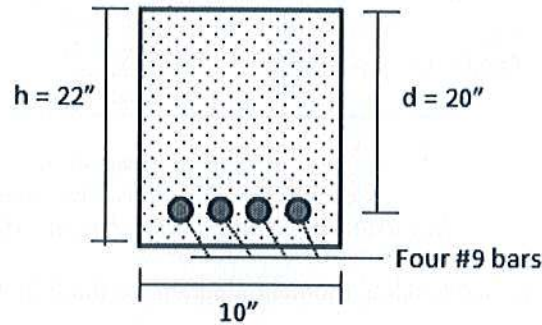
2. A small sandwich beam spanning 400 mm is made up by bonding two Aluminum alloy strips to an alloy steel bar as shown below. The idealized stress-strain diagrams are shown in the figure. What is the magnitude of the applied bending moment if it causes  $-7.5 \times 10^{-3}$  longitudinal strain in the gage attached on the top of the Aluminum alloy strip?



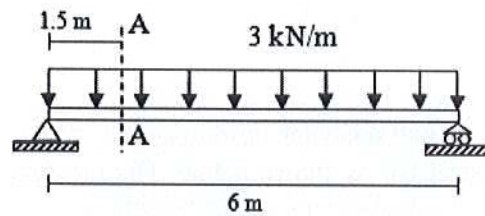
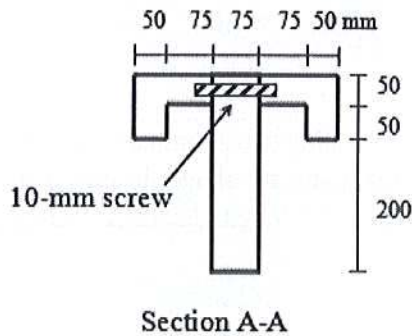
3. As shown below, a rigid bar with negligible mass is pinned at O and attached to two vertical rods. Assuming that the rods were initially stress-free, what maximum load P can be applied without exceeding stresses of 150 MPa in the steel rod and 70 MPa in the bronze rod?



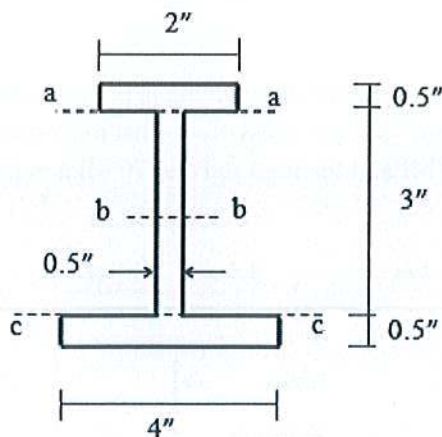
4. Determine the maximum stress in the concrete and the steel for a reinforced concrete beam with the section shown below if it is subjected to a positive bending moment of 50 kip-ft. The reinforcement consists of four #9 steel bars (each bar area is 1 in<sup>2</sup>). Assume cracked section and  $n = 10$ .



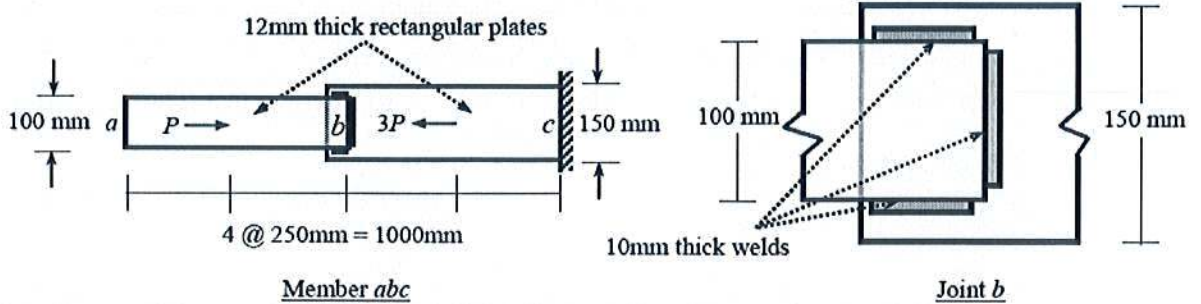
5. A simple beam on 6-m span carries a load of 3 kN/m including its own weight. Specify the spacing of 10-mm screw (as shown) necessary to fasten the parts together at section A-A. Assume that allowable shear capacity for 10-mm screw is 2 kN.



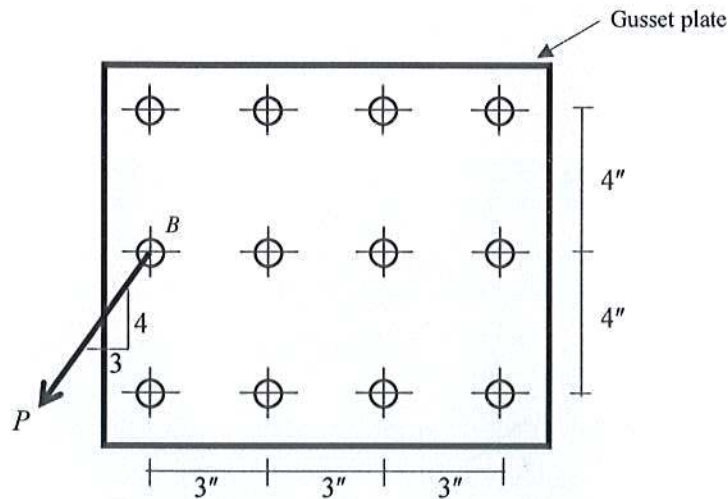
6. A beam having the cross section with dimension shown below, transmits a vertical shear  $V = 7$  kip. Determine the shear stress at section a-a, b-b and c-c. Section b-b is at neutral axis.



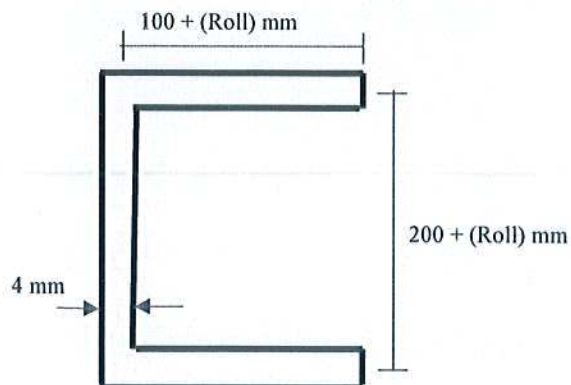
7. (i) Calculate the maximum allowable value of  $P$  for the axially loaded member  $abc$  shown below.  
 (ii) For the force  $P$  calculated in (i), determine the lengths of 10 mm fillet welds to connect the members  $ab$  and  $bc$  at joint  $b$  [Given: Allowable stress in shear = 180 MPa, tension = 200 MPa, compression = 150 MPa].



8. On the connection of 12 rivets shown below, the load  $P = 48$  kips acting on the gusset plate passes through the center of rivet  $B$  and has a slope of 4 to 3. Determine the resultant load on the most heavily loaded rivet.



9. The vertical shear force is 2000N. Compute and illustrate shear flow and determine the location of shear centre. Here Roll = last 3 digits of your id.





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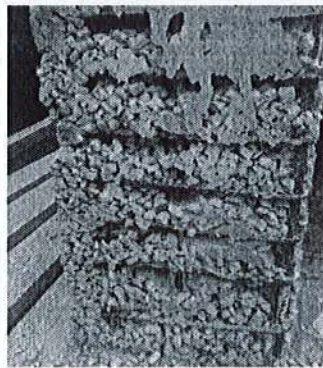
Course Title: Engineering Materials  
Time: 3 hours

Credit Hour: 4.00

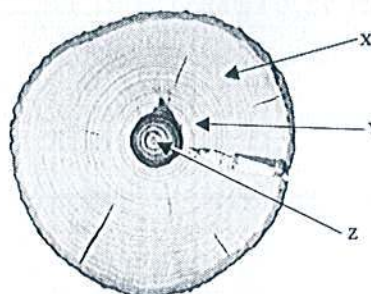
Course Code: CE 201  
Full Marks: 100

**Answer all FIVE questions.**

1. a) Retarders are used in concrete that need to be transported over long distances. Describe the function of a retarder and suggest a readily available and cheap retarder. [4]  
b) 'X' is an admixture that allows 16-25% reduction of water in concrete. Name the type of admixture that 'X' belongs to and describe its working principle. [6]  
c) Chemical admixtures like 'X' are sometimes found to contain chloride salts. Small chloride content can be beneficial for concrete, however above the threshold level it is considered harmful to steel and concrete. Explain why. [5]
2. a) The honeycomb structure that can be seen in the column below is a direct result of segregation in fresh concrete. Identify the causes of segregation in the concrete. [5]



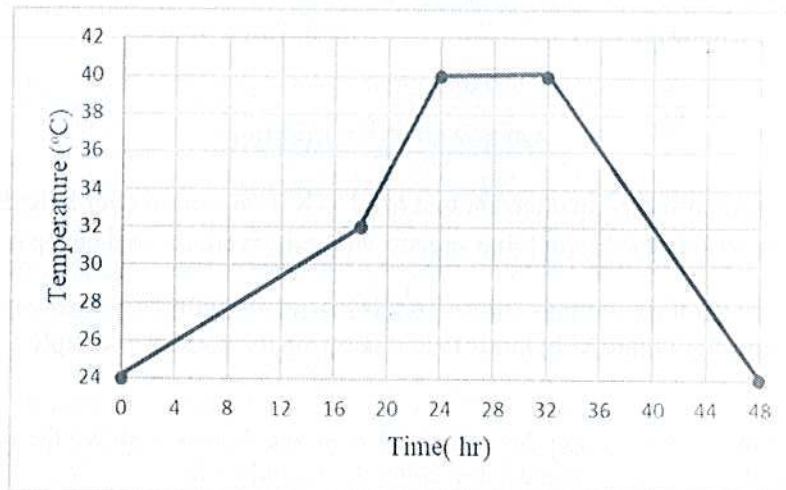
- b) Discuss how the honeycomb can be repaired to temporarily strengthen the column shown above. [5]
- c) Sketch schematic curve of 'sand to aggregate (s/a) volume ratio versus workability' and explain the nature of the curve. [10]
3. a) In some places within Dhaka, rainwater can clog streets, even flood the footpaths. Suggest a type of concrete that can be used to construct these sidewalks and describe how it can drain water quickly onto the ground. [5]  
b) Name and describe the main constituents of paint. [5]  
c) From the timber cross-section shown below identify the components labeled X, Y and Z. And list three key differences between X and Y. [5]





4. a) A concrete maturity of  $30^{\circ}\text{C}\cdot\text{day}$  is desired after 2 days to meet the strength specification for a specific construction. Following graph shows internal temperature vs time of a concrete sample for 2 days since its preparation. Examine whether the sample meets the criterion or not.

[8]



- b) The following data was obtained from a sample of aggregate:

Bulk Specific Gravity (Oven-dry basis),  $BSG_{OD} = 2.20$   
 Weight of the saturated surface-dry sample = 1250 g  
 Volume of solid + impermeable pore =  $0.0003 \text{ m}^3$   
 Volume of permeable pore =  $0.0002 \text{ m}^3$   
 Unit weight of water =  $1000 \text{ kg/m}^3$

- i) Calculate Bulk Specific Gravity (Saturated Surface-dry basis)
- ii) Calculate Apparent Specific Gravity
- iii) Calculate Absorption Capacity

[12]

5. Design a concrete mix following the ACI 211.1 mix design method and find the ingredients required for a trial mix of a set of 6 standard cylinders (diameter = 150mm, length = 300 mm). The concrete is required for an exterior column located above ground. Specified strength is 18 MPa at 28 days. Assume shrinkage and loss factor = 10%. Refer to the appendix for the required tables and charts.

**Specifications:**

**Slump:** 75-100 mm

**Cement:** Ordinary Portland Cement (Specific gravity= 3.15)

**Coarse Aggregate:**

Absorption Capacity: 2%

Moisture Content: 2%

Bulk Specific Gravity (OD): 2.62

Unit Weight (Dry Rodded):  $1570 \text{ kg/m}^3$

**Fine Aggregate:**

Fineness Modulus: 2.50

Absorption Capacity: 1.8%

Moisture Content: 4.0%

Bulk Specific Gravity (OD): 2.68

[30]