2-1

University of Asia Pacific

Department of Basic Sciences and Humanities

Final Examination, Fall 2021

Programme: B.Sc. Engineering (Civil)

(2nd Year 1st Semester)

Course Title: Bangladesh Studies: Society and Culture **Course Code: HSS 211(a)**
Time: 2 hrs. **Credit: 2 hrs.** **Marks: 100**

Answer FOUR questions including Question no. 5 and 6 (4 x 25 = 100)

1. a) Define marriage, family and divorce. 5
   b) Point out and explain the probable reasons why divorce rate is increasing in Bangladesh. 20

OR

2. a) Write down the different forms of families in the contemporary world. 5
   b) Do you think the traditional functions of the family are changing? Illustrate. 20

3. a) What is globalization? 5
   b) Illustrate the impact of globalization on the social life of Bangladesh. 20

OR

4. a) What are the features of industrial societies advanced by Lenski? 5
   b) Point out the stages of development of human society from Marxist perspective. 20

5. a) Define social stratification. 5
   b) Explain how caste system forms a closed society. 20

6. a) Define dependent and independent variables. 5
   b) Show the steps of a sociological research. 20

University of Asia Pacific

Department of Basic Sciences and Humanities

Final Examination, Fall 2021

Program: B. Sc. Engineering (Civil)

Course code: HSS 211(b) Course Title: Bangladesh Studies: History Credit: 2.00
Total Time: 2 hours Full Marks: 100

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

1.	What were the results of the Battle of Palassy and Buxer?	25
2.	Discuss the merits and demerits of 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, Fall-2021
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**

$$T:\Re^3 \to \Re^2, T(x,y,z) = (2x+2y+4z, x-5y+2z)$$

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

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

2. Find the Eigen values and Eigen vectors of the matrix $A = \begin{pmatrix} 1 & 2 & 2 \\ 1 & 2 & -1 \\ -1 & 1 & 4 \end{pmatrix}$ and hence **25**

find $P^{-1}AP$.

3. **(a)** For $A = \begin{pmatrix} 1 & -2 & 2 \\ -2 & -4 & -1 \\ 1 & -5 & 2 \end{pmatrix}$, find $A^2 - A^T + (A^T)^T$ **10**

(b) Find the inverse of $A = \begin{pmatrix} 1 & 1 & 2 \\ 1 & 2 & 5 \\ 1 & 3 & 7 \end{pmatrix}$ **15**

4. **(a)** Using Gaussian elimination method solve the system **15**

$$x+y+2z=9$$
$$2x+4y-3z=1$$
$$3x+6y-5z=0$$

(b) Using Cramer's rule solve the system **10**

$$5x-7y+z=11$$
$$6x-8y-z=15$$
$$3x+2y-6z=7$$

5. (a) Calculate mean deviation and then calculate quartile deviation using empirical relation between them for the following data. 15

Consumption	10-20	20-30	30-40	40-50	50-60
No. of users	8	12	20	6	4

(b) Calculate median and for the following data 10

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	6	11	21	35	30	22	7

6. Find Kurtosis for the following distribution 25

Tax(Lakhs)	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of members	10	25	145	220	70	30	22

7. Calculate coefficient of skewness for the following distribution 25

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

8. (a) A fair die is tossed twice. Find the probability of getting a 4, 5, or 6 on the first toss and a 1, 2, 3, or 4 on the second toss. 10

(b) Three balls are drawn successively from the box containing 6 red balls, 4 white balls, and 5 blue balls. Find the probability that they are drawn in the order red, white, and blue if each ball is (a) replaced and (b) not replaced. 15

University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall-2021
Program: B.Sc. Engineering (Civil)

Course Title: Basic Electrical Engineering — Course Code. ECE 201
Credit Hr: 3.00 — Time: 180 minutes. — Full Mark:150

[There are **Eight** Questions. Answer **Six** questions including Q-1, Q-2, 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 the R-C and R-L branch of the circuit in Figure 1. [25]

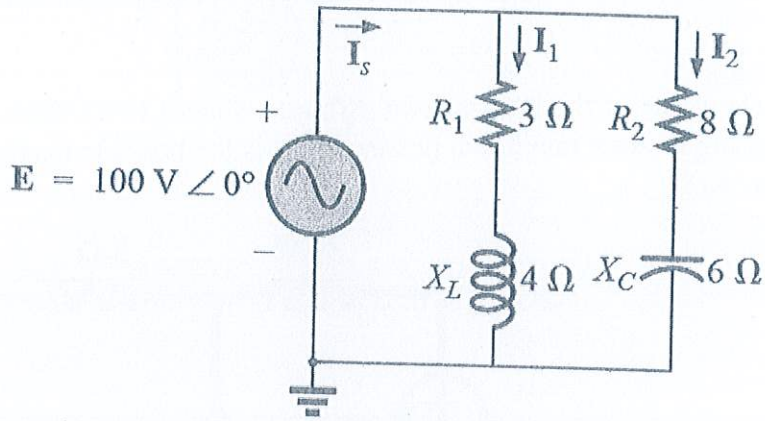


Figure 1

2. Find the value of current required to establish magnetic flux in the circuit of figure 2. Use attached B-H curve if required. [25]

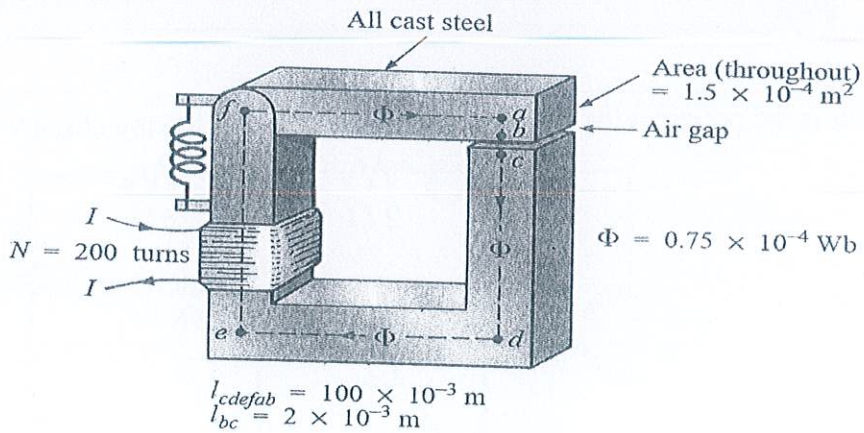


Figure 2

3. Find and list the voltage of each element of the circuit of figure 3. [2

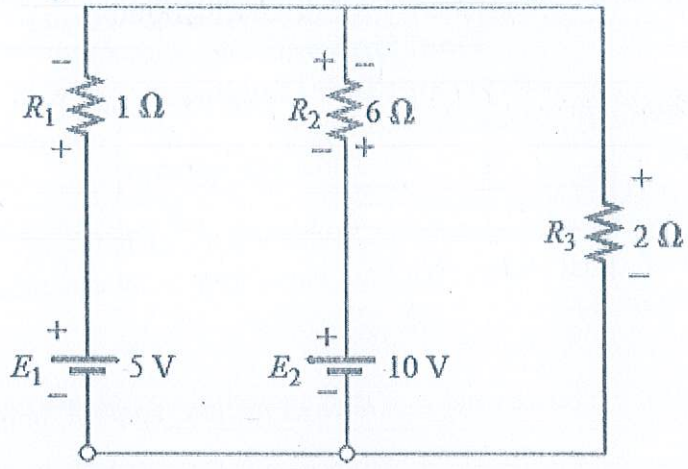


Figure 3

4. The value of the load resistor of figure 4 is set to 25 Ohm. Prove that this resistor is not going to draw maximum power. What is the possible maximum power that can be drawn by R_L? [15+10

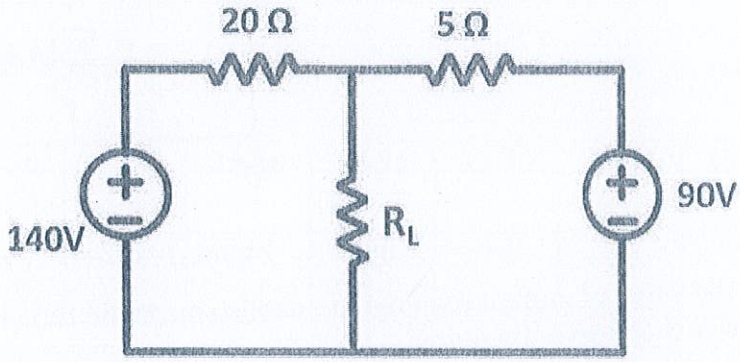


Figure 4

5. What is the power of the DC Voltage source of the following circuit? [25]

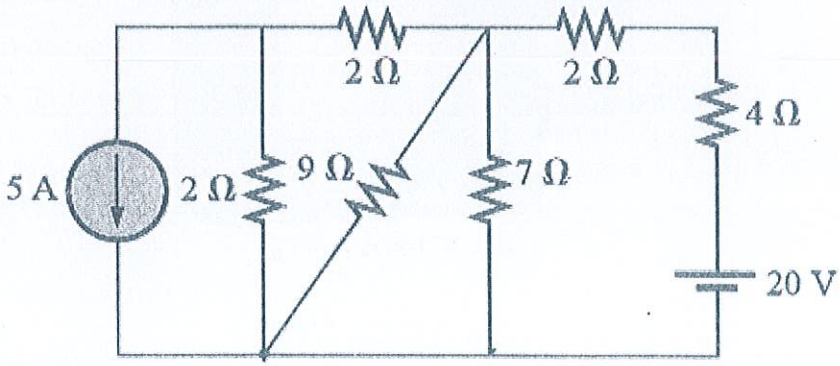


Figure 5

OR

6. Calculate the power of all five elements of the circuit of figure 6. [25]

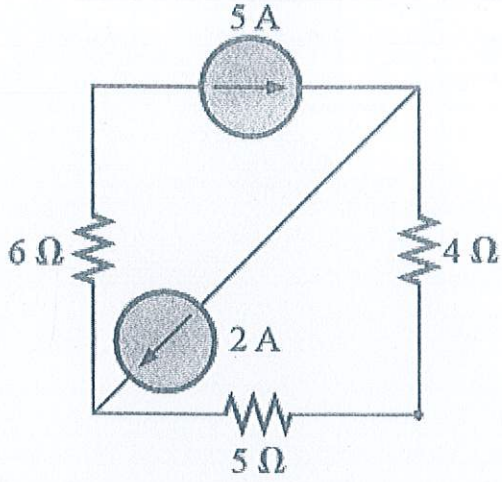


Figure 6

7. Draw power triangles for the motor and the capacitive load each. [25]

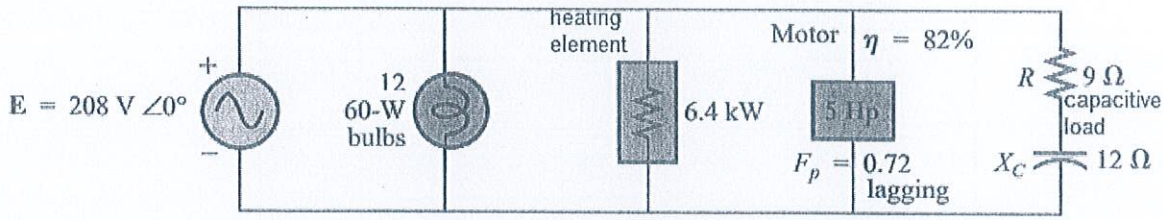


Figure 7

OR

8. Find power of the 6-Ohm inductor. [25]

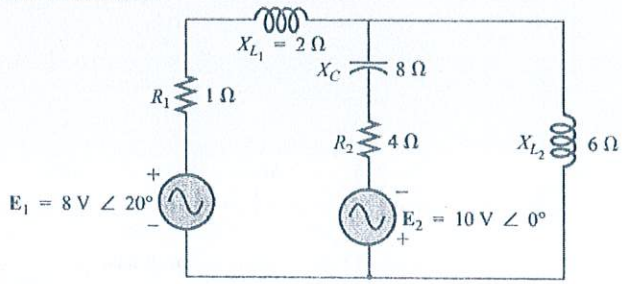


Figure 7

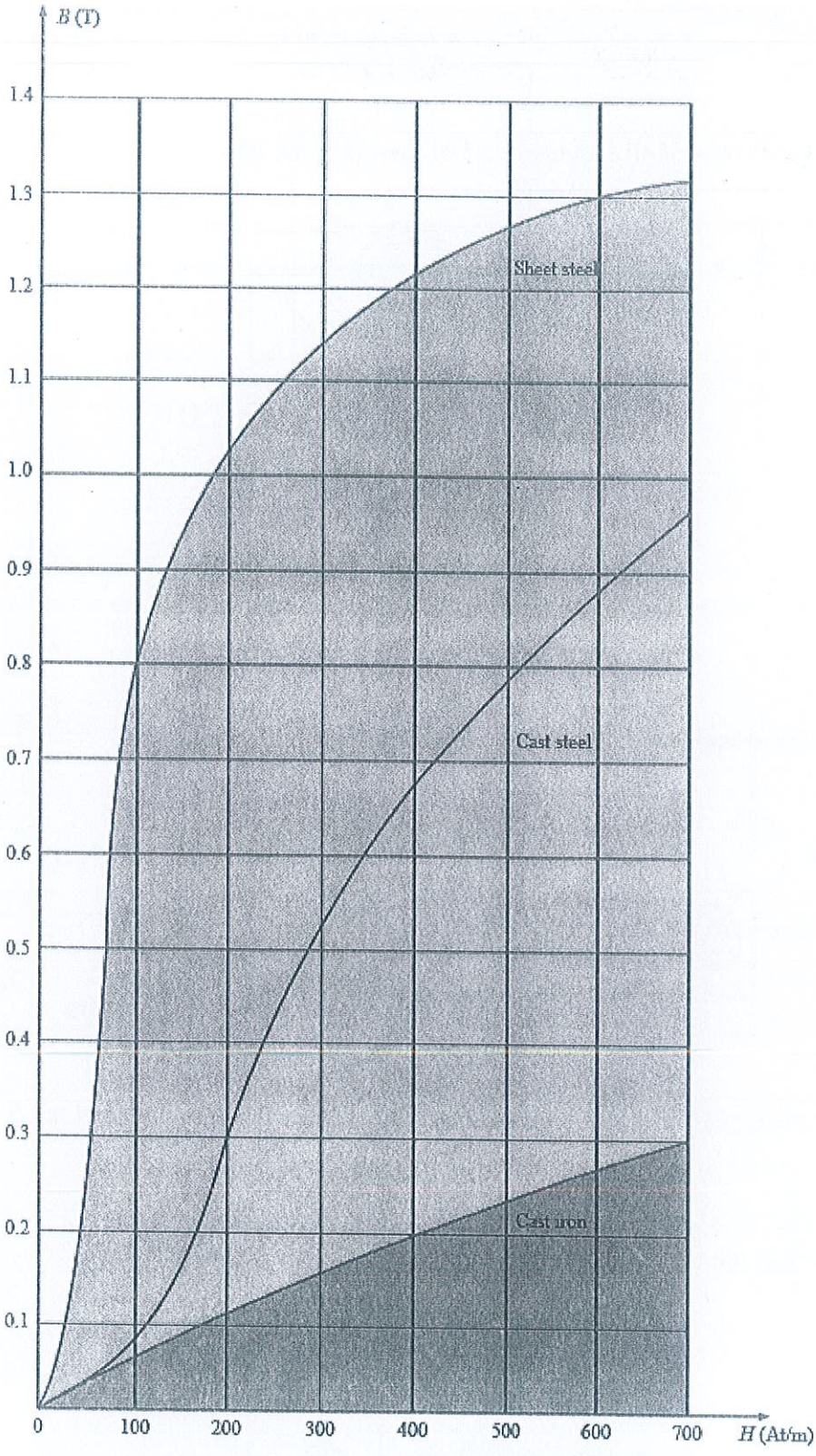


Figure: B-H curve of the materials

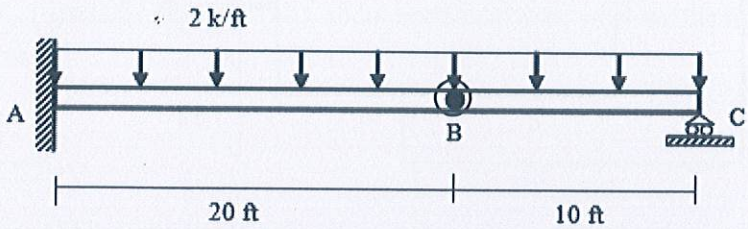
University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2021
Program: B.Sc Engineering (Civil)

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

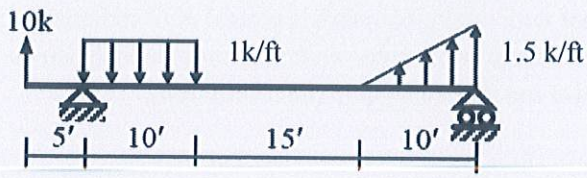
Course Code: CE 211
Full Marks: 10 x 10 = 100

There are 10 questions. Answer all.
The symbols have their usual meanings.

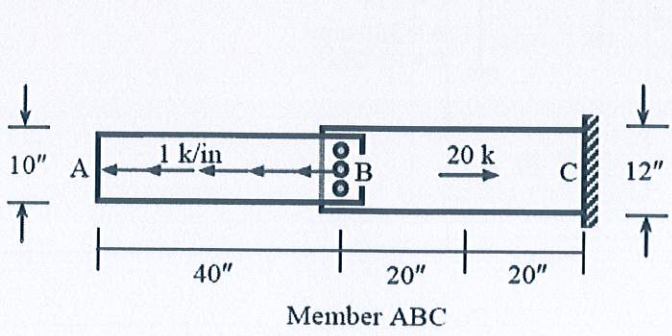
1. Draw SFD and BMD for the beam with loading w k/ft $= 2 + L$ (L= Last digit of Roll). , shown below. B is an internal hinge

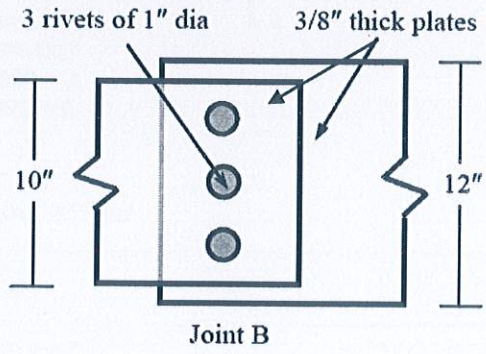


2. Use singularity functions to write equations of SF and BM of the beam loaded as shown below.

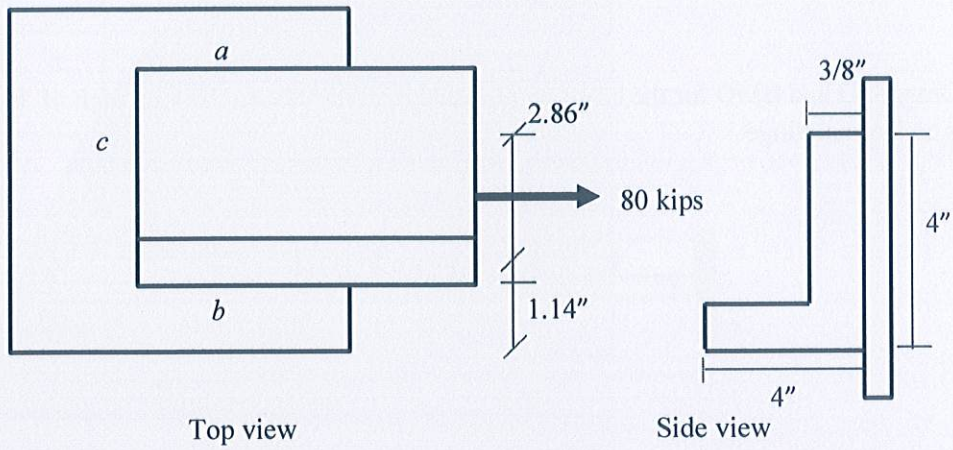


3. Calculate the shearing stress in the rivets and the maximum tearing and bearing stresses in the plates at joint B of the structural member ABC loaded as shown below.



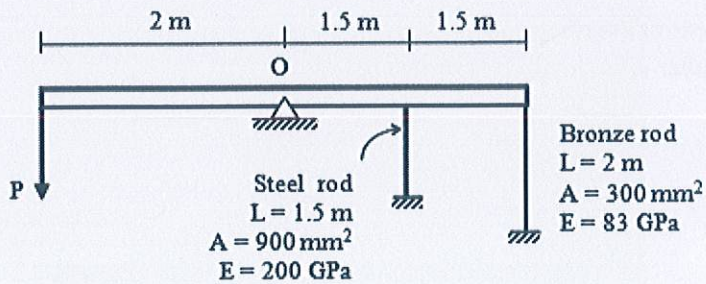


4. A 4 x 4 x 3/8 in. angle, which is to be welded to a gusset plate, carries a load of 80 kips applied along its centroidal axis. Assuming the allowable shearing stress through the throat of each weld is 21 ksi and maximum weld size of 5/16 in., determine the minimum length of welds along 3 sides (*a*, *b*, and *c*) of the angle.

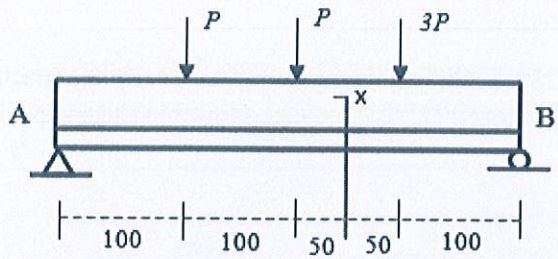


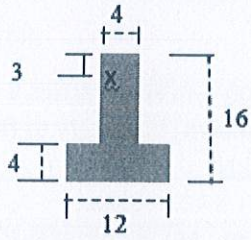
Top view Side view

5. 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?

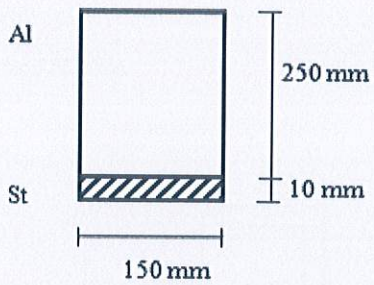


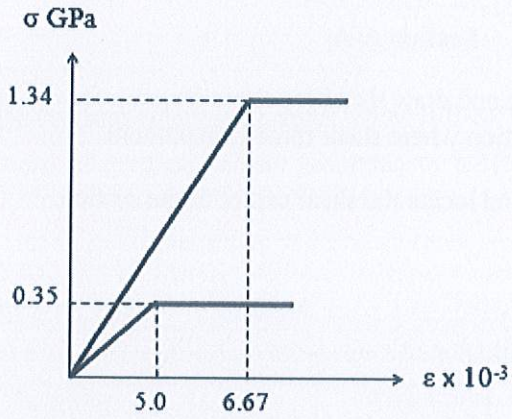
6. An inverted small steel T beam is supported at A and B as shown below. What is the value of P if a strain gage attached at x point measures 0.0002 mm/mm when the load is applied. All dimensions are in mm. GPa. Units are in mm.



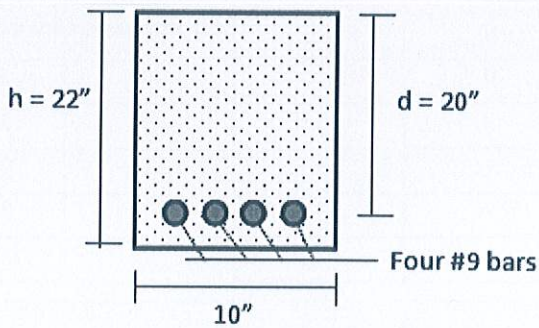


7. Consider a composite beam of the cross-sectional dimensions shown below. The upper 150x250 mm part is aluminum with the lower 10x150 mm strap is steel. If the beam is subjected to a bending moment of M kN-m $= 30 + L$, (L= Last digit of Roll). about horizontal axis, what are the maximum stresses in the steel and aluminum?

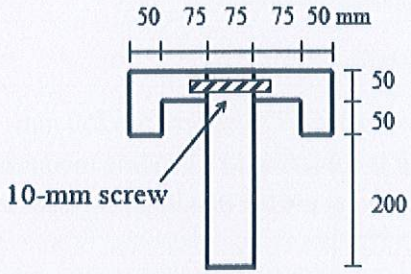




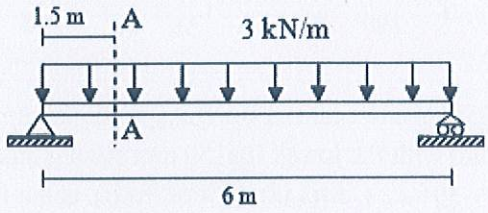
8. Determine the maximum stress in the concrete and the steel for a reinforced concrete beam with the section shown below if it is subjected to a positive bending moment of 50 kip-ft. The reinforcement consists of four #9 steel bars. Assume cracked section and n = 15.



9. 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. Assume that allowable shear capacity for 10-mm screw is 2 kN.



Section A-A



10. (a) Compute and draw the shear stress diagram for the thin-walled channel section shown below at the longitudinal section where shear force is maximum.

(b) Determine and locate the shear center of the section.

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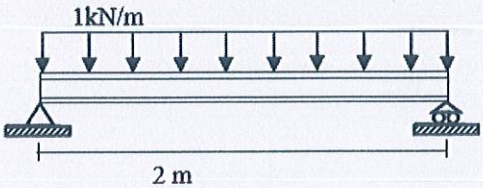
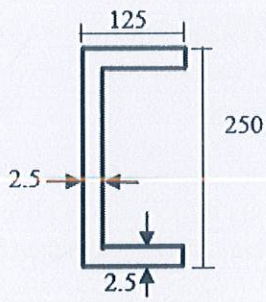


Longitudinal section



Cross section

(All dimensions are in mm)

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2021
Program: B.Sc. in Civil Engineering

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

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

1. (a) What is mortar? Write down the properties of a good mortar. (1+4)

(b) Draw qualitative gradation curve for (i) well-graded; (ii) gap-graded; (iii) open-graded and (iv) uniform-graded aggregate. (2)

(c) Aggregates from three sources having bulk specific gravities of 2.75, 2.65, and 2.7 were blended at a ratio of 60:25:15 by weight, respectively. What is the bulk specific gravity of the aggregate blend? (6)

2. (a) Draw load-strain behavior with time for saturated clay soil. (4)

(b) What do you understand by the notation of the Portland-composite cement 'CEM II/B-M(V-S)42.5R'? (3)

(c) Write down the hydration phase compositions of Portland cement according to ASTM. Mention the properties of alite. (2+3)

3. (a) Write down the effect of aggregate/cement ratio on strength of concrete. (5)

(b) Find the mix ratio of aggregate A, B, and C to meet the specification using equation solution method. (10)

Material	Aggregate A	Aggregate B	Aggregate C	Target Specification
Sieve	% Passing	% Passing	% Passing	% Passing
1.5	100	100	100	
¾	100	95	15	**65%**
3/8	100	33	8	
No. 4	92	12	2	**28%**
No. 8	76	0	0	
No. 16	58	-	-	
No. 30	40	-	-	
No. 50	12	-	-	**3%**
No. 100	2	-	-	

4. (a) Write down the difference between hydraulic lime and fat lime. (5)

(b) Write down the sand types as per ASTM with the classification criteria and use for each type. (5)

5. (a) What are the classifications of bricks based on raw materials? Write down the use of over-burnt brick. (5)
(b) What are the harmful ingredients of burnt clay bricks? Write down the characteristics of good quality clay bricks. (2+8)

6. (a) Design the mix of a concrete for a design strength of 30 MPa at 28 days with the following information. Use ACI 211.1 method. Also find the amount of ingredients required to cast 9 cylinders for trial batch. Use Table 1- Table 4 for the required data. Assume, loss factor =1.2. (17)

- Slump: 30-50 mm
- Cement: Ordinary Portland cement, specific gravity = 3.15
- Coarse Aggregate:
  - ✓ Maximum size: 37.5 mm
  - ✓ Absorption capacity: 2%
  - ✓ Moisture content: 1%
  - ✓ Bulk specific gravity (OD): 2.62
  - ✓ Unit weight (dry-rodded): 1570 kg/m^3
- Fine Aggregate:
  - ✓ Fineness modulus: 2.50
  - ✓ Absorption capacity: 2%
  - ✓ Moisture content: 5%
  - ✓ Bulk specific gravity (OD): 2.68

(b) Find the amount of cement and admixture for 1 m^3 concrete with the material specification stated in 6(a) considering the use of a water reducing admixture. At a 7 gm per kg of cement dose the selected admixture can reduce water demand by about 15% while keeping the workability same. (3)

7. (a) Write short notes on Smith's test and Brad's test of stone. (4)
(b) Find the mix ratio to produce a concrete with strength of 3000 psi after 28 days using ¾" aggregate for normal machine-mixed hand-compacted concrete. Voids in coarse aggregate is 50% and voids in fine aggregate is 25%. Allow 7% excess for cement and 10% excess for fine aggregate. (5)
(c) Calculate the water/cement ratio for a trial concrete mix following British mix design method. Use Table 5, Figure 1 and Figure 2 for the required data. (6)

- ✓ Characteristic strength: 35 MPa at 28 days
- ✓ Cement: OPC (EN class 42.5)
- ✓ Percent defectives: 5%, Himsworth constant, $k = 1.64$
- ✓ No. of test samples, $s = 5$
- ✓ Coarse aggregate: 10 mm uncrushed

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

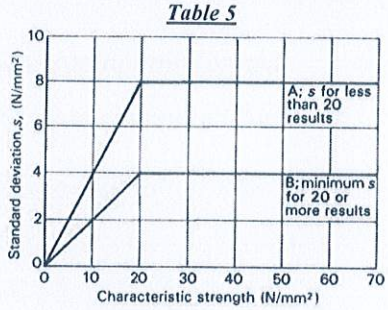
Table 3

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

Table 5



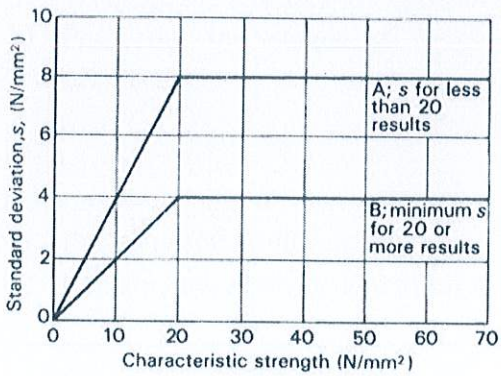


Figure 1

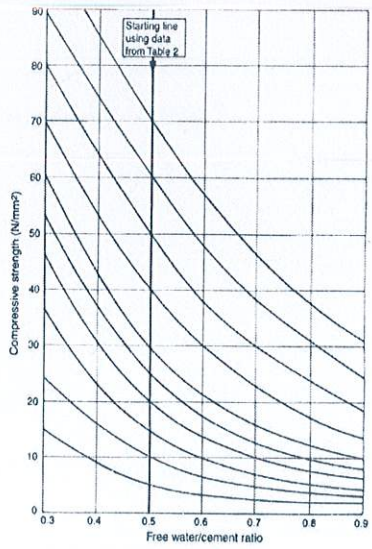


Figure 2