2-1

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring 2023
Program: B. Sc. Engineering (Civil)

Course Title: Bangladesh Studies: Society and Culture — Course Code: HSS 211(a)
Time: 2 hours — Credit Hours: 2 — Full Marks: 100

Answer the following questions.

1.	a.	Define family. Describe the characteristics of family as a social institution.	15
	b.	What are the basic causes of the transformation of joint family into nuclear family in Bangladesh? Discuss.	10
		OR	
2.	a.	How is material culture different from non-material culture?	15
	b.	Analyze the term 'cultural lag' in the present social context of Bangladesh.	10
3.	a.	Define socialization. Discuss the role of family and peer group as agencies of socialization.	15
	b.	Describe socialization throughout various stages in the life course.	10
		OR	
4.	a.	Define ascribed status, achieved status and master status.	15
	b.	How does social mobility differ in the three systems of stratification?	10
5.	a.	Distinguish between society and community.	10
	b.	Explain why the sociological imagination is important for studying society.	15
6.	a.	Define family, marriage and divorce.	10
	b.	Elucidate the changing nature of marriage and family pattern of Bangladesh in this era of globalization.	15

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University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring 2023
Program: B. Sc. Engineering (Civil)

Course Title: Bangladesh Studies: History — Course Code: HSS211(b)
Time: 2 hours — Credit Hour: 2 — Full Marks: 100

Answer ANY FOUR including Q-5 and Q-6. Figures in the right margin indicate marks.

1. Explain the reasons and results of the Battle of Plassey. 25

Or

2. Discuss the results of the Permanent Settlement. 25

3. Discuss the reforms of Lord William Bentinque. 25

Or

4. Discuss the Language Movement and its significance. 25

5. Narrate elaborately the points of the 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, Spring-2023
Program: B.Sc. in Civil Engineering

Course Title: Mathematics-III | Course Code: MTH 201
Time: 3.00 Hours | Credit Hour: 3.00 | Full Marks: 150

There are **eight** (8) questions. Answer any **six** (6). All questions are of equal values, indicated in the right margin.

1. (a) Calculate the eigenvalues and associated eigenvectors for the matrix **15**

$$A=\begin{pmatrix} 1 & 0 & -2 \\ 0 & 0 & 0 \\ -2 & 0 & 4 \end{pmatrix}.$$

(b) Find the characteristic equation of the matrix $A=\begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{pmatrix}$ and verify cayley-hamilton theorem for the given matrix. **10**

2. (a) Show whether the transformation is linear or not **10**

$$T:\Re^3 \to \Re^2, T(x,y,z)=(3x-2y+z, x-3y-2z).$$

(b) Find the rank and nullity of the linear transformation defined as follows **15**

$$T:\Re^3 \to \Re^3, T(x,y,z)=(x+2y, y-z, x+2z).$$

3. (a) Determine whether (4, 2, 1, 0) is a linear combination of vectors **10**

$$\{(1,2,-1,0),(1,3,1,2),(6,1,0,1)\}$$

(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 by gaussian elimination method **12**

$$5x-6y+4z=15$$
$$7x+4y-3z=19$$
$$2x+y+6z=46$$

(b) Find the solution of the system by applying crammer's rule **13**

$$x+2y-z=9$$
$$2x-y+3z=-2$$
$$3x+2y+3z=9$$

5. **(a)** Calculate mean and median of the distribution given below. Hence calculate the mode using empirical relation 20, 18, 22, 27, 25, 12, 15. **15**

(b) Calculate standard deviation 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)** Based on the frequency distribution given below calculate mean for mid exam **10**

marks	10	75	80	45	55
No. of students	15	10	13	11	12

(b) Calculate quartile deviation for the following data and then calculate mean deviation using empirical relation **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

8. **(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 6 and 8 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 7. What is the probability of no death in a particular day. **13**

University of Asia Pacific
Department of Civil Engineering
Semester Final Examination, Spring – 2023
Program: B.Sc. in CE (2nd Year, 1st Semester)

Course Title: Basic Electrical Engineering Course Code: ECE 201 Credit Hours: 3.00
Time: 3 hours Full Marks: 150

[There are **Eight** questions. Answer any **Six including Question 1 to 4.** Figures in the right margin indicate marks]

1. Two light bulbs are connected to a 10V battery as shown in Figure 1 and Figure 2 [25]

Calculate for both figures:

i. The total current supplied by the battery
ii. The current through each bulb
iii. The resistance of each bulb

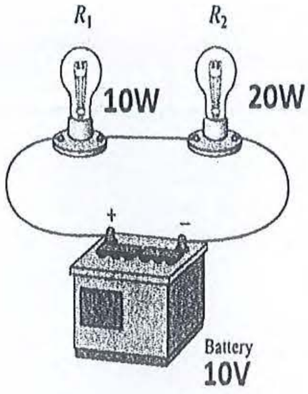


Figure 1

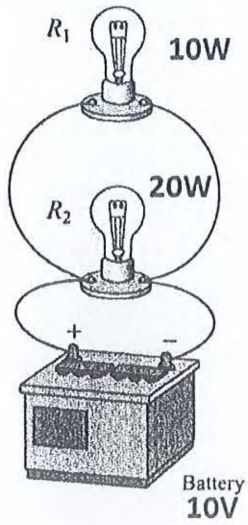


Figure 2

2 Compute V_o for the circuit shown in Figure 3, using Nodal **or** Mesh analysis. [25]

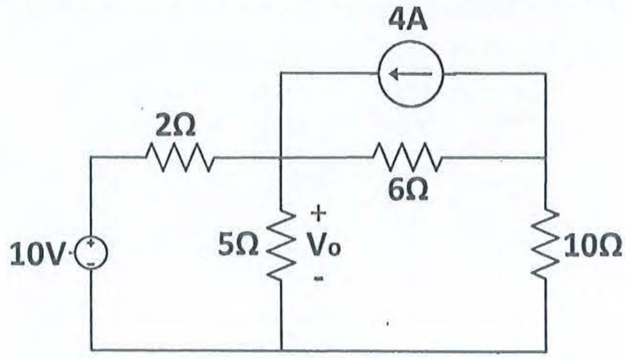


Figure 3

3. a. For Figure 4, [15]

i. Calculate the value of i_L and v_c.
ii. Calculate the energy stored in the inductor.
iii. Calculate the energy stored in the capacitor.

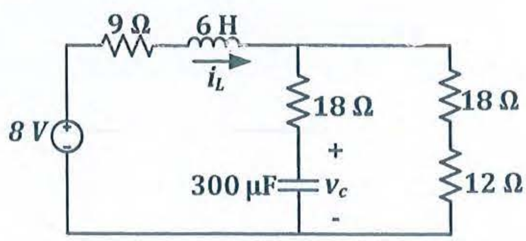


Figure 4

b. Compute the voltage across 10Ω resistor of the circuit shown in Figure 5 using Superposition theorem. [1?]

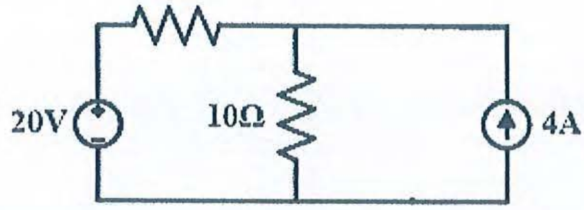


Figure 5

4. Calculate the value of current required to establish magnetic flux in the circuit shown in Figure 6. Use attached B-H curve if required. [25]

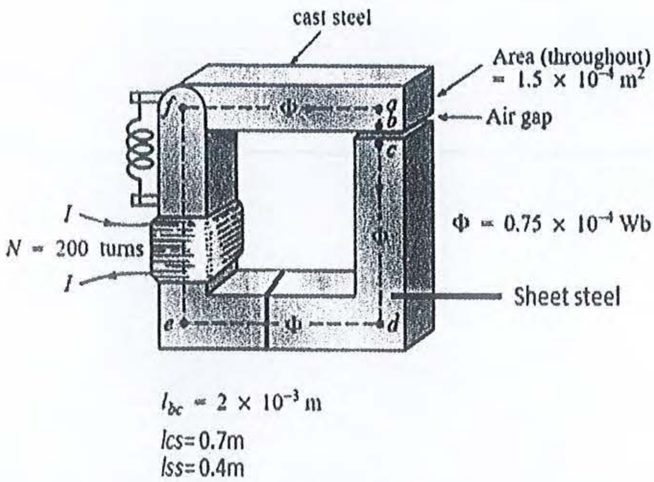


Figure 6

5. Construct the smallest equivalent circuit for the circuit given in Figure 7, [one voltage source and a resistor] with respect to the load resistor R_L. [25]

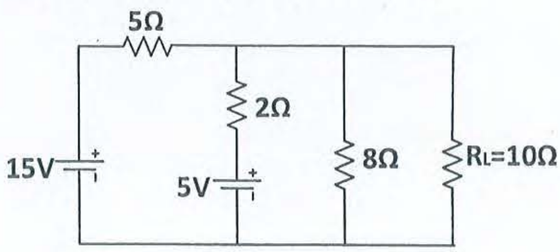


Figure 7

OR

6. Construct the smallest equivalent circuit for the circuit given in Figure 7, [one current source and a resistor] with respect to the load resistor R_L. [25]

7. a. The current though an inductive reactance, $X_L = 10\ \Omega$ is given by [12.5]

$$i = 40\sin(100t - 40)A$$

i. Compute the expression for the voltage v.

ii. Sketch v and i on the same axis.

7b. Calculate the average and the R.M.S value of the wave shape given in Figure 8. [12.5]

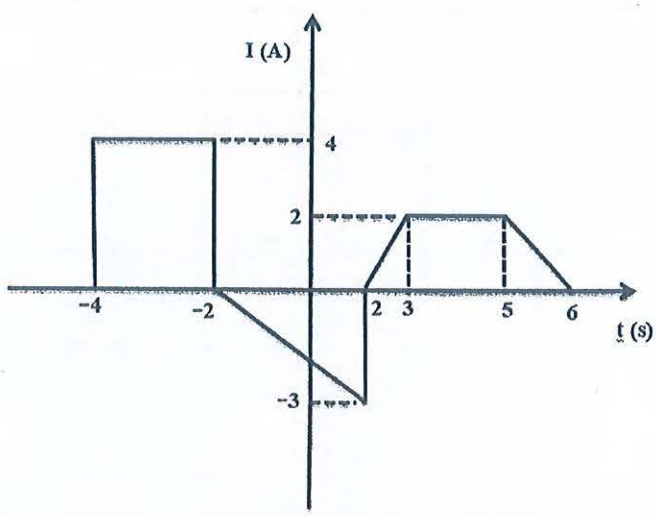


Figure 8

OR

8. Calculate the Power factor of the source for the circuit shown in Figure 9. [25]

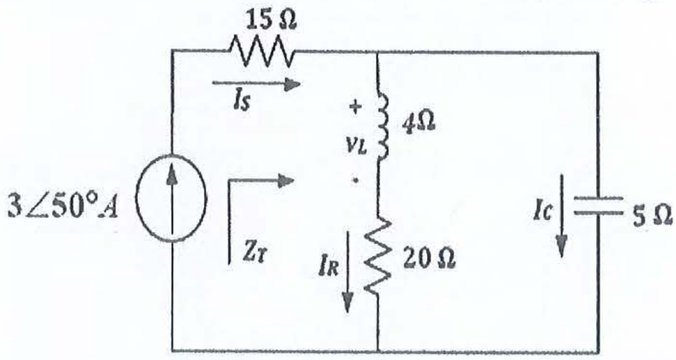
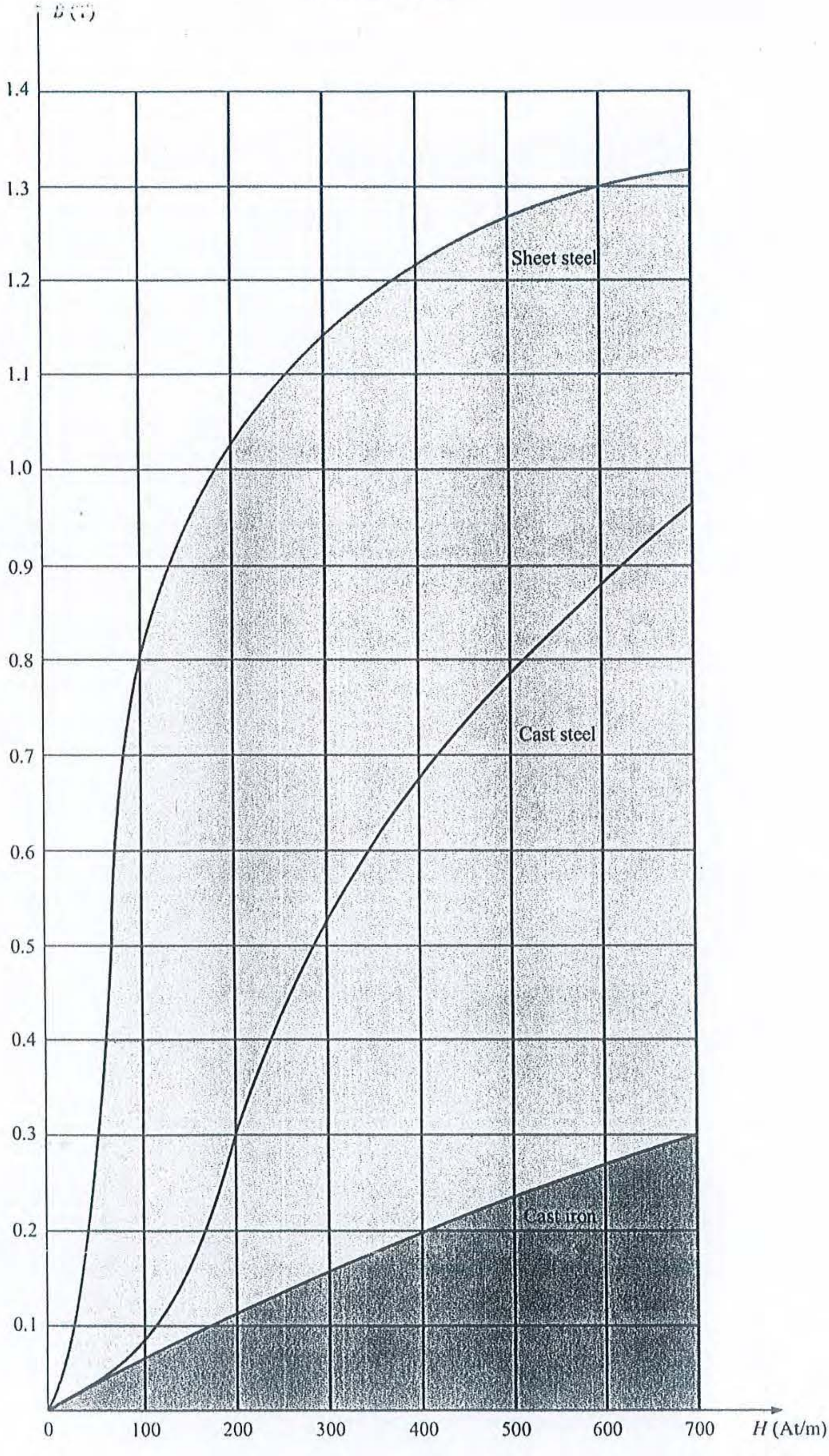


Figure 9

B-H curve


B (T)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Sheet steel
Cast steel
Cast iron
0
100
200
300
400
500
600
700
H (At/m)

24.11.23

SET A

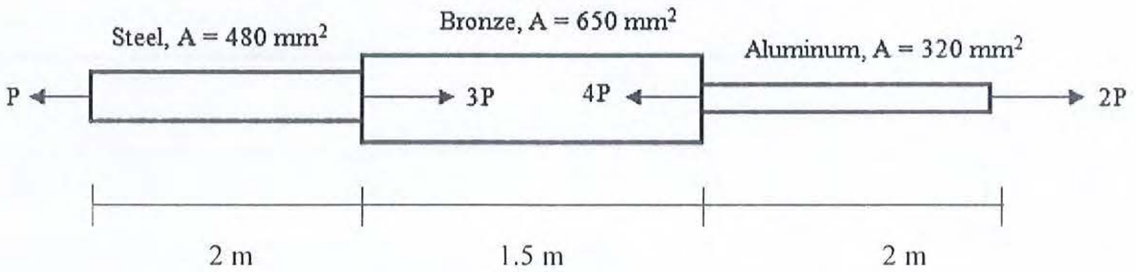
University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2014
Program: B.Sc Engineering (Civil)

Course Title: Mechanics of Solids I — Course Code: CE 211
Time: 3:00 hours — Full Marks: $10 \times 7 + 30 = 100$

Answer all 8 (Eight) questions
The symbols have their usual meanings.

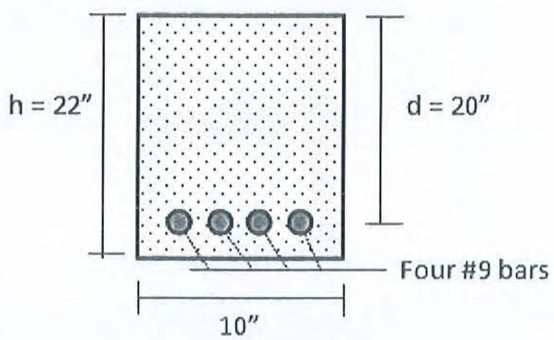
No. 1 [Mark 10]

A bronze bar is fastened between a steel bar and aluminum bar as shown below. Axial loads are applied at the positions indicated. Determine the largest value of P that will cause no more than 3.0 mm overall deformation or the following stresses: 140 MPa in steel, 120 MPa in bronze and 80 MPa in the aluminum. Use E_{st} = 200 GPa, E_{al} = 70 GPa and E_b = 83 GPa.



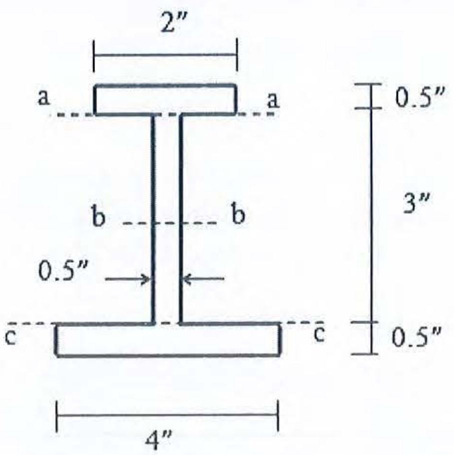
No. 2 [Mark 10]

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^2). Assume <u>cracked</u> section and n = 10.



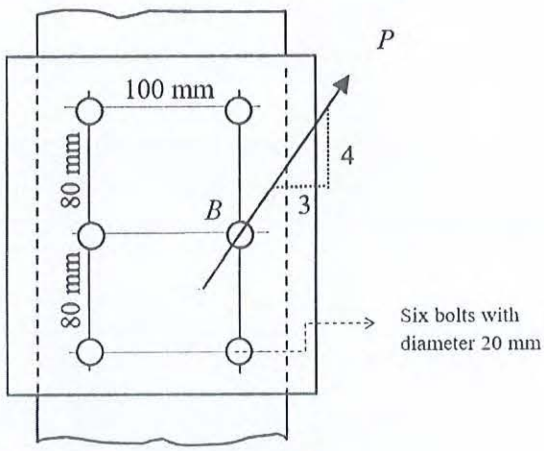
No. 3 [Mark 10]

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.



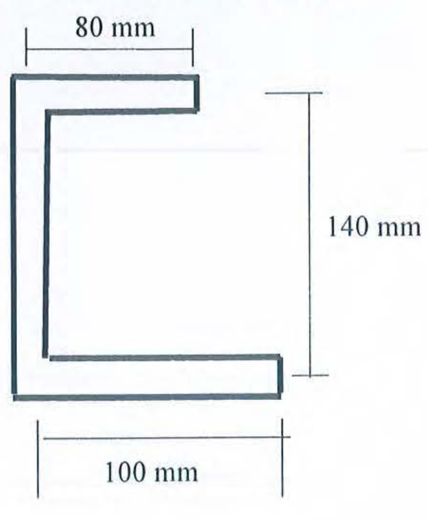
No. 4 [Mark 10]

On the connection of 6 rivets shown below, the load $P = 32$ 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.



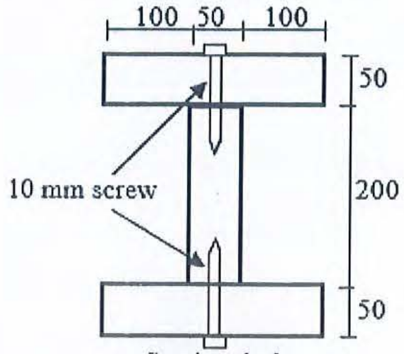
No. 5 [Mark 10]

The vertical shear force is 2000N. Compute and illustrate shear flow and determine the location of shear centre of the following shape (Overall thickness 25mm)..

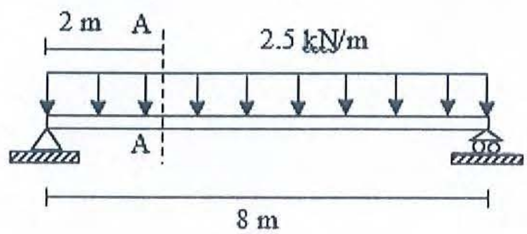


.o. 6 [Mark 10]

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
(i) quarter point of the beam i.e., section A-A and
(ii) maximum shear zone.
Assume that allowable shear capacity for a 10-mm screw is 3kN.

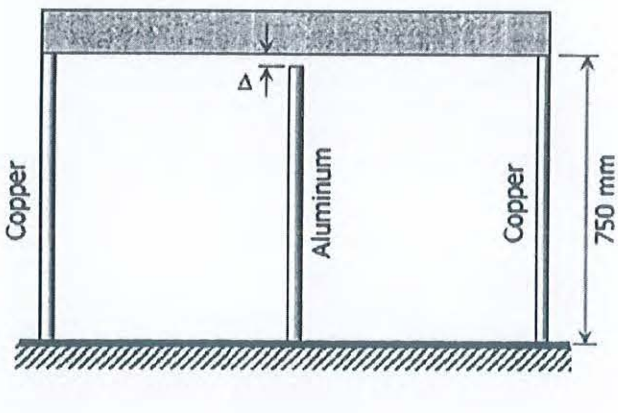


Section A-A
All dimensions in mm



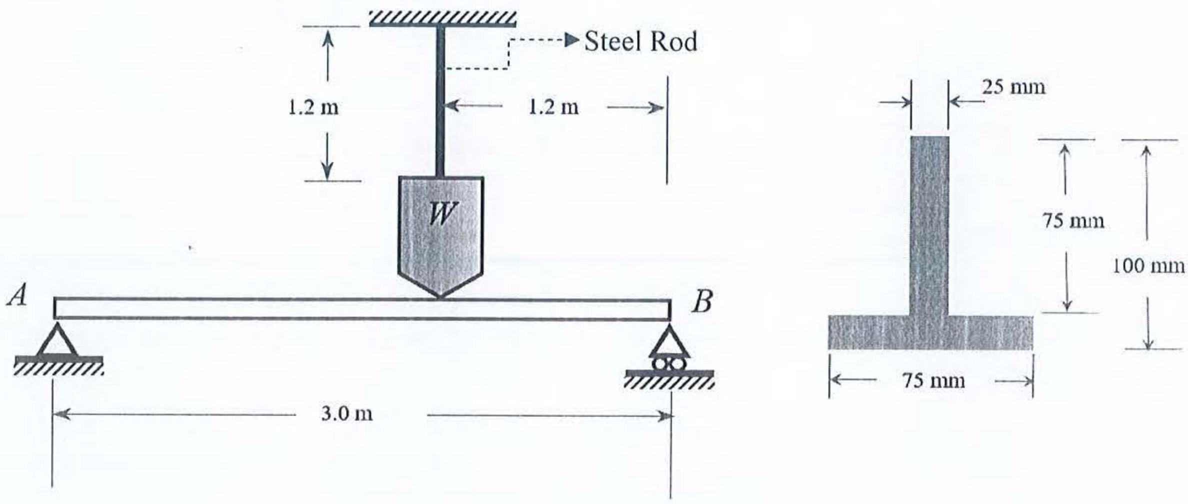
No. 7 [Mark 10]

As shown in Fig, there is a gap between the aluminum bar and the rigid slab that is supported by two copper bars. At 10°C, $\Delta = 0.18$ mm. Neglecting the mass of the slab, calculate the stress in each rod when the temperature in the assembly is increased to 95°C. For each copper bar, $A =$ 500 mm^2, $E = 120$ GPa, and $\alpha = 16.8$ μm/(m·°C). For the aluminum bar, $A = 400$ mm^2, $E = 70$ GPa, and $\alpha = 23.1$ μm/(m·°C).



No. 8 [Mark 30]

AB is a non-rigid beam with T-section. Determine the safest maximum load *W* so that the flexural compressive stress, tensile stress does not exceed 70 MPa and 43 MPa respectively and the steel rod must not extend beyond 0.0135 mm. The steel rod has a cross-section of 20 mm^2 and Modulus of Elasticity of steel cable is of 200 GPa.



University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2023
Program: B.Sc. in Civil Engineering

Course Title: Engineering Materials | Course Code: CE 201
Time: 3 hours | Credit Hour: 4.0 | Full Marks: 100

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

1. (a) Draw stress-strain diagram for mild steel and show different limits on it. (5)

(b) Five brick samples are tested for compressive strength. Bricks are cut into identical halves along the length. Following results are obtained from the test. Calculate compressive strength of brick. Assume average depth of each brick = 2.7 inch. Compression Test machine calibration equation:

$\mathbf{Y = 0.91X - 3.1}$ (10)

Sample	**Dimension (inch)**				**Observed Load (lb)**
	Side-1		**Side-2**		
	L	**W**	**L**	**W**	
1	4.65	4.58	4.72	4.59	70332
2	4.63	4.6	4.65	4.55	68050
3	4.55	4.48	4.6	4.45	64560
4	4.66	4.5	4.71	4.52	75670
5	4.73	4.49	4.65	4.42	65160

2. (a) Honeycomb seen in concrete is a direct result of segregation in fresh concrete. Identify the causes of segregation and suggest measures to control it. (4+3)

(b) Outline the procedure to determine the soundness test (Brad's test) of stones. (3)

(c) For a concrete mix ratio of 1:2:4 (volume basis), calculate the volume of sand required to cast 80 m^3 concrete considering bulking of sand. During the bulking test, sand was initially filled up to 300 mm into a measuring cylinder. After full inundation with water, the height of the sand sample came down to 210 mm. (5)

3. (a) 16, 48, and 29 kg of three aggregates with compressive strengths of 9, 37, and 22 MPa respectively, are mixed together to get a blended aggregate. Determine the compressive strength of the aggregate blend.

$\mathbf{X = P_A * X_A + P_B * X_B + P_C * X_C + \dots\dots}$

where, X = composite property of the blend

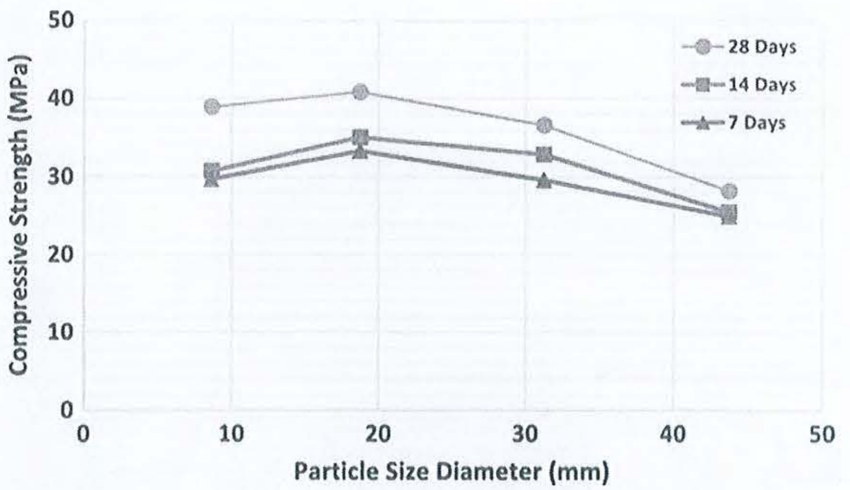
X_A, X_B, X_C, ... = Property of aggregates A, B, C, ...

P_A, P_B, P_C, ... = Proportion of aggregates used in the blend in fractions. (6)

(b) Three aggregates are to be mixed together to obtain an aggregate blend for an asphalt mixture. Estimate the mix ratio of aggregate A, B, and C to meet the specification using equation solution method. (9)

Material	Aggregate A	Aggregate B	Aggregate C	Target Specification
Sieve	% Passing	% Passing	% Passing	% Passing
2	100	100	100	
1.5	100	97	100	
1	100	28	94	63%
3/4	88	6	77	
3/8	45	1	55	28%
No. 4	12	-	33	
No. 8	1	-	18	13%
No. 16	0	-	2	

4. (a) Explain the effect of aggregate size on the compressive strength of concrete using the graph given below. (8)



(b) Addition of superplasticizers provides concrete the same workability with 16-25% less water. Describe the principle behind this. (8)

(c) Write down the functions of sand in mortar. (4)

5. (a) Design a concrete mix following ACI 211.1 mix design method for Padma Bridge piers. Concrete with a specified strength of 33 MPa at 28 days and slump between 25 to 50 mm need to be used. Use Table 1- Table 4 for the required data. Assume, loss factor =1.2. (17)

- Cement type: Ordinary Portland cement, specific gravity = 3.15
- Coarse Aggregate:
  - ✓ Maximum size: 25 mm

- ✓ Absorption capacity: 1.2%
- ✓ Moisture content: 0.88%
- ✓ Bulk specific gravity (Oven Dry): 2.65
- ✓ Unit weight (dry-rodded): 1580 kg/m^3

- Fine Aggregate:
  - ✓ Fineness modulus: 2.9
  - ✓ Absorption capacity: 1.3%
  - ✓ Moisture content: 4%
  - ✓ Bulk specific gravity (OD): 2.54

(b) Suppose you need to use an admixture in the above concrete mix stated in 5(a) to reduce water demand by about 12% while keeping the workability same. Calculate the amount of cement and admixture for 1 m^3 concrete with the material specification stated in 5(a) considering a dose of 5.5 gm admixture per kg of cement. (3)

6. (a) List the major durability problems associated with concrete and provide brief solutions. (5)

(b) Determine the mix ratio to produce a concrete with crushed stone and coarse sand using minimum voids method. Laboratory test result shows, 35% voids in crushed stone and 28% voids in coarse sand. Consider 12% excess for cement and 10% excess for fine aggregate. (5)

(c) Lime cycle is one of the oldest chemical processes used in construction industry. Draw the lime cycle with the reactions involved and provide brief description. (5)

Table 1

Slump, mm	Water, kilograms per cubic meter of concrete, for indicated sizes of aggregate*							
	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

Table 2

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

Table 3

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	$1.10 f'_c + 5.0$

Table 4

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 (⅜)	0.50	0.48	0.46	0.44
12.5 (½)	0.59	0.57	0.55	0.53
19 (¾)	0.66	0.64	0.62	0.60
25 (1)	0.71	0.69	0.67	0.65
37.5 (1½)	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