2-1

University of Asia Pacific

Department of Basic Sciences and Humanities

Final Examination, Fall 2015

Programme: B. Sc. Engineering (Civil)

(2nd Year 1st Semester)

Course Title: Bangladesh Studies: Society and Culture **Course Code: HSS 211(a)**

Credit: 2.00

Time: 2 Hours **Full Marks: 100**

There are **SIX** questions. Answer **ANY FOUR** (4x25)

1. What is social process? Discuss the social processes. 5+20

2. What is marriage? What are the different types of marriage? Give examples. 5+15+5

3. Define social groups. Discuss the types of social groups. What is the importance of social groups? 3+15+7

4. Define family. Discuss different functions of the families in Bangladesh. 5+20

5. Define over urbanization. Analyze the positive and negative impacts of urbanization in Bangladesh. 5+20

6. Who is a juvenile delinquent? Explain the causes of juvenile delinquency in Bangladesh. 5+20

University of Asia Pacific
Department of Basic Sciences and Humanities
Semester Final Examination, Fall 2015
Program: B.Sc. Engineering (Civil)
2nd year 1st semester

Course Title: Bangladesh Studies: History Course Code: HSS 211(b) Credit: 2.00

Total Time: 2 Hours Full Marks: 100

There are **Six** Questions. Answer any **Four.** All questions are of equal value (4 x 25)

1. What was *permanent settlement*? What were its objectives?
2. Briefly describe the reforms of *Pandit Ishwar Chandra Vidyasagar*.
3. Why did Lord Curzon *partition Bengal* in 1905? How did the Muslims and Hindus react?
4. Describe the background and reaction of *Lahore Resolution*.
5. Describe the first phase and significance of *Language Movement*.
6. Explain the *Six Points* of Awami League.

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination Fall-2015
Program: B.Sc. Engineering (Civil)

Course Title: Mathematics III | Course Code: MTH 201 | Course credit: 3.00
Time: 3.00 Hours | Full Marks: 150

There are **Eight** Questions. Answer any **Six.** All questions are of equal value/Figures in the right margin indicate marks.

1. **(a)** Based on the frequency distribution given below calculate quartile deviation (QD) **15**

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

(b) Calculate standard deviation for the following data **10**

Profits	0-10	10-20	20-30	30-40	40-50
No. of companies(f_i)	6	25	36	20	13

2. **(a)** Consider the following joint probability density function of X and Y **4+4+7**

$$f(x,y) = \begin{cases} K(x+y), & 0 \le x \le 2, \ 0 \le y \le 2 \\ 0 \ , & elsewhere \end{cases}$$

(i) Find the value of K (ii) Find $P[X > Y]$ (iii) Determine whether the random variables X and Y are independent or dependent

(b) Define random variable. A random variable X has the following function **10**

$$f(x) = \begin{cases} x \ , & 0 < x < 1 \\ 2 - x \ , & 1 < x < 2 \\ 0 \ , & elsewhere \end{cases}$$

(i) Check whether it is a probability function (ii) Find $P[X < 1.3]$

3. **(a)** What do you mean by Bernoulli trials? Define Binomial distribution. Assume that, on an average, one telephone number out of 15 is busy. Suppose six randomly selected telephone numbers are called, **2+2+9**

(i) What is the probability that all of them will be answered?
(ii) What is the probability that at least three of them will be busy?
(iii) What is the probability that at most four of them will be busy?

(b) The average number of emergency patients in a given day in a private clinic is 10.Find the probability that in a specified day, the clinic will receive **12**

(i) 5 emergency patients
(ii) at least three emergency patients
(iii) Between 5 and 10 emergency patients

If the number of patients is assumed to follow the Poisson distribution.

4. (a) Define Normal distribution. Given a normal distribution with mean $\mu = 50$, standard deviation $\sigma = 10$. Find a probability that x assumes a value between 45 and 62 where $\varphi(1.2) = 0.8849$ and $\varphi(0.5) = 0.6915$ **3+10**

(b) Show that the area under the normal curve is 1. **12**

5. (a) Define linear transformation. Consider the function $T: \mathbb{R}^2 \to \mathbb{R}^2$ given by $T(x, y) = (x\cos\theta - y\sin\theta, x\sin\theta + y\cos\theta)$, where θ is a fixed number and $0 \leq \theta \leq 2\pi$. Show that T is a linear transformation. **15**

(b) Apply Cramer's rule to solve the following system of linear equation. **10**

$$x + 2y - z = 1$$
$$3x - 2y + z = 0$$
$$2x + y + z = 2$$

6. (a) Is the vector $v = (2, -5, 3)$ in $\mathbb{R}^3$ is a linear combination of the vectors $v_1 = (1, -3, 2)$, $v_2 = (2, -4, -1)$ and $v_3 = (1, -5, 7)$. **13**

(b) Show that the vectors $V_1 = (1, 2, 1)$, $V_2 = (2, 1, 0)$ and $V_3 = (1, 1, -2)$ span or generate the vector space $\mathbb{R}^3$. **12**

7. (a) Define basis. Show that the vectors $V_1 = (2, 4, 2)$, $V_2 = (2, 9, 0)$ and $V_3 = (3, 3, 4)$ is a basis for $\mathbb{R}^3$. **15**

(b) Find the rank of the following system of linear equations. **10**

$$x + 3y + z - 2p - 3q = 2$$
$$x + 4y + 3z - p - 4q = 3$$
$$2x + 3y - 4z - 7p - 3q = 6$$
$$3x + 8y + z - 7p - 8q = 8$$

8. (a) Find the standard matrix for the linear transformation $T: \mathbb{R}^3 \to \mathbb{R}^4$ defined by **10**

$$T(x, y, z) = (x + y, x - y, z, x)$$

(b) Find the eigenvalues and the corresponding eigenvectors of the matrix **15**

$$A = \begin{bmatrix} 3 & 3 \\ 1 & 5 \end{bmatrix}$$

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination Fall-2015
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(b) Find the eigenvalues and the corresponding eigenvectors of the matrix **15**

$$A = \begin{bmatrix} 3 & 3 \\ 1 & 5 \end{bmatrix}$$

University of Asia Pacific

Department of Civil Engineering

Semester Final Examination,Fall-2015

Program: B.Sc Engineering (2nd Year / 1st Semester)

Course Title: Basic Electrical Engineering **Course No.** ECE (CE) 201 **Credits**: 3.00

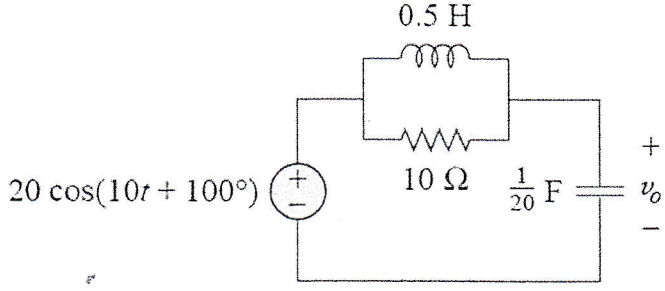
Time: 3.00 Hours. **Full Marks**: 150

There are **Eight** Questions. Answer any **Six**. Figures in the right margin indicate marks.

1. (a) Find the amplitude, phase, period, angular frequency and frequency of the sinusoid (10)

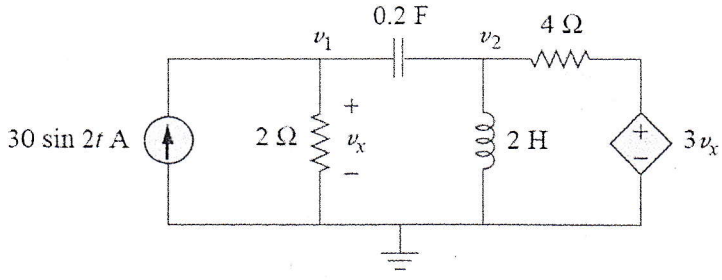
$$v(t) = 20\cos(50t + 80°)$$

(b) Determine $v_o\,(t)$ in the following circuit. (15)



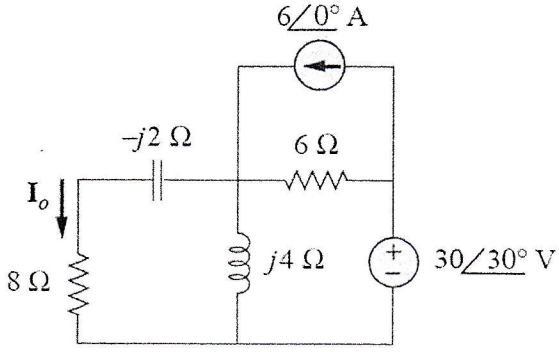
Circuit diagram for question 1(b)

2. (a) Using nodal analysis, find v_1 and v_2 in the following circuit. (12)



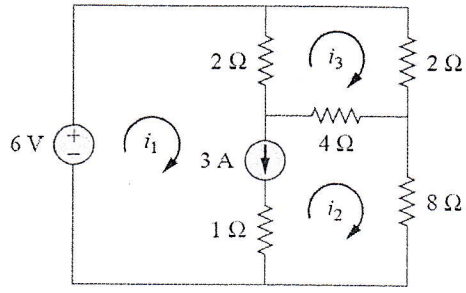
Circuit diagram for question 2(a)

(b) Find I_o in the following circuit using mesh analysis. (13)



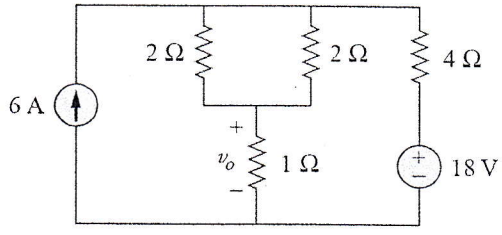
Circuit diagram for question 2(b)

3. (a) Use Mesh analysis to determine i_1, i_2 and i_3 (13)



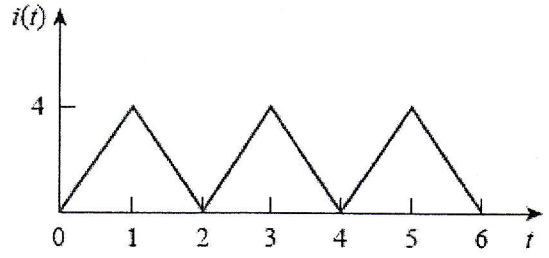
Circuit diagram for question 3(a)

(b) Use superposition to find v_0 (12)



Circuit diagram for question 3(b)

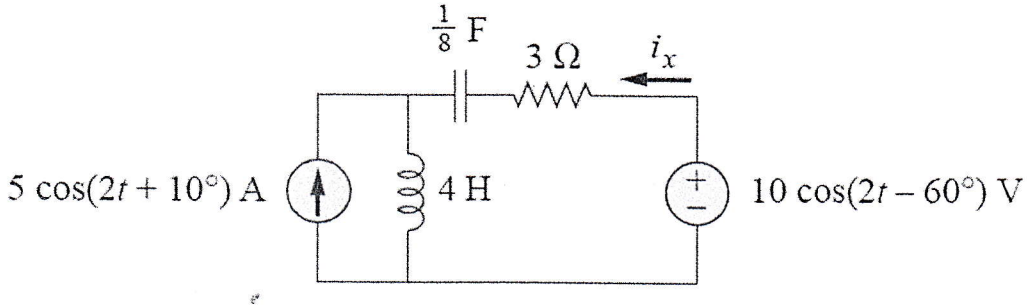
4. (a) Find the rms value of the current waveform of following figure. If the current flows through a 9-Ω resistor, calculate the average power absorbed by the resistor. (13)



Circuit diagram for question 4(a)

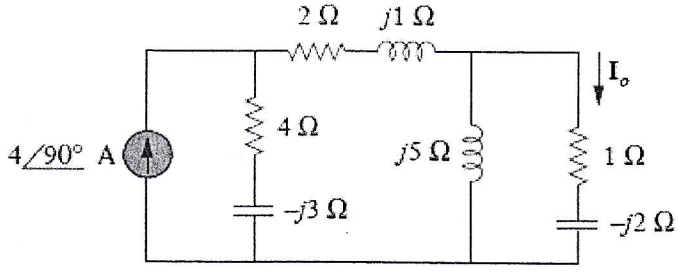
(b) A series connected load draws a current $i(t) = 5\cos(100\pi t - 10°)$ A when the applied voltage is $v(t) = 150\cos(100\pi t + 20°)$ V. Find the apparent power and the power factor of the load. Determine the impedance, resistance and inductance that form the series-connected load. (12)

5. (a) Calculate i_x in the following circuit using the superposition theorem. (13)



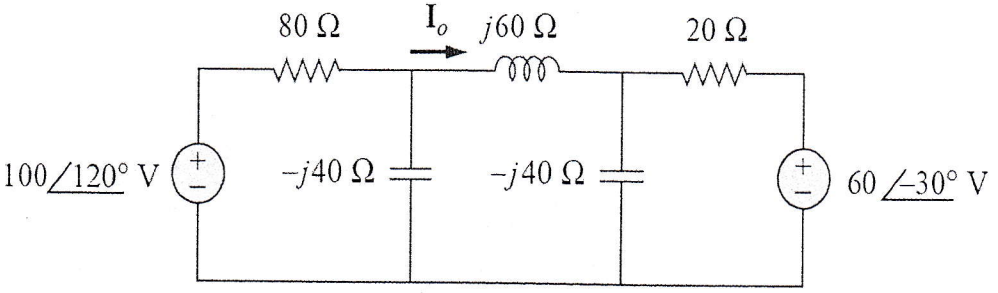
Circuit diagram for question 5(a)

(b) Find I_o in the following circuit using the concept of source transformation. (12)



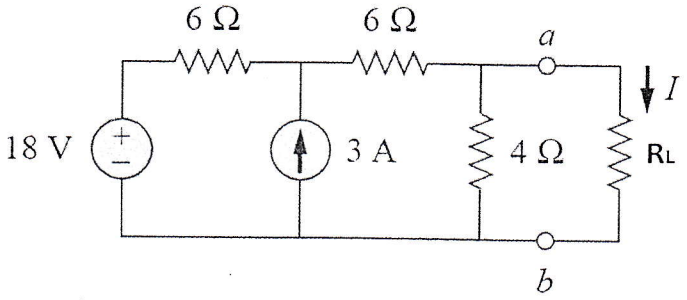
Circuit diagram for question 5(b)

6. (a) Obtain current I_o in the following figure. (12)



Circuit diagram for question 6(a)

(b) Find Thevenin's equivalent and also value R_L for maximum power transfer in the following circuit. Find the maximum power. (13)



Circuit diagram for question 6(b)

7. (a) If the voltage and current at the terminals of a circuit are (12)

$$v(t) = V_m \cos(\omega t + \theta_v)$$
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Show that , average power, $P = \frac{1}{2} V_m I_m \cos(\theta_v - \theta_i)$

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8. (a) Find the value of I required to establish a magnetic flux of $\emptyset = 0.75 \times 10^{-4}$ Wb in the series magnetic circuit of following figure. (18)

(b) Also find out I when are no air gap (7)

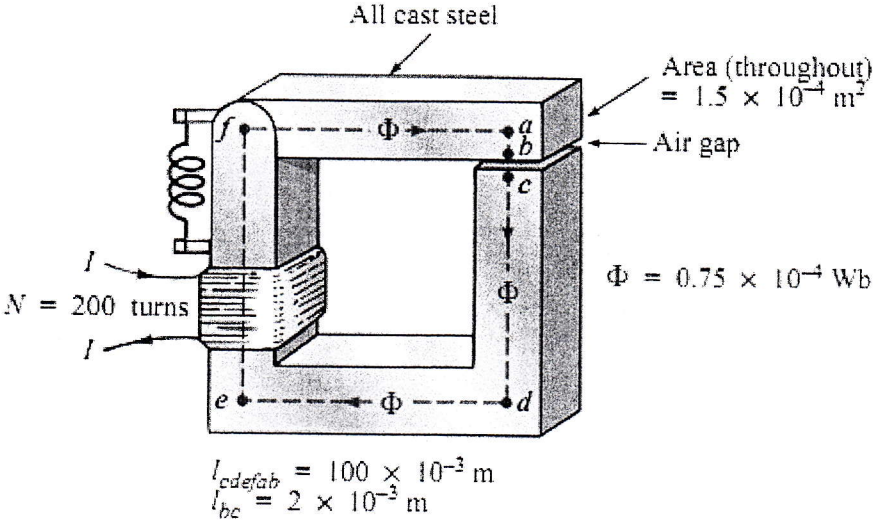
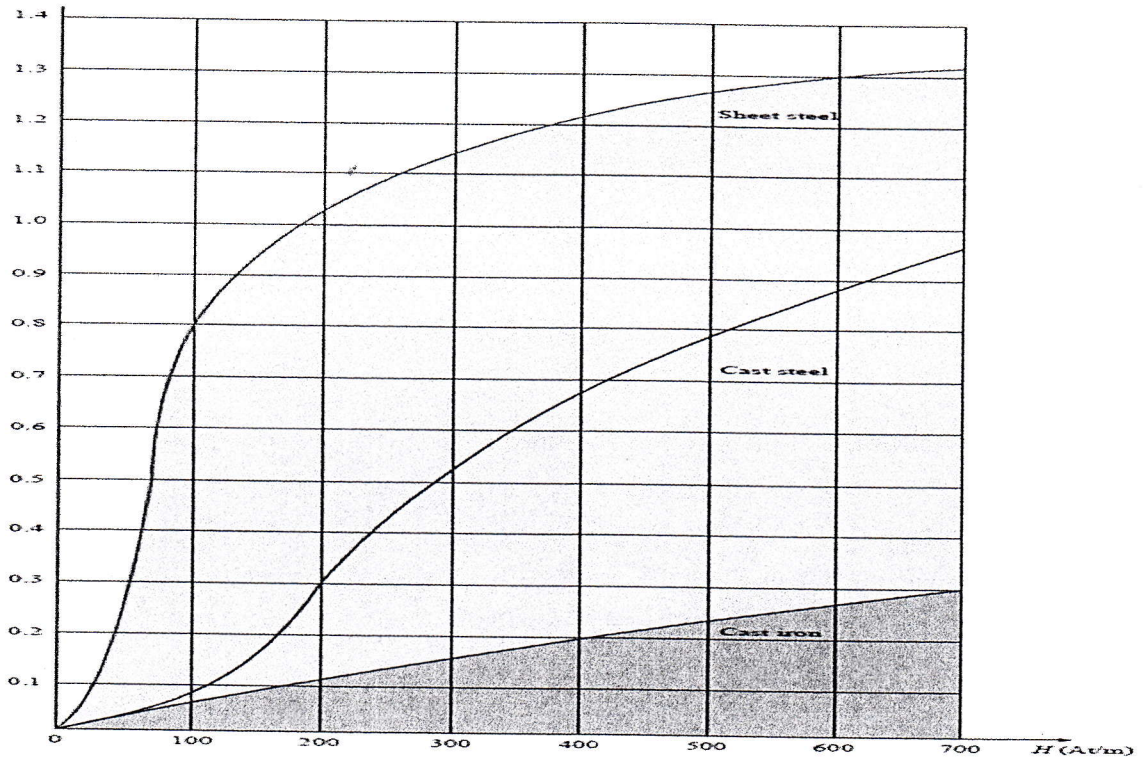


Figure for question 8(a)

Required B-H table

B(T)	0.1	0.2	0.3	0.4	0.5	0.6	0.7
H(At/m)	100	160	200	230	280	340	410

(7)



University of Asia Pacific

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Semester Final Examination,Fall-2015

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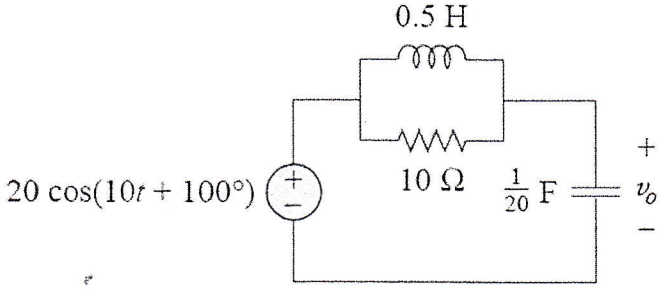
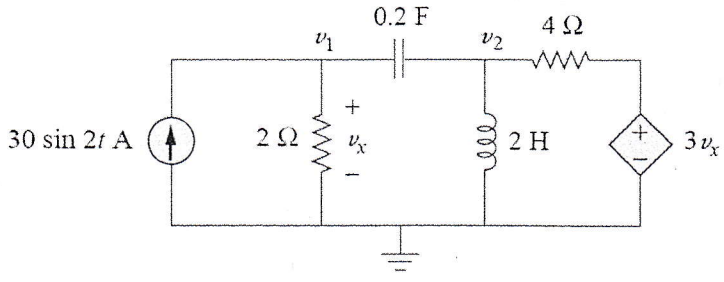


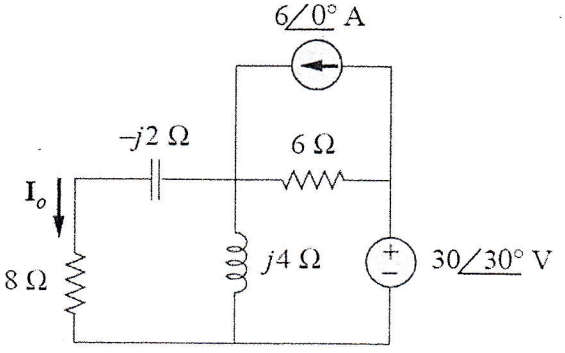
Circuit diagram for question 1(b)

2. (a) Using nodal analysis, find v_1 and v_2 in the following circuit. (12)



Circuit diagram for question 2(a)

(b) Find I_o in the following circuit using mesh analysis. (13)



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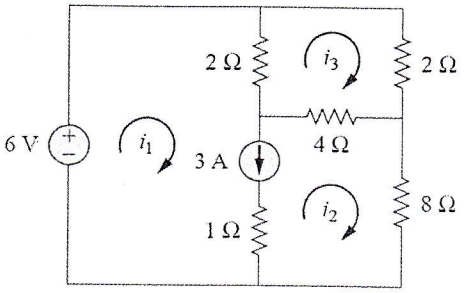

Circuit diagram for question 3(a)

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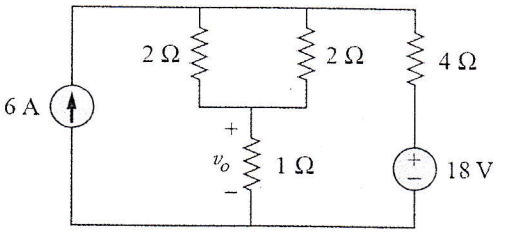

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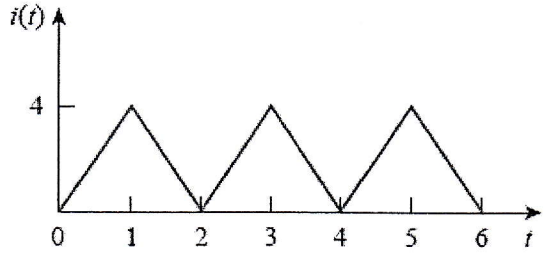

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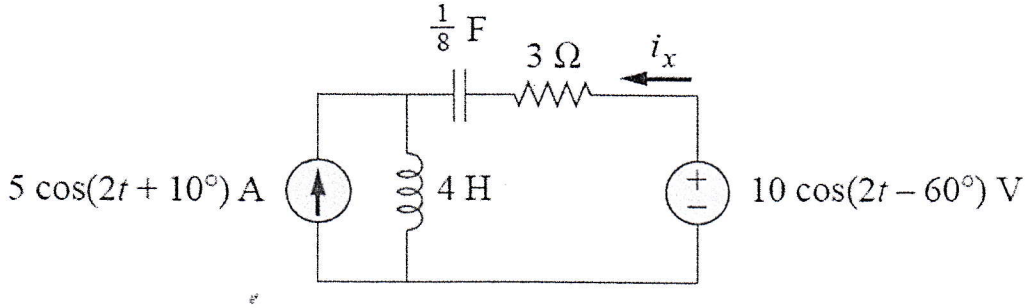

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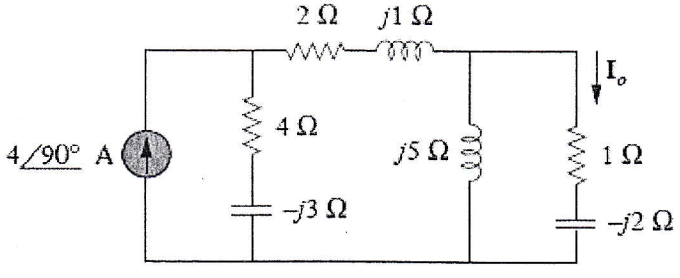
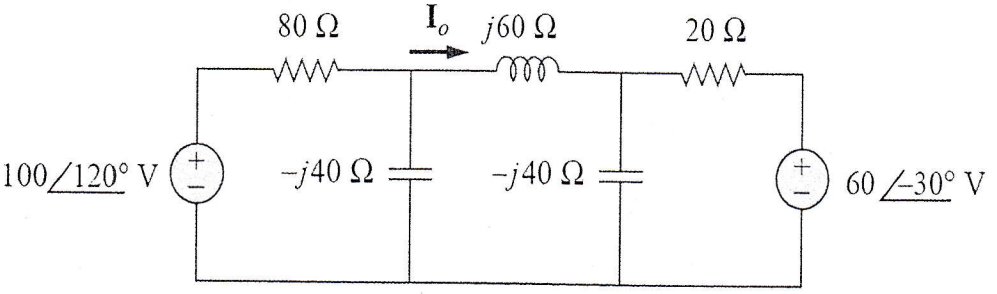


Circuit diagram for question 5(b)

6. (a) Obtain current I_o in the following figure. (12)



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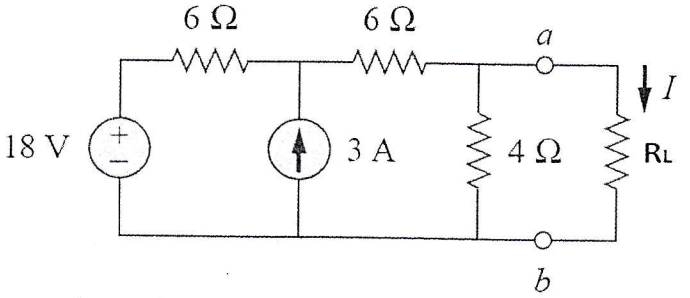

Circuit diagram for question 6(b)

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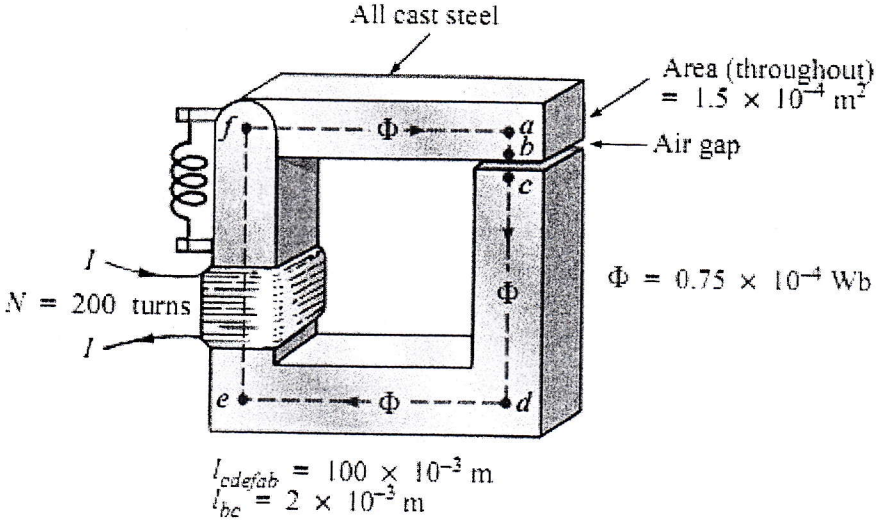

Figure for question 8(a)

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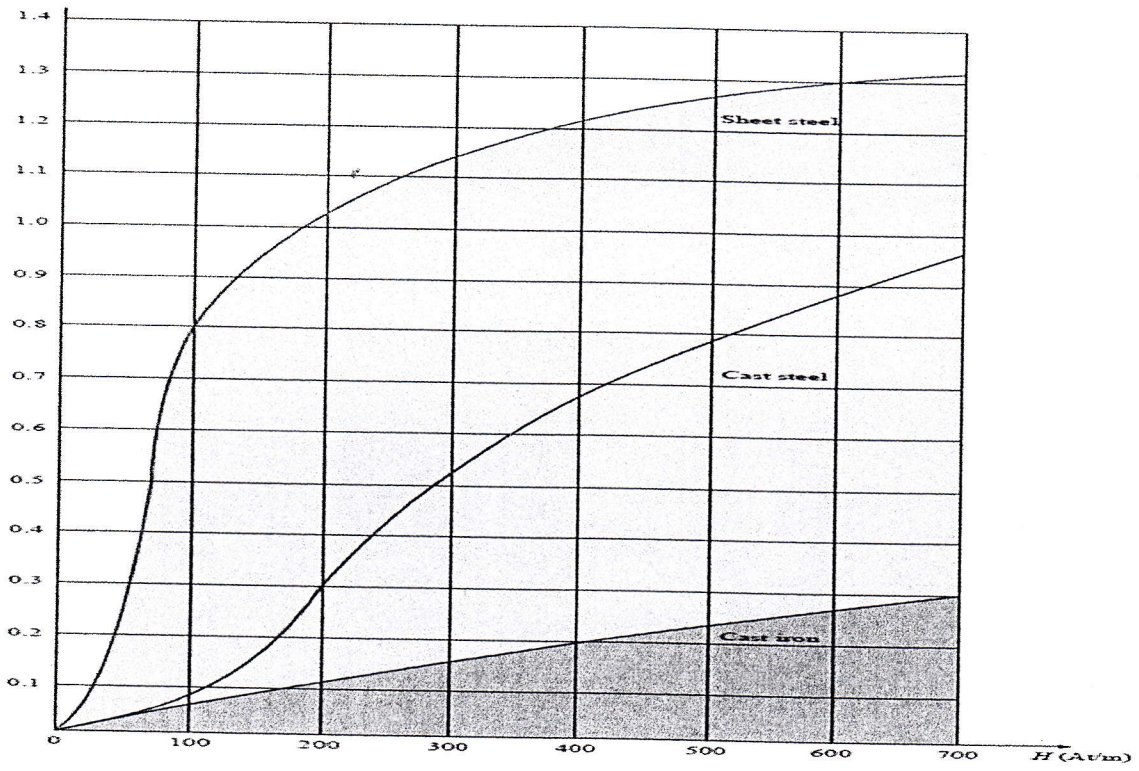
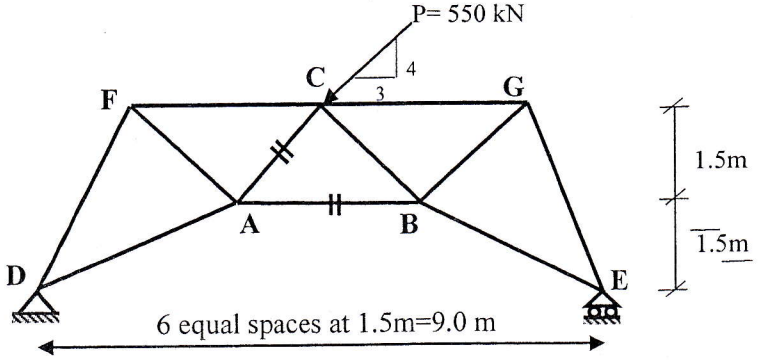


University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2015
Program: B.Sc. Engineering (Civil)

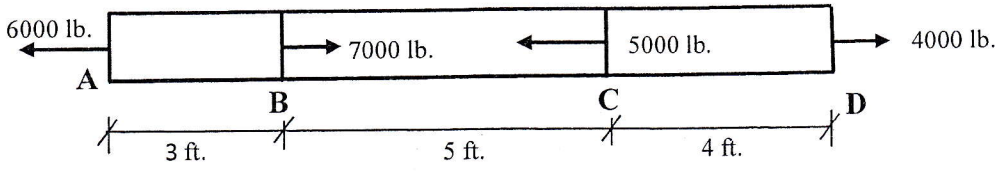
Course Title: Mechanics of Solids I | **Section: A** | Course Code: CE 211
Full Marks: 100 (=10×10) | Time: 3 hours

There are **FOURTEEN (14)** questions in this paper. Answer any **Ten** of the following questions. Each question has equal marks.

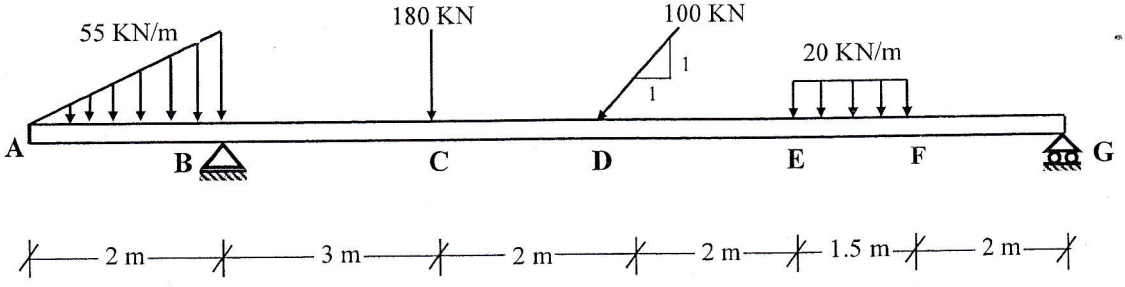
1. Select members AB and CA in the truss shown below to carry an inclined force P of 550 kN. Given the allowable tensile stress 120 MPa and the allowable compressive stress 140 MPa.



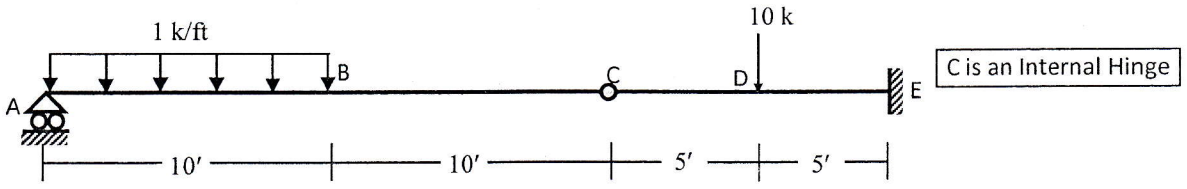
2. Determine the total change in length of the steel bar shown below having 0.5 in^2 cross sectional area. Let E = 10×10^6 psi.



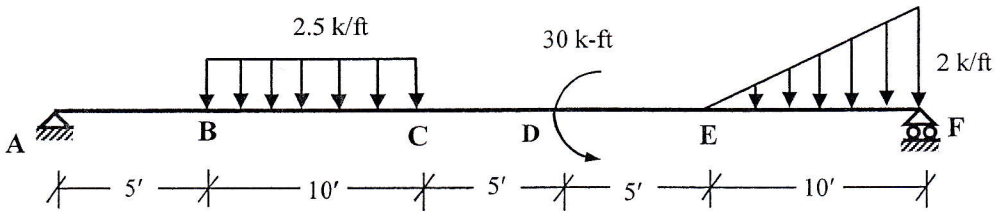
3. Draw axial force, shear force and bending moment diagrams for the beam loaded as shown below.



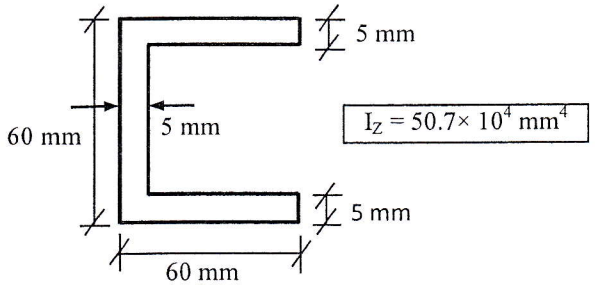
4. Draw shear force and bending moment diagrams for the beam loaded as shown below in by integration method.



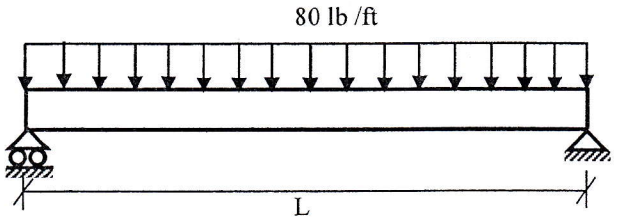
5. Calculate the shear force and bending moment at point D of the beam shown below. Also draw the bending moment diagram of the beam.

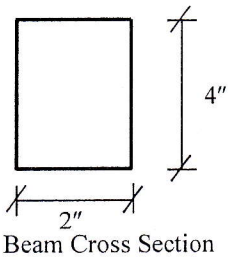


6. What is shear center? Locate out the shear center of the given cross section.



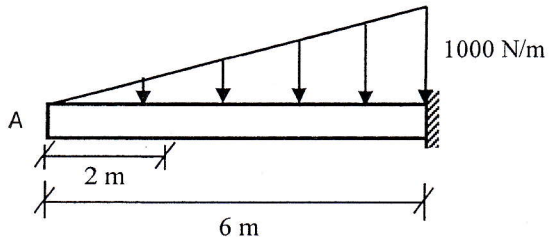
7. A simply supported rectangular beam, 2 in wide by 4 in deep, carries a uniformly distributed load of 80 lb/ft. over its entire length. What is the maximum length (L) of the beam if the flexural stress is limited to 3000 psi?

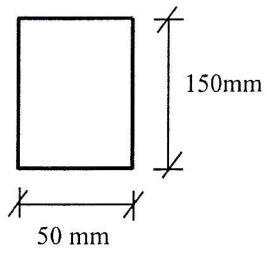




Beam Cross Section

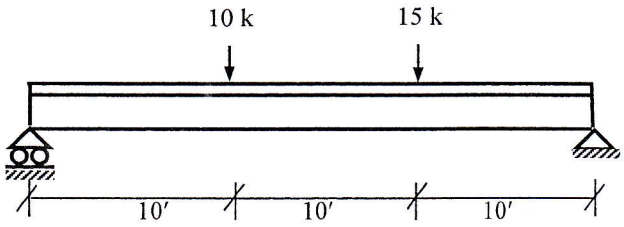
8. A cantilever beam, 50 mm wide by 150 mm high and 6 m long, carries a load that varies uniformly from zero at the free end to 1000 N/m at the wall. (a) Compute the magnitude and location of the maximum flexural stress. (b) Determine the type and magnitude of the stresses in a fiber 20 mm from the top of the beam at a section 2 m from the free end.

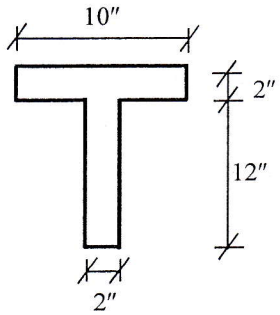




Beam Cross Section

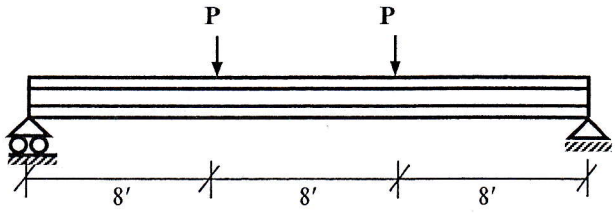
9. Draw the shear stress diagram over the beam cross section where the shear force in the beam is maximum.

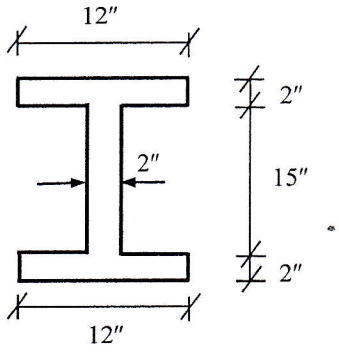




Beam Cross Section

10. (i) Calculate the maximum allowable load **P** in the simply supported beam loaded as shown below, if the allowable shear stress in the cross-section is 12 ksi.
    (ii) For this value of P, draw the shear stress diagram over the section at support.





Beam Cross Section

11. A cylindrical steel pressure vessel 400 mm in diameter with a wall thickness of 20 mm is subjected to an internal pressure of 4.5 MPa. (i) Calculate the tangential and longitudinal stresses and strains in the steel. (ii) To what value may the internal pressure be increased if the allowable stress in steel is 120 MPa.

12. (a) Draw the stress strain diagram for ductile steel by showing well defined regions.

(b) Prove that in a thin walled cylindrical pressure vessel, longitudinal stress is one half of hoop stress.

13. Calculate the maximum allowable force P if the allowable shearing, tearing and bearing stresses are 15 ksi, 20 ksi and 25 ksi respectively.

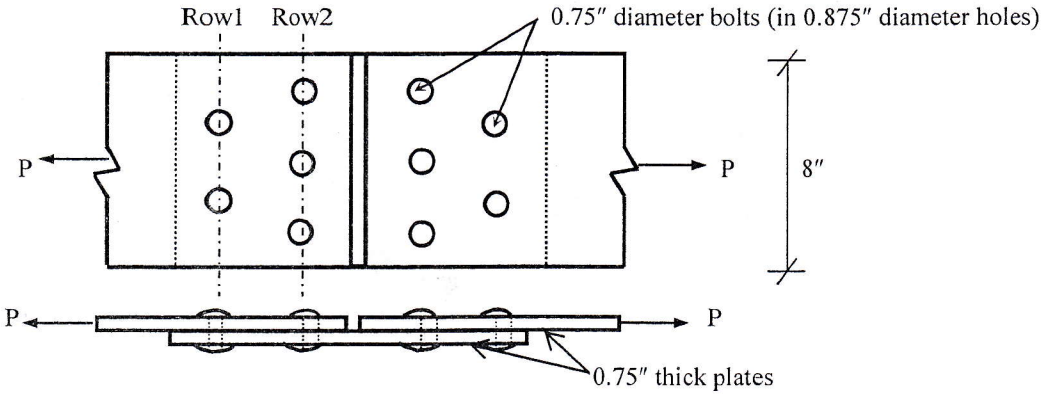
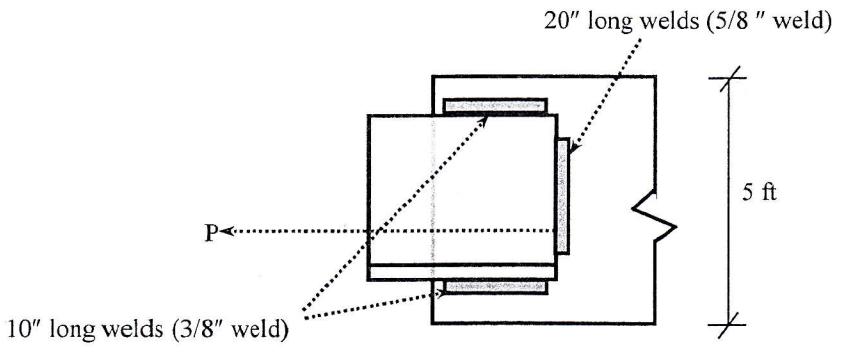


Fig: Bolted joint subjected to force P

14. Calculate the axial force P shown in figure whose weld leg is 3/8″ and 5/8″ given below. Allowable shear stress is limited to 100 ksi.

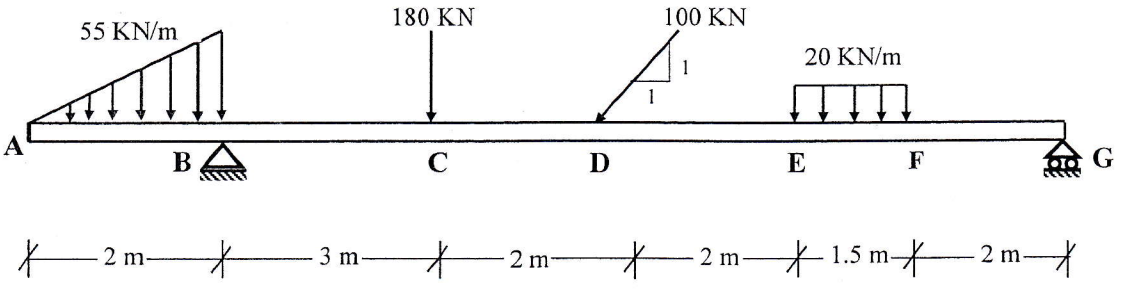


University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2015
Program: B.Sc. Engineering (Civil)

Course Title: Mechanics of Solids I **Section: B** Course Code: CE 211
Full Marks: 100 (=10×10) Time: 3 hours

There are **FOURTEEN (14)** questions in this paper. Answer any **Ten** of the following questions. Each question has equal marks.

1. Draw axial force, shear force and bending moment diagrams for the beam loaded as shown below.



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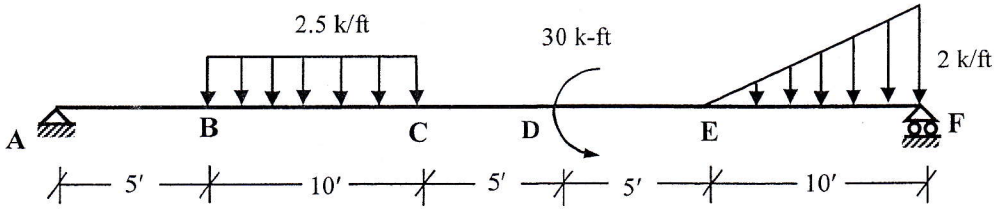

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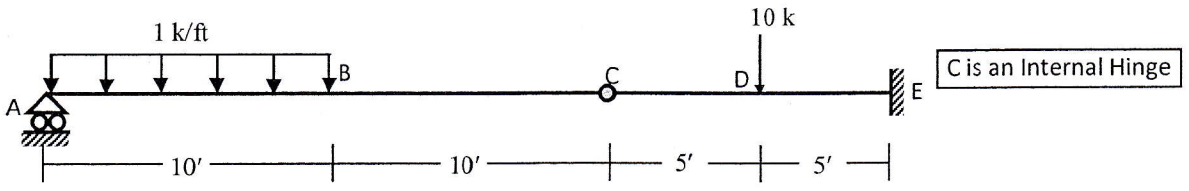
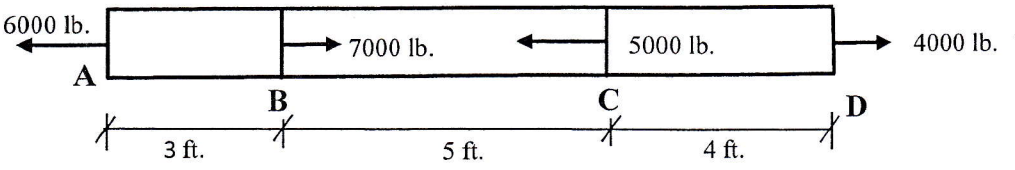
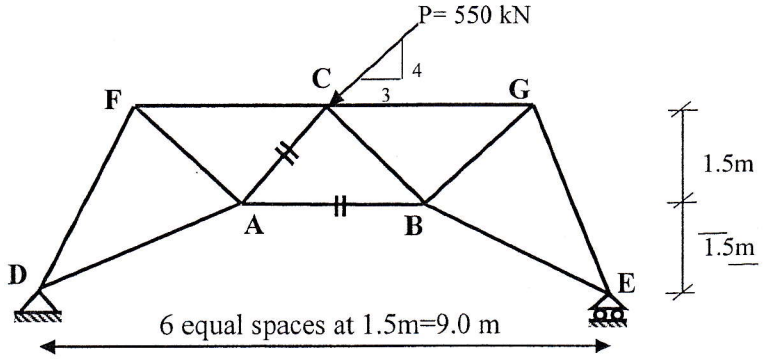


4. Determine the total change in length of the steel bar shown below having 0.5 in^2 cross sectional area. Let E = 10×10^6 psi.



5. Select members AB and CA in the truss shown below to carry an inclined force P of 550 kN. Given the allowable tensile stress 120 MPa and the allowable compressive stress 140 MPa.



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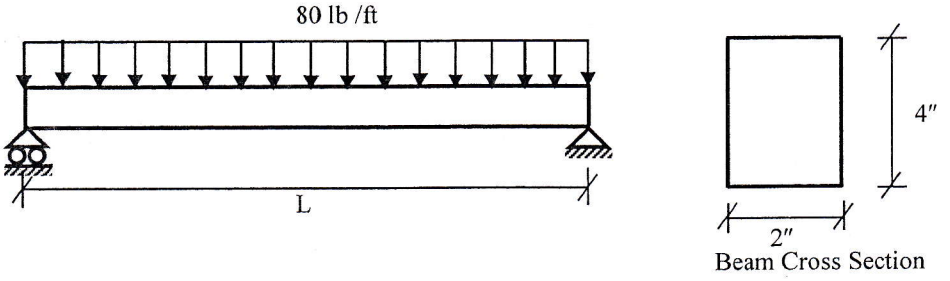

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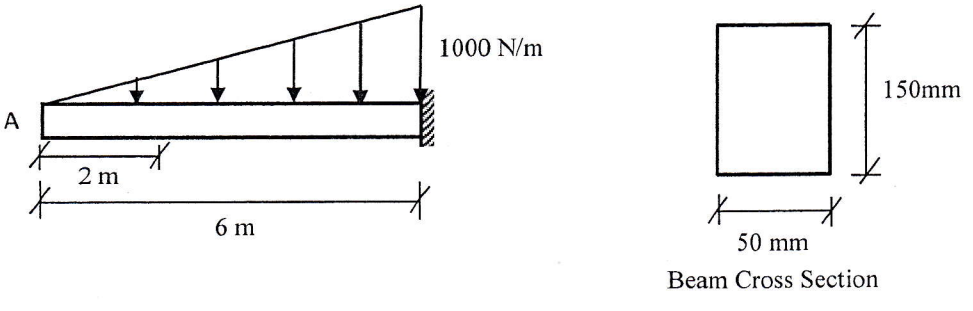

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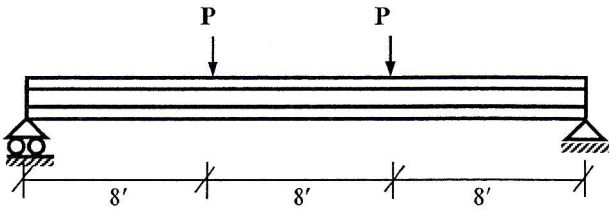

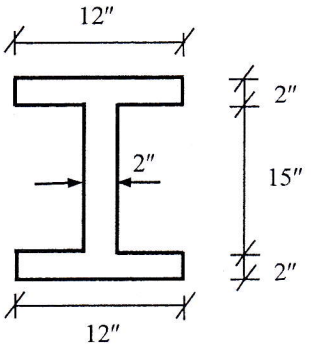

Beam Cross Section

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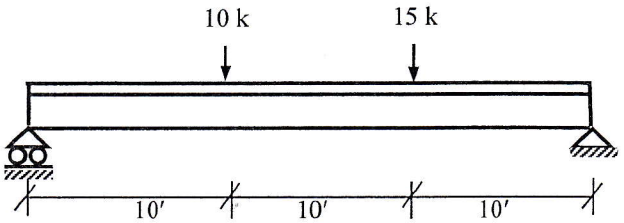

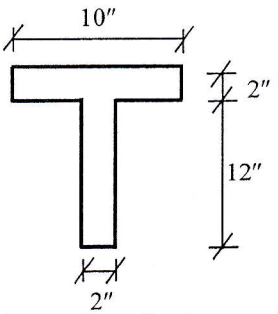

Beam Cross Section

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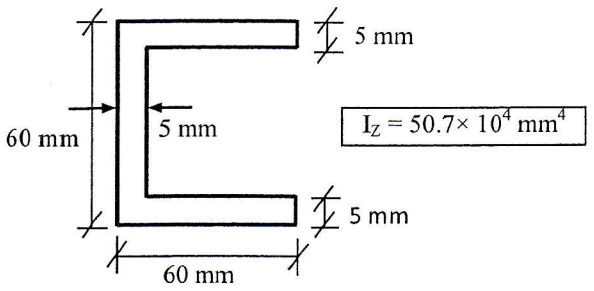

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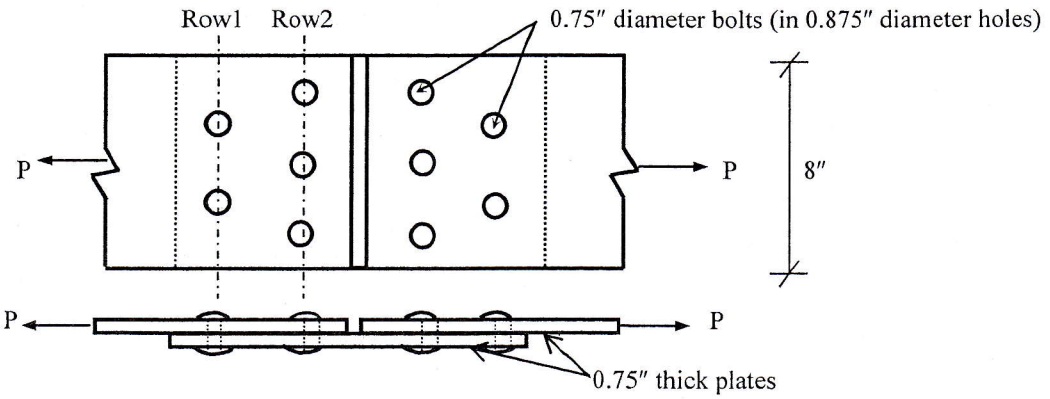

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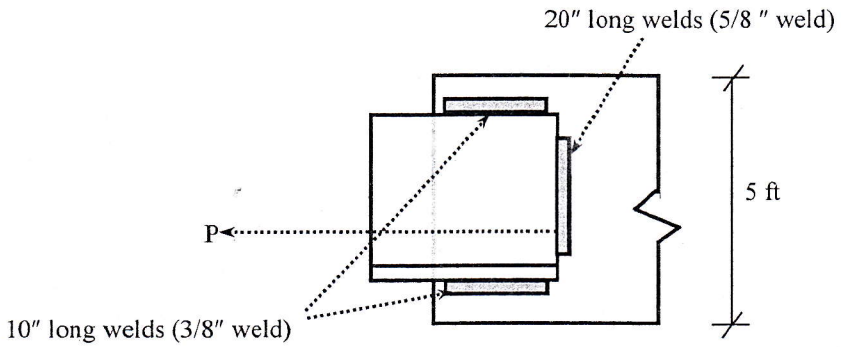

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University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2015
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Materials | Course Code: CE 201 (Sec B)
Time: 3 hours | Full Marks: 150

Part 1: Answer the following question

Question 1:

a. Concrete is required for column of a building in Dhaka. Average Compressive strength should be 3000 psi at 28 days. Design the mix according to ACI volume method using following information. [40]

(i) Cement is Ordinary Portland Cement.
(ii) Coarse aggregate is crushed stone having maximum size 25 mm and fine aggregate is Sylhet sand (FM 2.80)
(iii) Slump value should be 80-100 mm
(iv) Fine and coarse aggregate has a loose dry density of 1300 kg/m^3 and 1500 kg/m^3 respectively.
(v) A water reducing admixture (specific gravity 1.1) will be used so that water can be reduced by 15%. Recommended dose 800 ml per 100 kg cement
(vi) For first trial mix, three cylinders with ACI standard dimensions are cast. Assume 30% loss in cylinder casting.
(vii) Assume reasonable value for missing data, if any.

b. Find the mix ratio in volume basis from the batch masses. (Use the attached tables and given formula)

Part 2: Answer any 2(Two) out of 3 questions (2-4)

Question 2:

a. Describe the typical stress-strain response concrete with different strengths. How to evaluate the Young's modulus from the stress-strain curve of concrete. [6]
b. Explain different moisture condition of coarse aggregate. [5]
c. What are the benefits of brick aggregate over stone aggregate in concrete construction works? [5]
d. Describe the bulking of sand. [3]
e. Explain the Field tests of Brick. [3]

Question 3:

a. Explain Relaxation, Creep and Fatigue strength. [6]
b. A mortar is to be placed on a brick wall of 20 ft long, 10 ft height and the mortar thickness is 1". Sand to cement ratio (by weight) is 2. Calculate the proportion of each component (cement, sand, water) per unit cubic meter of mortar. What is the unit weight of mortar? Assume air content in mortar is 3%. Estimate the amount of mortar necessary for the wall and the amount of each ingredient of mortar. Assume 15 % extra volume of mortar for loss during application. If bulking of sand is 15 %, calculate the volume of sand. [Sand unit weight = 1350 kg/m^3 with void (SSD)] [12]
c. "Brick get strength during burning"-How? [4]

Question 4:

a. What is the FM of a sand sample if all the materials are retained on sieve #8? [5]
b. What do you mean by hydration of cement? Write the hydration reactions of cement and discuss the morphology of the hydration product. [8]
c. Compare Bulk, Absolute and Apparent Specific Gravity. [3]
d. Describe the role of gypsum in cement. [3]
e. Explain the defects in plaster work. [3]

Part 3: Answer any 3(Three) out of 4 questions (5 – 8)

Question 5:

a. The result of sieve analysis of a sand sample is as follows: [10]

Sieve No. (Size, mm)	% Finer
#8 (2.36 mm)	80
#16 (1.18 mm)	78
#30 (0.60 mm)	50
#50 (0.30 mm)	19
#100 (0.15 mm)	2.5

Determine whether the sand can be used for making ferrocement as per BNBC 1993 guideline.
b. What is exogenous tree? Draw a section of exogenous tree showing different parts. [4]
c. What are the differences between soft rubber and hard rubber? Why vulcanization is necessary? [4]
d. "An excess of fine aggregate leads to easily workable, more permeable and less economical concrete"- justify the statement. [4]

Question 6:

a. Illustrate how ferrocement technology can be used to repair spalling of concrete of a floor slab. Why do you think such repair would prevent possibility of further spalling? [10]

b. "W/C ratio is the key parameter related to strength and durability of concrete"- explain briefly. [4]
c. Differentiate between (i) heart wood and sap wood, (ii) hard wood and soft wood [4]
d. What is carbonation? What will happen if concrete is carbonated? [4]

Question 7:

a. Describe the corrosion preventive measures in concrete. [8]
b. Compare distemper and varnish. [3]
c. Discuss the effect of following factors on the strength of concrete: [8]
   (i) Cement type
   (ii) Maximum aggregate size
   (iii) workability
   (iv) Cement fineness
d. How does the size and shape of aggregate particles affect the properties of fresh concrete? [3]

Question 8:

a. What is admixture? Explain the limitation of maturity rule of concrete. [3]
b. Write a short note on the following: [9]
   i) Accelerating Admixture
   ii) Superplasticiser
   iii) Bullet proof glass
c. What are the purposes of using air entraining admixtures in concrete? [2]
d. Define laitance and bleeding. How can bleeding be controlled? [4]
e. What is curing? Graphically show the effect of following factors on curing of concrete. [4]
   i) Wind velocity
   ii) Relative humidity
   iii) Temperature

Necessary Tables for Question No. 1

Table 1: Properties of Fine Aggregate

Sl. No.	Property	Test Method	Value	Unit
1	Bulk Specific Gravity (OD basis)	ASTM C127	2.50	-
2	Apparent Specific Gravity (OD basis)	ASTM C127	2.60	-
3	Absorption Capacity	ASTM C127	1.5	%
4	Dry Rodded Bulk density	ASTM C29	1570	kg/m^3
5	Moisture Content of FA in Laboratory		3.5	%

Table 2: Properties of Coarse Aggregate

Sl. No.	Property	Test Method	Value	Unit
1	Bulk Specific Gravity (OD basis)	ASTM C127	2.60	-
2	Apparent Specific Gravity (OD basis)	ASTM C127	2.70	-
3	Absorption Capacity	ASTM C127	1.00	%
4	Dry Rodded Bulk density	ASTM C29	1530	kg/m^3
5	Moisture Content of CA in Laboratory	-	0.50	%

Table 3: Properties of cement

Sl. No.	Property	Test Method	Value	Unit
1	Brand name		Rubi (OPC)	-
2	Clinker		100	%
3	Fly Ash		0	%
4	Compacted Unit Weight		1400	kg/m^3
5	Loose Unit Weight		1200	kg/m^3
6	Specific Gravity of clinker		3.15	

Table 4: ACI recommended dry rodded bulk volume of coarse aggregate per unit volume of concrete

Max size of agg	FM of fine aggregate			
mm	2.40	2.60	2.80	3.00
9.5	0.50	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
19	0.66	0.64	0.62	0.60
25	0.71	0.69	0.67	0.65
37.5	0.75	0.73	0.71	0.69
50	0.78	0.76	0.74	0.72
75	0.82	0.80	0.78	0.76
150	0.87	0.85	0.83	0.81

Table 5: ACI recommended mixing water content for 1 m^3 fresh concrete

Max size of aggregate (mm)	10	12.5	20	25	40	50	70	150
Slump Value (mm)	**Amount of mixing water in kg per 1 m^3 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	205	190	178	160	-
Entrapped air (%)	3	2.5	2	1.5	1	0.5	0.3	0.2

Table 6: First Trial Mix Result

Water Added	0.2 kg less water was added than calculated for first trial mix
Slump measured	100 mm
Measured density of fresh concrete	2360 kg/m^3

Estimating w/c ratio

$$\frac{w}{c} = 1.1734e^{-0.0259f_c'}$$

Where, f_c'=Target Mean Strength in MPa