

**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Final Examination, Spring 2022**  
**Programme: B.Sc. Engineering (Civil)**  
**(1<sup>st</sup> Year 2<sup>nd</sup> Semester)**

Course Title: Bangladesh Studies: Society and Culture  
Time: 2 hrs.

Credit: 2

Course Code: HSS 211(a)  
Marks: 100

**Answer ANY FOUR questions of the following (4 × 25)**

1. a) How does the Functionalist Perspective view a society? 10  
b) Explain how sociological knowledge can be used in our everyday life. 15
  
2. a) What do you understand by social stratification? 5  
b) Distinguish between caste and social class systems with examples. 20
  
3. a) Is there any relationship between power and authority? 10  
b) What are the types of authority? Discuss with examples. 15
  
4. a) Distinguish between the material culture and the non-material culture. 10  
b) Describe different elements of culture with examples from your own society. 15
  
5. a) Briefly discuss the different forms of families in contemporary world. 10  
b) Do you think the traditional functions of the family are changing? Justify your answer. 15
  
6. a) What did Lenski mean by socio-cultural evolution? 5  
b) Identify, in brief, the main characteristics of hunting and gathering, horticultural and agrarian societies. 20

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**Final Examination, Spring 2022**  
**Program: B. Sc. Engineering (Civil)**  
**(2<sup>nd</sup> Year 2<sup>nd</sup> Semester)**

Course code: HSS 211(b)  
Total Time: 2 hours

Course Title: Bangladesh Studies: History

Credit: 2.00  
Full Marks: 100

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

1. Explain the results of the Battle of Palassy and impact of Dual Rule in Bengal. 25
2. Discuss the merits and demerits of the Permanent Settlement. 25
3. Write down the causes of the Partition of Bengal in 1905. 25
4. Show the significance of the Language Movement in the national history of Bangladesh. 25
5. Narrate elaborately the points of Six Points Demand of 1966. 25
6. Explain the role of international community in the Liberation War of Bangladesh. 25

**University of Asia Pacific**  
**Department of Basic Sciences & Humanities**  
**Final Examination, Spring-2022**  
**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) Show whether the transformation is linear or not 10

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

- (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 a matrix P that diagonalizes the matrix  $A = \begin{pmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{pmatrix}$ . 25

3. (a) Find the basis and dimension of the subspace S generated by the set of vectors  $\{(1, -2, 4, 1), (2, -3, 9, -1), (1, 0, 6, -5), (2, -5, 7, 5)\}$ . 10

- (b) Test whether the following matrices are linearly dependent or independent 15

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

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

$$x + 2y - 3z = -1$$

$$3x - y + 2z = 7$$

$$5x + 3y - 4z = 2$$

- (b) Find the parametric solution of the system 13

$$x + 2y - 3z = 6$$

$$2x - y + 4z = 2$$

$$4x + 3y - 2z = 14$$

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

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 Variance for the following data

10

Tax(Thousands)	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of managers	18	30	46	28	20	12	6

6. Find Kurtosis for the following distribution

25

Profit(Lakhs)	70-90	90-110	110-130	130-150	150-170
No. of companies	8	11	18	9	4

7. (a) Write down the probability density function of Binomial distribution. An unbiased coin is tossed 8 times. The mean and variance of a binomial distribution are 8 and 9 respectively. Find the probability density function of at best 2 flower. 12

(b) Write down the probability density function of Poisson distribution. The mean of death of kids per day in a village is 5. What is the probability of no death in a particular day. 13

8. (a) Based on the frequency distribution given below calculate mean deviation 5

Score	10	75	80	45	55
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(b) Find standard deviation for the following data

5

320, 310, 315, 322, 326, 340, 325, 324, 321, 331.

(c) 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**  
**Final Examination, Spring-2022**  
**Program: B. Sc Engineering (Civil)**

Course Title: Basic Electrical Engineering  
 Credit Hr: 3.00

Time: 180 minutes.

Course Code: ECE 201  
 Full Mark: 150

[There are **Eight** Questions. Answer **Six** questions including Q1, Q2, Q3 and Q4. All questions are of equal value. Symbols have their usual meanings. Figures in the right margin indicate marks.]

1. Calculate the power factor of each of all 3 branches of the circuit in figure 1. [25]

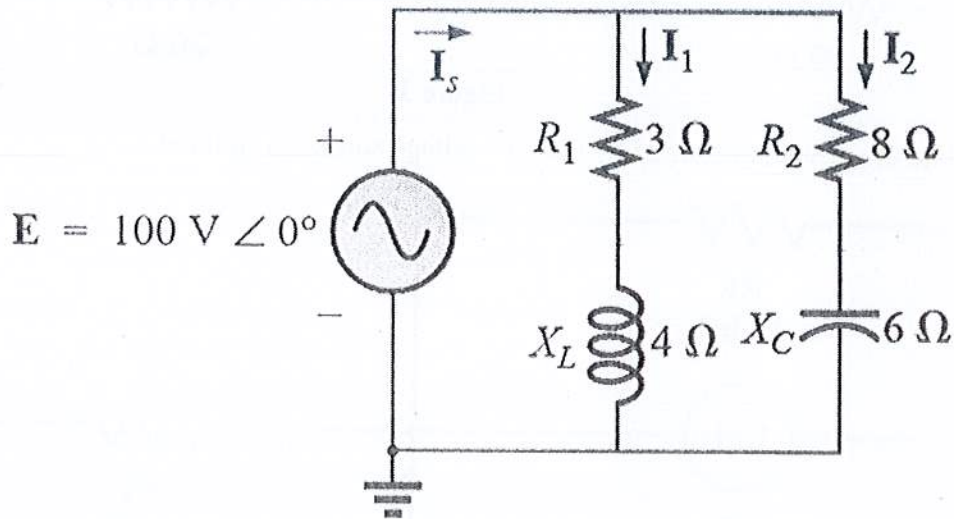


Figure 1

2. Determine 'I' as shown in the figure 2. [25]

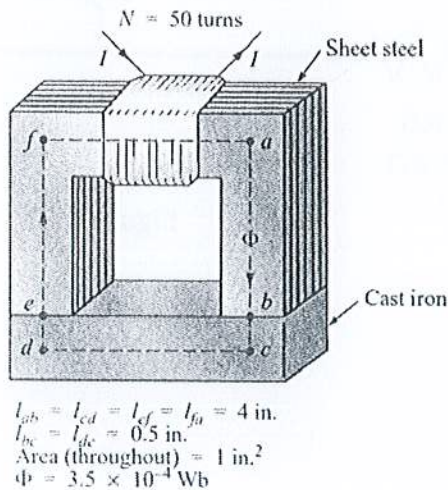


Figure 2

3. The 'R' of figure 3 needs to draw the maximum available power. What is the value of the maximum power? [25]

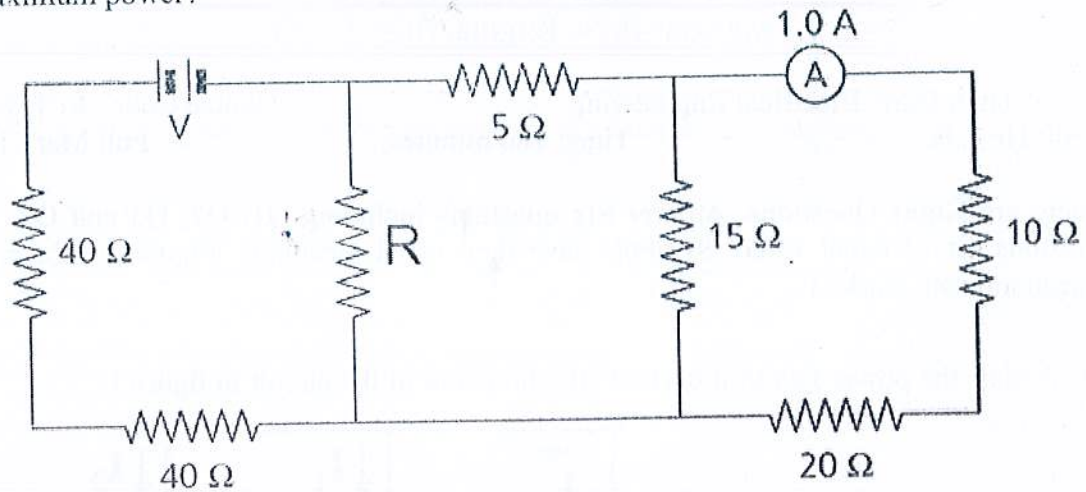


Figure 3

4. Calculate the power consumed by the DC voltage source in figure 4. [25]

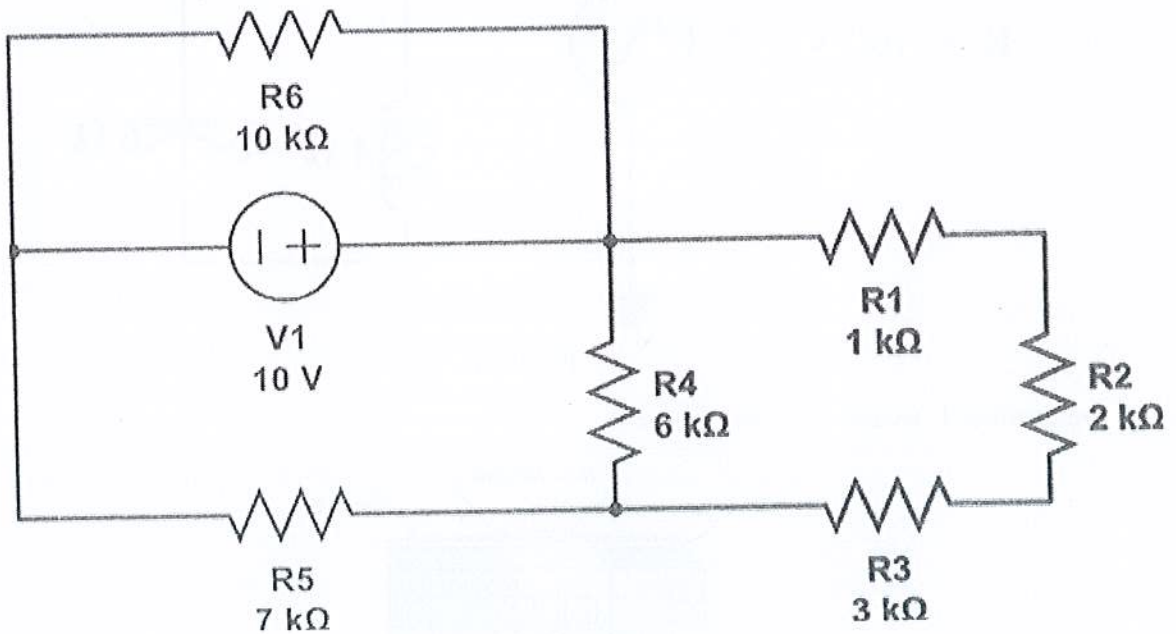


Figure 4

5. A 10V source is connected at point A and B. What is the power drawn by 1, 2 and 3 ohm resistors? [Pick source polarity as per your choice] [25]

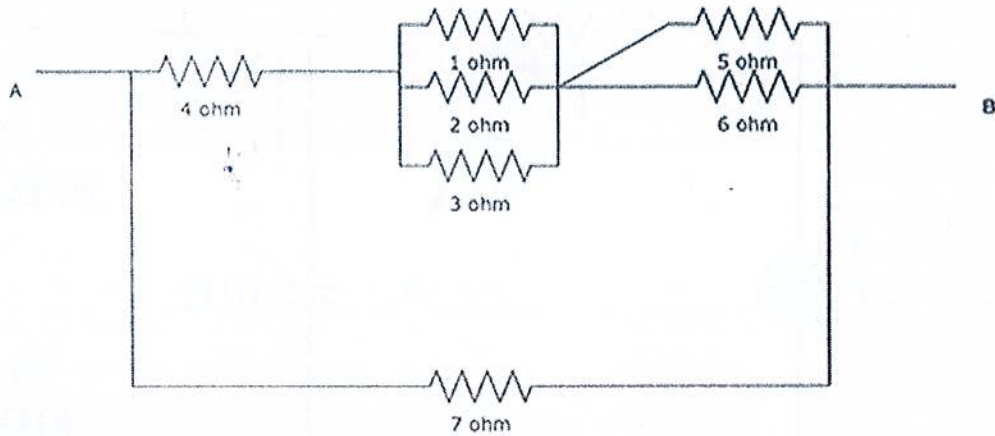


Figure 5

**OR**

6. Calculate the power Consumed by R1 and R4 of figure 6. [25]

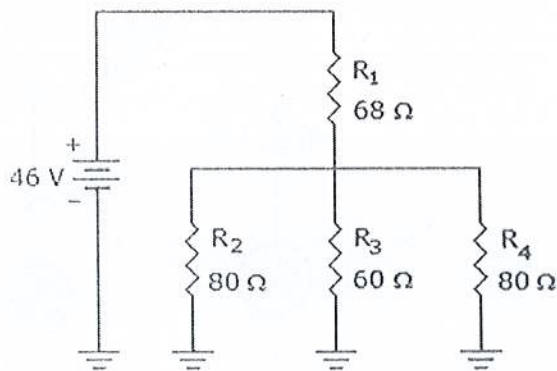


Figure 6

7. Find all 3 kinds of total powers and power factors of R-L branch of figure 7.

[16+  
9]

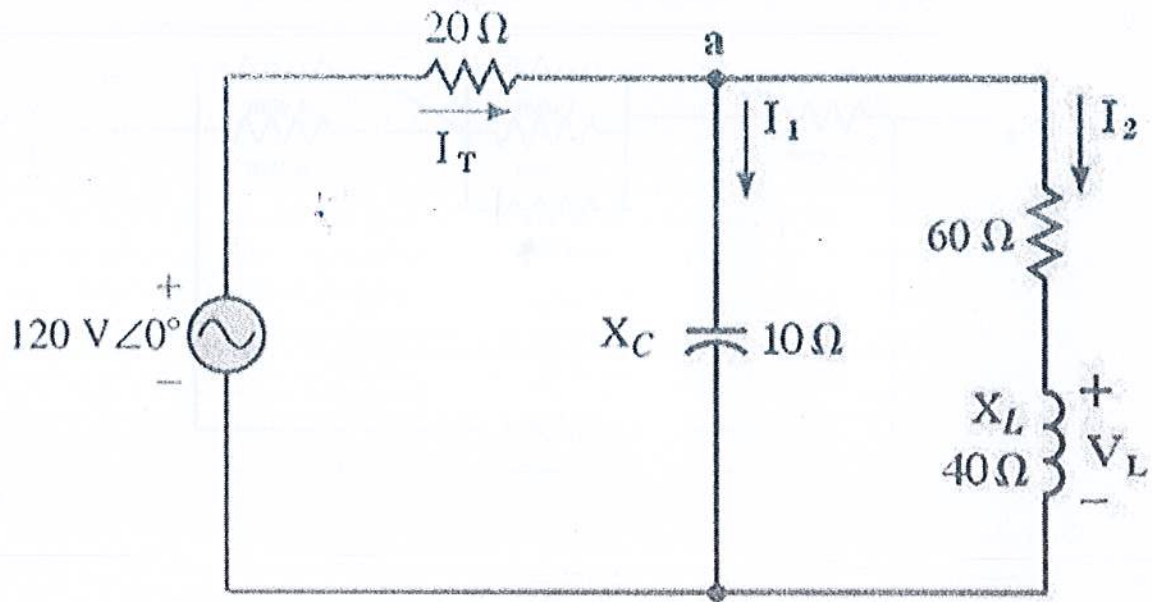


Figure 7

**OR**

8. Mathematically find power and power factor of the 6-Ohm inductor.

[25]

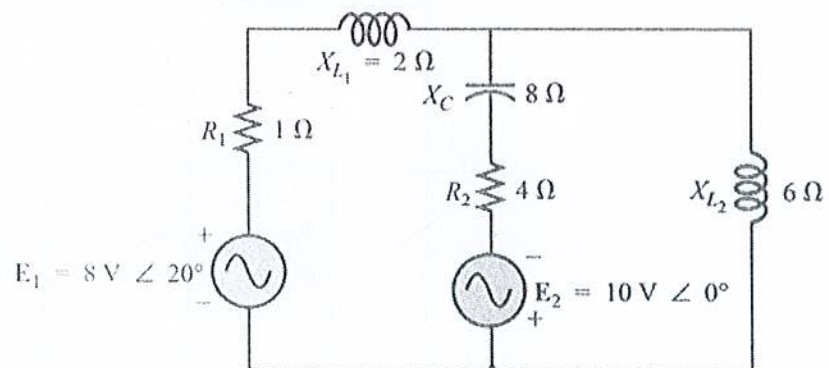


Figure 8



Figure 9: B-H curve of the materials

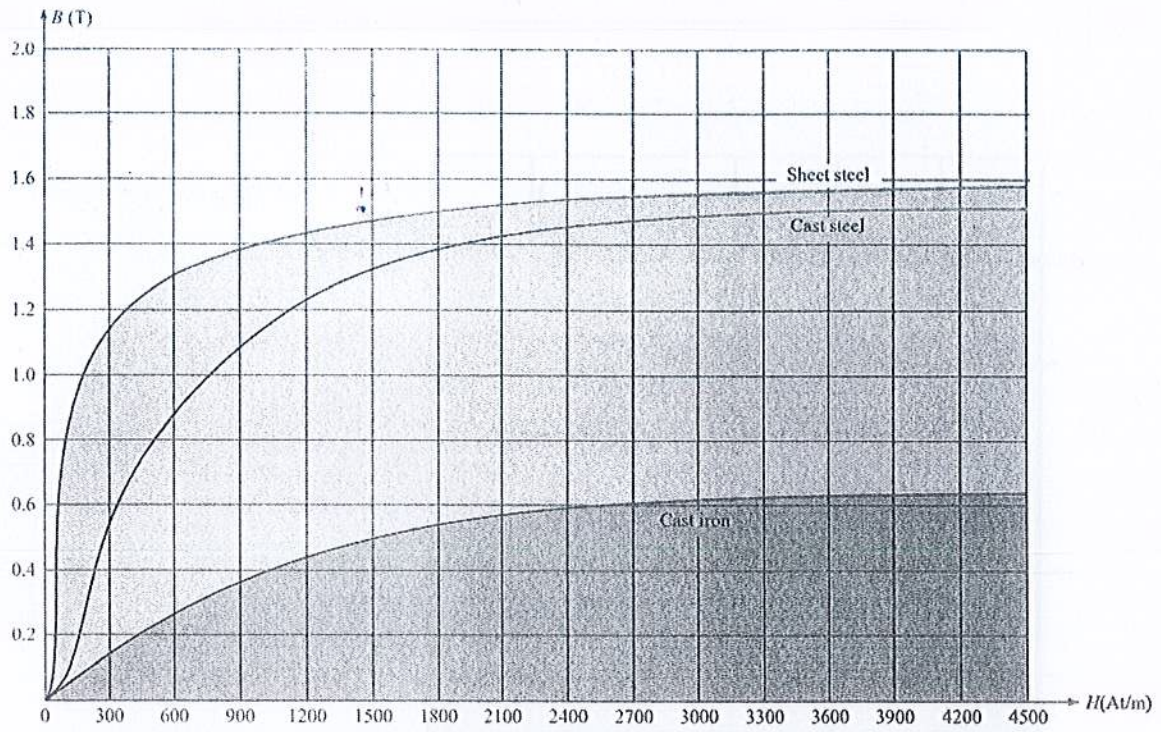
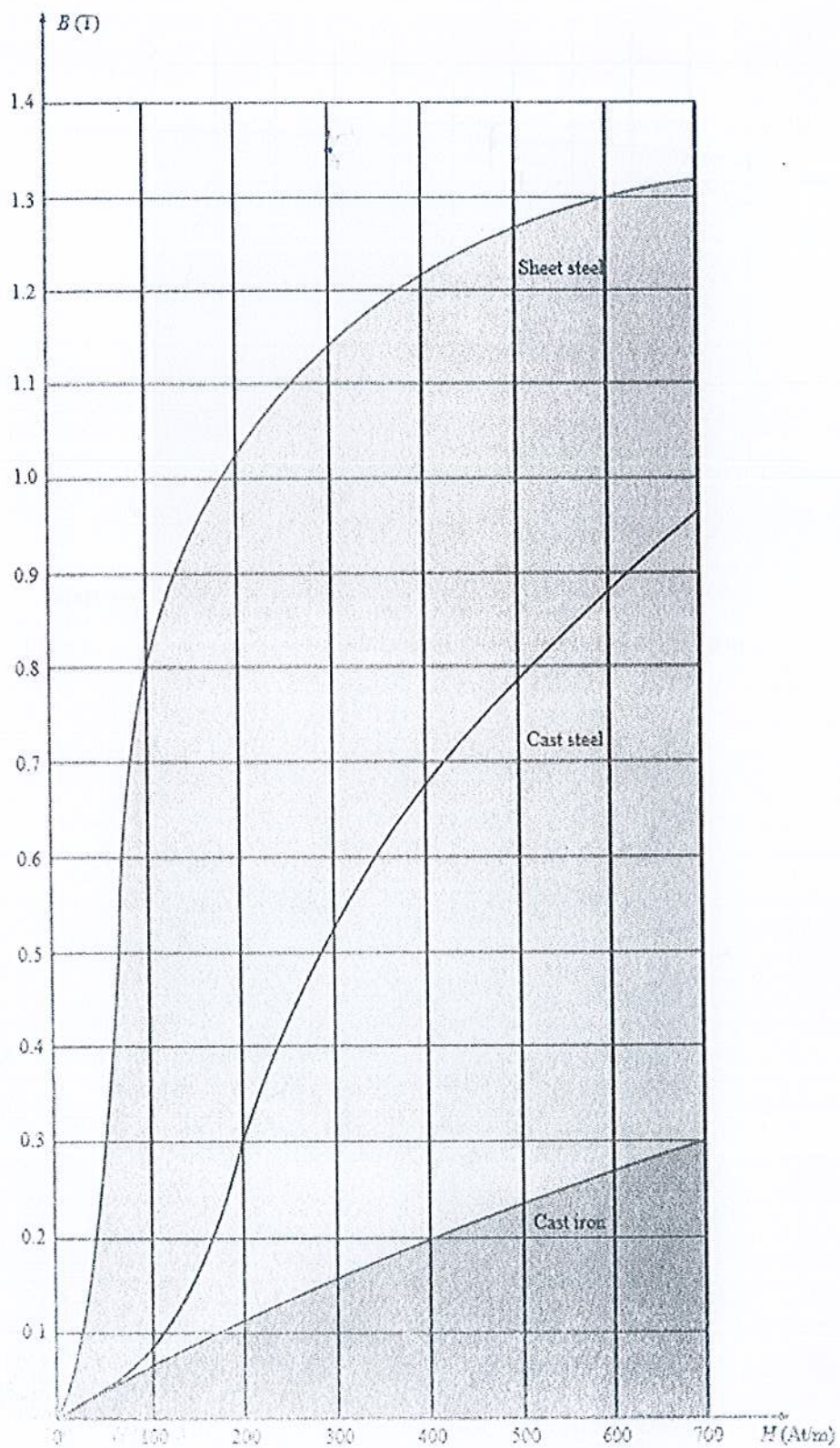


Figure 10: B-H curve of the materials



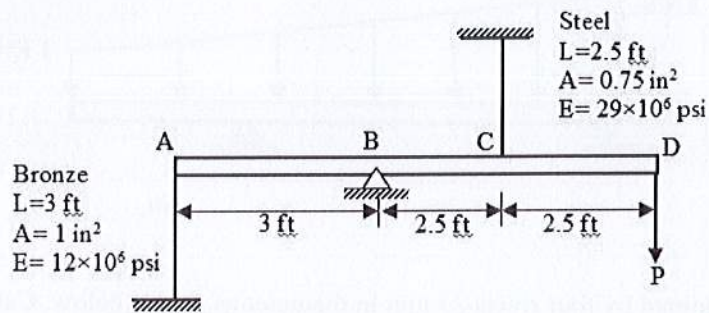
**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Spring 2022**  
**Program: B.Sc Engineering (Civil)**

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

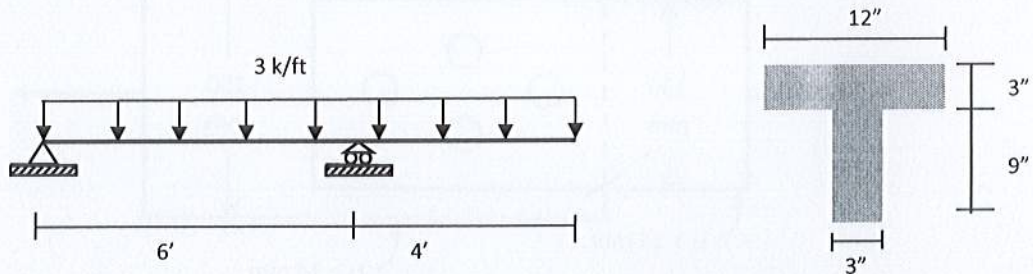
Course Code: CE 211  
 Full Marks:  $8 \times 10 = 80$

*Answer all the Questions*

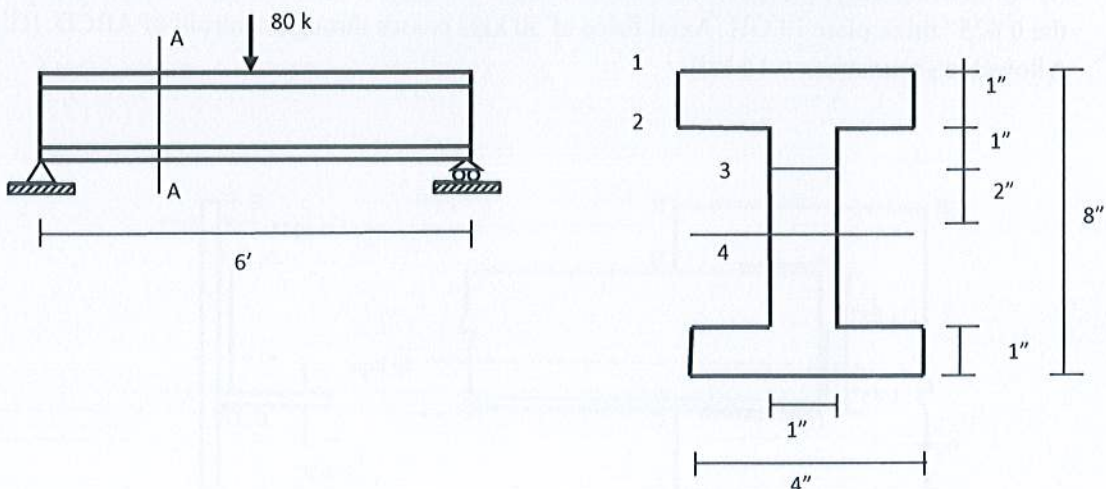
1. The light rigid bar ABCD shown below is pinned at B and connected to two vertical rods. Assuming that the bar was initially horizontal and the rods stress-free, determine the stress in each rod after the load  $P = 15$  kips is applied.



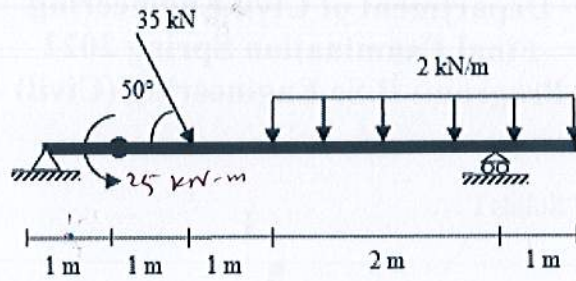
2. Determine the maximum compressive and tensile stress for the following beam.



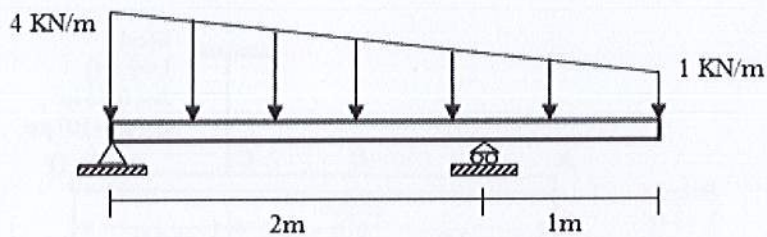
3. An I beam is loaded as shown below. Cross section of the beam is also given. Determine the shear stresses at the levels indicated (1, 2, 3, 4). Neglect the self-weight of the beam.



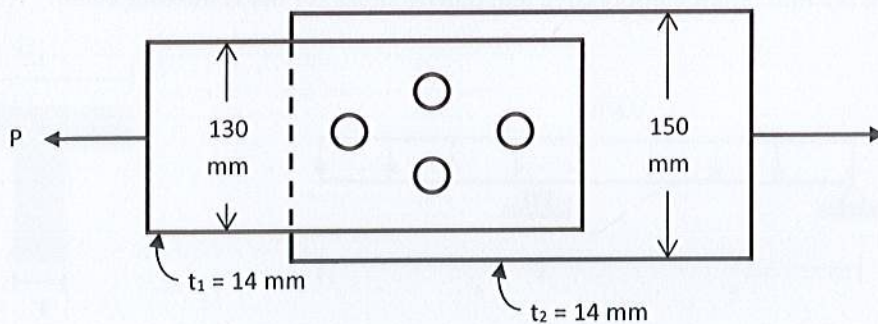
4. Draw the Shear Force and Bending Moment diagrams for the beam loaded as shown below.



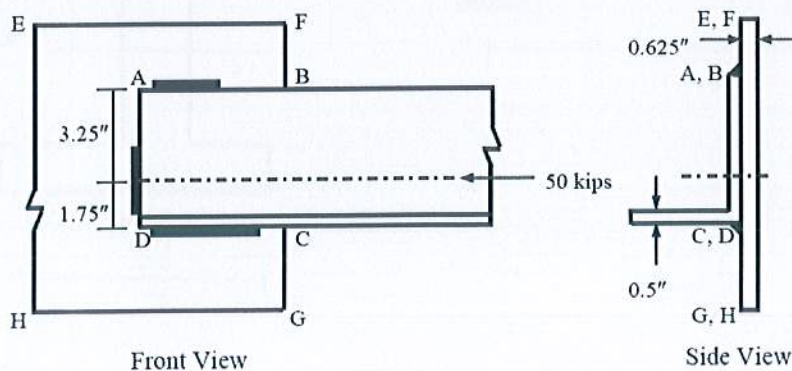
5. Draw the Shear Force and Bending Moment diagrams for the beam loaded as shown below.



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

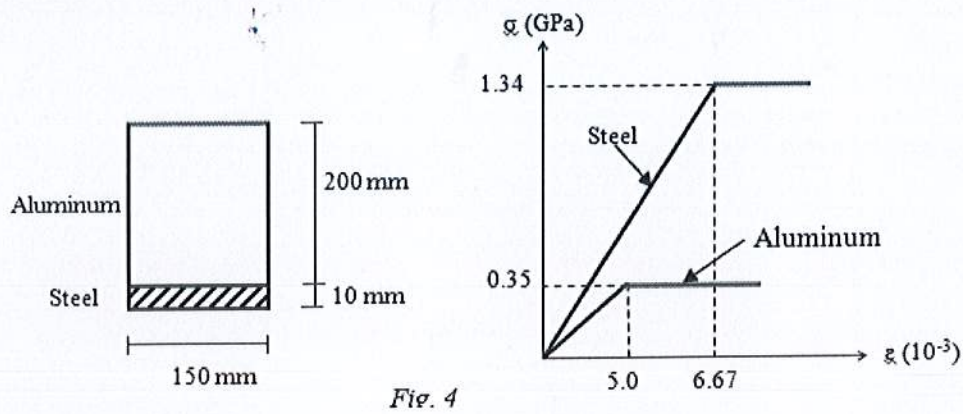


7. In the figure shown below, calculate the length of 3/8-inch weld joints required on sides (i) AB and CD only, (ii) AB, AD and CD to connect the 0.5" thick channel section ABCD to the 0.625" thick plate EFGH. Axial force of 50 kips passes through centroid of ABCD. [Given: Allowable shear stress = 16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



8. Consider a composite beam of the cross-sectional dimensions shown in the following figure. The upper  $150\text{ mm} \times 200\text{ mm}$  part is aluminum while the lower  $150\text{ mm} \times 10\text{ mm}$  strap is steel. If the beam is subjected to a positive bending moment of  $30\text{ kN}\cdot\text{m}$  around horizontal axis, what are the maximum stresses in the steel and aluminum?

Note: Modulus of elasticity for steel and aluminum can be found from the stress-strain diagram provided.



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

Course Title: Engineering Materials  
Time: 3 hours

Credit Hour: 4.00

Course Code: CE 201  
Full Marks: 100

*[Answer all the questions. Assume values for any missing data]*

1.(a) Corrosion in concrete reinforcement initiates with the formation of an electrical potential difference between any two locations within it. Explain the mechanism, including the reactions taking place.

(b) Studies have shown that the wastewater discharged from the battery industry generally contains a high level of calcium and magnesium sulfates. The wastewater treatment facilities fed with this type of wastewater requires waterproofing of the concrete surface. Considering the durability of the concrete, discuss why waterproofing is necessary.

(c) Superplasticizers (SPs), also known as high range water reducers, are admixtures used in making high strength concrete. Describe the working principle of SPs. [5+5+5]

2.(a) Write down the causes of bleeding of concrete. What effects does it have on concrete and what measures can be taken to prevent bleeding of concrete?

(b) List the main constituents of paint. Name any three defects of timber. [10+5]

3.(a) Draw a schematic graph of 7-days compressive strength of concrete vs water/cement ratio (w/c). Hence explain the shape of the curve.

(b) A sample of coarse aggregate has an oven dry weight of 1168g and an absorption capacity of 1.2%. Find the SSD weight of the sample aggregate.

(c) Calculate the FM of a sample of aggregate whose sieve analysis result is tabulated below:

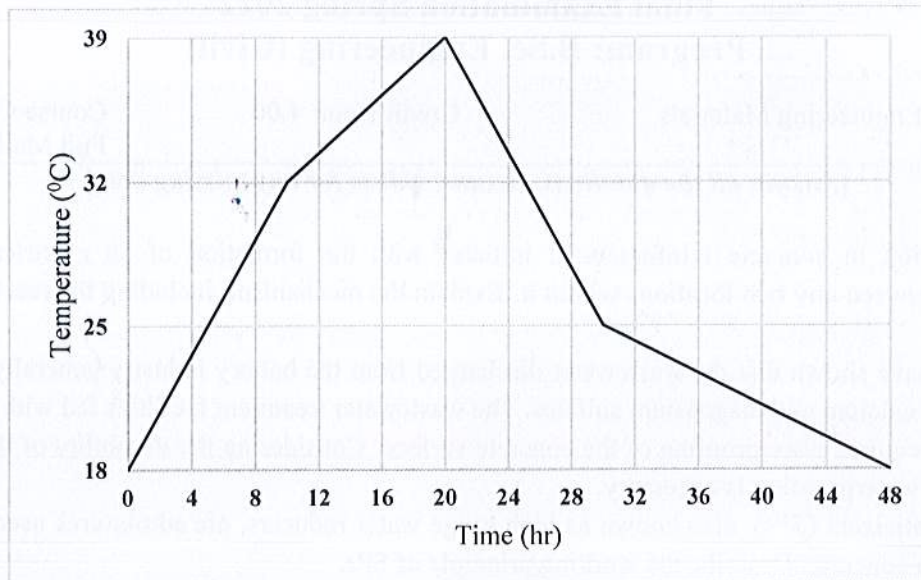
Sieve Size	Standard Opening (mm)	Materials retained (gm)
#4	4.75	12
#8	2.36	37
#16	1.19	75
#30	0.59	376
#50	0.3	579
#100	0.15	473
#200	0.075	47
<b>Pan</b>		17

[5+5+10]

4.(a) Standard concrete cube usually exhibits greater compressive strength than standard concrete cylinder in conventional concrete testing. Explain this observation.

(b) Slump test is one method to assess the workability of fresh concrete. With the aid of diagrams show the nature of zero slump, true slump, and shear slump. Also describe the range of workability each of these slumps indicate. [5+5]

5.(a) The compressive strength of concrete depends both on age and internal temperature. The following shows the graph of internal temperature vs time of concrete sample 'A' for 2 days since it's preparation.



- (i) Find the maturity of the concrete sample at 2<sup>nd</sup> day.  
(ii) Maturity of another sample 'B' at 2<sup>nd</sup> day is found to be 945°C-hr. Which sample is likely to have gained more compressive strength after 2 days.  
(b) What are the important properties of freshly prepared concrete. Also, write down the factors affecting the strength of concrete. [5+5]

6. 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 12 cylinders. The concrete is required for the casting of interior column members (slump: 75-100mm). Specified strength at 28days,  $f_c' = 31\text{MPa}$ . Maximum aggregate size is 37.5mm. Assume shrinkage and loss factor = 20%. Refer to the appendix for the required tables and charts.

**Specifications:**

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

**Coarse Aggregate:**

Absorption Capacity: 2%

Moisture Content: 1%

Bulk Specific Gravity (OD): 2.62

Unit Weight (Dry Rodded): 1600 kg/m<sup>3</sup>

**Fine Aggregate:**

Fineness Modulus: 2.50

Absorption Capacity: 1.8%

Moisture Content: 3.4%

Bulk Specific Gravity (OD): 2.68

[30]

Appendix

Specified compressive strength, $f'_c$ , MPa	Required average compressive strength, $f'_{cr}$ , MPa
Less than 21	$f'_c + 7.0$
21 to 35	$f'_c + 8.5$
Over 35	$1.10 f'_c + 5.0$

Adapted from ACI 318.

Slump, mm	Water, kilograms per cubic meter of concrete, for indicated sizes of aggregate <sup>a</sup>							
	9.5 mm	12.5 mm	19 mm	25 mm	37.5 mm	50 mm**	75 mm**	150 mm**
Non-air-entrained 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	202	190	178	160	—
Approximate amount of entrapped air in non-air-entrained concrete, percent	3	2.5	2	1.5	1	0.5	0.3	0.2
Air-entrained concrete								
25 to 50	181	175	168	160	150	142	122	107
75 to 100	202	193	184	175	165	157	133	119
150 to 175	216	205	197	184	174	166	154	—
Recommended average total air content, percent, for level of exposure:†								
Mild exposure	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
Moderate exposure	6.0	5.5	5.0	4.5	4.5	4.0	3.5	3.0
Severe exposure	7.5	7.0	6.0	6.0	5.5	5.0	4.5	4.0

Compressive strength at 28 days, MPa	Water-cementitious materials ratio by mass	
	Non-air-entrained concrete	Air-entrained concrete
45	0.38	0.30
40	0.42	0.34
35	0.47	0.39
30	0.54	0.45
25	0.61	0.52
20	0.69	0.60
15	0.79	0.70

Strength is based on cylinders moist-cured 28 days in accordance with ASTM C 31 (AASHTO T 23). Relationship assumes nominal maximum size aggregate of about 19 to 25 mm.

Adapted from ACI 211.1 and ACI 211.3.



Nominal maximum size of aggregate, mm (in.)	Bulk volume of dry-rodded coarse aggregate per unit volume of concrete for different fineness moduli of fine aggregate*			
	2.40	2.60	2.80	3.00
9.5 (3/8)	0.50	0.48	0.46	0.44
12.5 (1/2)	0.59	0.57	0.55	0.53
19 (3/4)	0.66	0.64	0.62	0.60
25 (1)	0.71	0.69	0.67	0.65
37.5 (1 1/2)	0.75	0.73	0.71	0.69
50 (2)	0.78	0.76	0.74	0.72
75 (3)	0.82	0.80	0.78	0.76
150 (6)	0.87	0.85	0.83	0.81

\*Bulk volumes are based on aggregates in a dry-rodded condition described in ASTM C 29 (AASHTO T 19). Adapted from ACI 211.