2-1

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall 2019
Programme: B.Sc. Engineering (Civil)
(2nd Year 1st Semester)

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

Answer **FOUR** questions **including questions 3 and 4.**
Figures in the right margin indicate marks.

1. Write in detail about:
   a) Role and role conflict; 12.5
   b) Norms and values. 12.5

OR

2. a) Discuss how population and environment are related. 12.5
   b) Does over population destroy environment? Discuss. 12.5

3. a) Define socialization. 5
   b) Discuss how school and mass media play roles in socialization. 20

4. a) Define social control. 5
   b) Explain the roles of family and religion as agencies of social control in rural Bangladesh. 20

5. a) Define society. 5
   b) Extend the idea of Gerhard Lenski in relation to the evolution of society. 20

OR

6. a) Define society. 5
   b) Distinguish between Institution and Association. 20

University of Asia Pacific

Department of Basic Sciences and Humanities

Final Examination, Fall 2019

Program: B. Sc. Engineering (Civil)

(2nd Year 1st Semester)

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

There are **Six** Questions. Answer **Four** Questions **including Q-5 and Q-6.**

1.	Discuss the importance of Battle of Plassey and Buxer in the history of Bengal.	25
	Or	
2.	Explain Permanent Settlement with its impact.	25
3.	Explain the reasons behind the Partition of Bengal in 1905.	25
	Or	
4.	Write an essay on the Language Movement of 1952.	25
5.	Discuss the Six Point Program.	25
6.	Write an essay on the genocide in the Liberation War of Bangladesh.	25

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2019
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Materials | Course Code: CE 201
Time: 3 hours | Credit Hour: 4.00 | Full Marks: 200

Answer all questions.

QUESTION 1 [88 MARKS]

Four long cantilever slabs (20 m x 5 m x 0.2 m) will be constructed with High-performance Lightweight Concrete (HPLWC) to reduce the dead load of the structure. To achieve the target strength of HPLWC, three types of sand are collected, and different physical tests are performed. The test data of the sieve analysis of sand samples are given in **Table 1**.

Table 1: Test data of sieve analysis of sand samples.

ASTM Sieve	Sieve opening (mm)	Materials Retained (gm)		
		Sand-X	Sand-Y	Sand-Z
3 inch	76.2	0	0	0
1.5 inch	38.1	0	0	0
3/4 inch	19.05	0	0	0
3/8 inch	9.5	0	0	0
# 4	4.75	0	0	0
# 8	2.36	60	0	0
# 12	1.7	60	0	0
# 16	1.19	70	400	0
# 30	0.59	80	100	0
# 40	0.425	80	0	0
# 50	0.3	90	0	200
# 100	0.15	50	0	250
# 200	0.075	10	0	50
Pan	-	0	0	0

a. (i) Complete the table including % passing of each sieve and determine the fineness modulus of three types of sand (Sand-X, Sand-Y and Sand-Z). **[24]**

(ii) Draw the gradation curve of three types of sand samples on a semi-log graph paper and make comments on the curves. Based on three gradation curves of sand samples, propose the suitable sand to make high-performance lightweight concrete and justify your selection with proper explanation. **[12]**

b. To achieve the target strength of HPLWC, three types of coarse aggregate (A, B and C) are collected, and unit weight and voids in aggregates are performed. The interior size of the mould of the test is 200 mm in diameter and 300 mm in height. The experimental test data are given in **Table 2**.

Table 2. Test data of the unit weight and voids in aggregates.

Aggregate	Mass of the empty mould (kg)	Mass of mould with aggregate in oven dry condition (kg)	Bulk Specific gravity (OD Basis)
Aggregate A	11	20	1.1
Aggregate B	11	28	2.7
Aggregate C	11	33	3.9

(i) Calculate % of voids in aggregates (A, B and C). Assume unit weight of water = 1000 kg/m^3. **[8]**

(ii) Based on the results of % of voids in aggregates (A, B and C), propose a suitable aggregate for the high-performance lightweight concrete and justify your selection with proper comments. **[4]**

c. Mix design of high-performance lightweight concrete (HPLWC) is necessary for slabs as well as cylinders to investigate the compressive strength and durability performance of concrete to ensure the longer service life of the structure. Since the absorption capacity of aggregate plays an important role in the durability of concrete, the design **absorption capacity of lightweight aggregate (LWA) of 20%** is considered. To do the mix design, **water to cement ratio (W/C)** will be taken from **Figure 1** with respect to the absorption capacity of LWA.

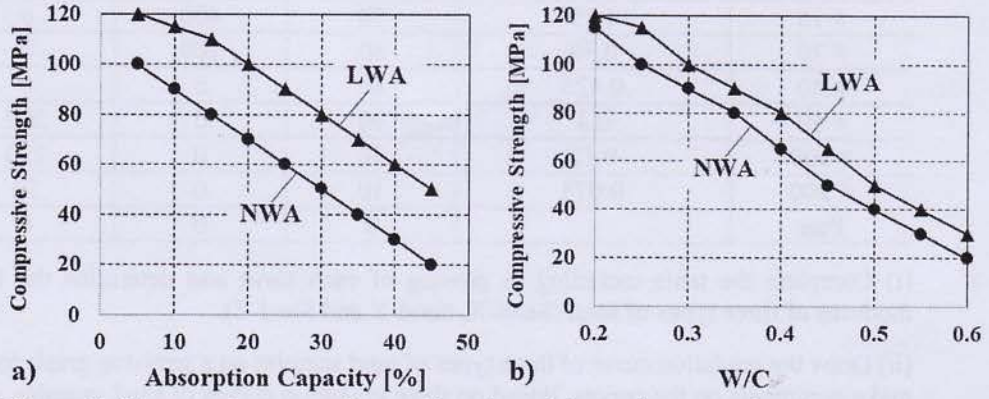


Figure 1: Compressive strength as a function of absorption capacity (a) and water to cement ratio (b) of lightweight aggregate (LWA) and normal-weight aggregate (NWA).

The specification requirements for the concrete are as follows:
Sand to total aggregate volume ratio = 0.40
Cement content = 500 kg/m^3
Air content = 2% (air-entraining admixture is not used)
Maximum slump = 70 mm
20 mm maximum size coarse aggregate
Uncrushed natural river sand as fine aggregate

The tests on concrete making materials gave the following results:
Specific gravity of Portland composite cement = 3.10
Specific gravity of coarse aggregate (SSD) = 1.20
Specific gravity of sand (SSD) = 2.50

Consider weight basis mix design for the calculation. Assume that the coarse and fine aggregates (sand) are in the Saturated Surface Dry (SSD) condition. Superplasticizer as chemical admixture is used which is not considered during the calculation. Determine the following:

(i) Calculate the amount of cement, coarse aggregate, fine aggregate and water per unit cubic meter of concrete (unit: kg/m^3). **[26]**

(ii) Estimate the quantity of cement, coarse aggregate, fine aggregate and water required for the casting of 4 slabs (20 m x 5 m x 0.2 m), and 12 cylinders for compressive strength (size: diameter = 100 mm and height = 200 mm) and 3 cylinders for durability (size: diameter = 150 mm and height = 300 mm) test. Assume 25% extra volume is necessary due to total loss of concrete during casting. **[10]**

(iii) To ensure good quality concrete, 20 mm, 15 mm, 10 mm and 5 mm size of coarse aggregate are 15%, 15%, 30% and 40%, respectively, used. Estimate the amount of each size of aggregate for casting all the slabs and cylinders. **[4]**

QUESTION 2 [23 MARKS]

"English bond is considered as the strongest and most widely used brick bond in construction work". Explain the statement briefly. With the help of a neat sketch, explain the test procedure to determine the efflorescence of brick.

QUESTION 3 [23 MARKS]

Describe the effect of incorporation of fly ash in cement on the fresh and hardened properties of concrete. Explain the pozzolanic reaction of fly ash with chemical reactions and proper comments.

Or

Discuss the effect of superplasticizer on the properties of fresh and hardened concrete. Using the schematic diagrams, discuss the mechanism of superplasticizer to improve the workability of fresh concrete.

QUESTION 4 [23 MARKS]

"Cylinder strength is lower than cube strength of hardened concrete". Justify this statement with neat sketches and proper mechanisms. Explain the significance of the determination of the compressive strength of concrete.

QUESTION 5 [23 MARKS]

What is honeycomb of concrete? Write the conditions favorable for the honeycomb of concrete and explain the repairing procedure if honeycomb occurs.

QUESTION 6 [20 MARKS]

Using a schematic diagram and chemical reactions, explain the mechanisms involved in concrete deterioration by corrosion of embedded steel.

University of Asia Pacific

Department of Civil Engineering

Semester Final Examination, Fall-2019

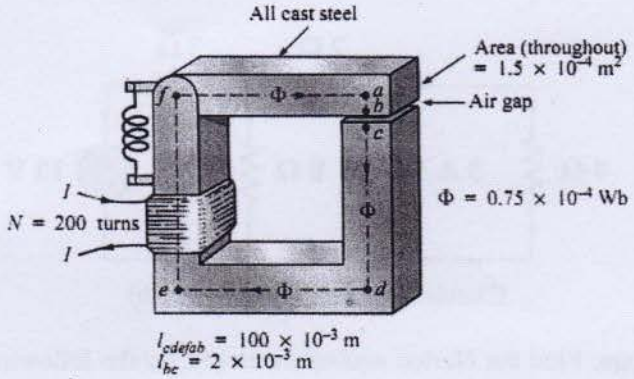
Program: B.Sc Engineering (2nd Year / 1st Semester)

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

Time: 3.00 Hours. Full Marks: 150

There are **Eight (8)** Questions. Answer **Six (6)** from them **including Question no. 1, 2, 3 and 4.** Figures in the right margin indicate marks.

1. (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. 17



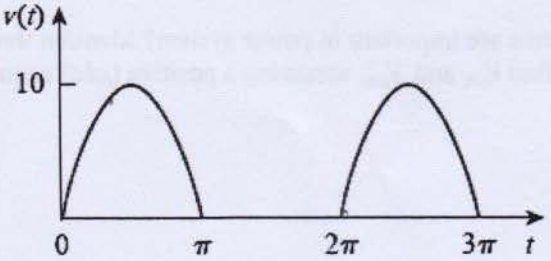
Circuit diagram for question 1(a)

Required B-H table for cast steel:

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

(b) Write short notes on (i) flux density (ii) magnetomotive force (iii) magnetizing force (iv) permeability 8

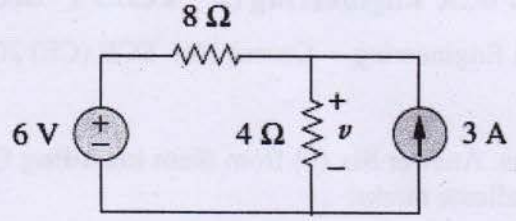
2. (a) Find the r.m.s voltage value of the half-wave rectified sine wave in the following figure. Calculate the average power dissipated in a 5-Ω resistor. 12



Waveform for question 2(a)

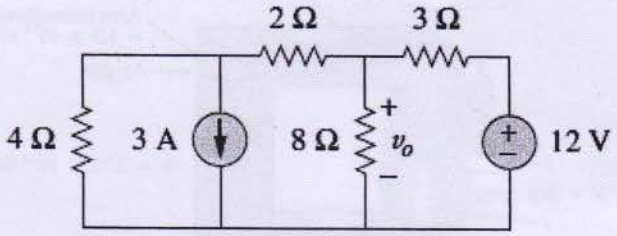
(b) Obtain the power factor and the apparent power of a load whose impedance is $\mathbf{Z} = 60\text{-}j40\ \Omega$ when the applied voltage is $v(t) = 150\cos(377t + 10°)$ V. Also, determine the circuit element values that form the series-connected load. 13

3. (a) Using the superposition theorem, find v in the following circuit. 13



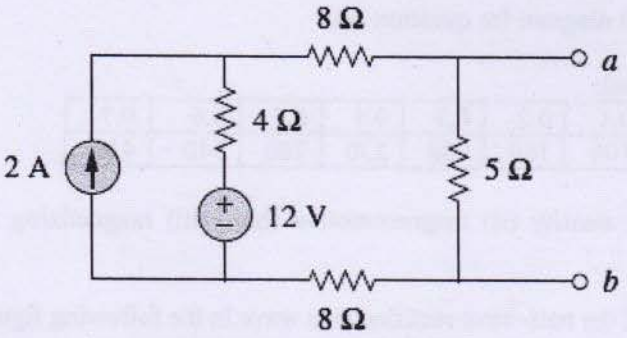
Circuit diagram for question 3(a)

(b) Find v_o in the following circuit using source transformation. 12



Circuit diagram for question 3(b)

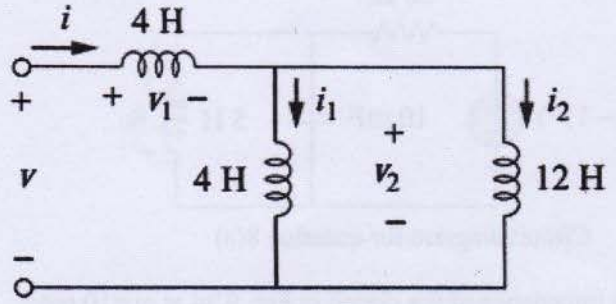
4. (a) State Norton's theorem. Find the Norton equivalent circuit for the following circuit at terminal a-b. 3+10



Circuit diagram for question 4(a)

(b) Why three phase circuit systems are important in power system? Mention three reasons. 12
Given that $V_{bn} = 110 \angle 30°$, find V_{an} and V_{cn}, assuming a positive (abc) sequence.

5. (a) For the circuit in following figure, $i(t) = 4(2 - e^{-10t})$ mA. If $i_2(0) = -1$ mA, find: (a)$i_1(0)$; (b) $v(t)$, $v_1(t)$, and $v_2(t)$; (c) $i_1(t)$ and $i_2(t)$. 15



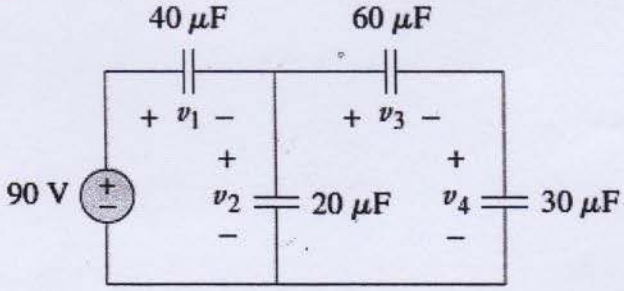
Circuit diagram for question 5(a)

(b) Prove with necessary figure that the equivalent inductance of parallely connected inductors is the reciprocal of the sum of the reciprocals of the individual inductors. 10

Or

6. (a) If the current through a 1-mH inductor is $i(t) = 20\cos 100t$ mA, find the terminal voltage and the energy stored. 12

(b) Find the voltage across each capacitor. 13



Circuit diagram for question 6(b)

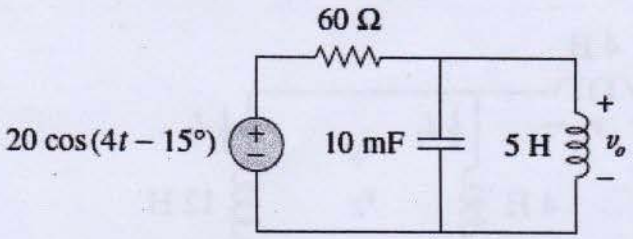
7. (a) Find the phase angle between $i_1 = -10\cos(377t + 50°)$ and $i_2 = 12\sin(377t - 10°)$ Does i_1 lead or lag i_2? 10

(b) For the inductor L, assume the current through it is $i = I_m\cos(\omega t + \varphi)$. Show that, the voltage across the inductor is $V = j\omega Li$. 10

(c) Find the amplitude, phase, angular frequency, period, and frequency of the sinusoid $v(t) = 12\cos(50t + 10°)$ 5

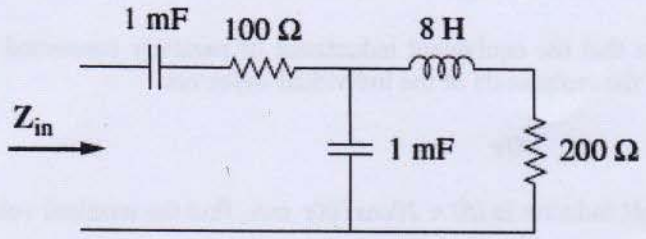
Or

8. (a) Calculate V_o in the circuit of the following figure. 13



Circuit diagram for question 8(a)

(b) Determine the input impedance of the circuit in Fig. 9.24 at ω =10 rad/s. 12



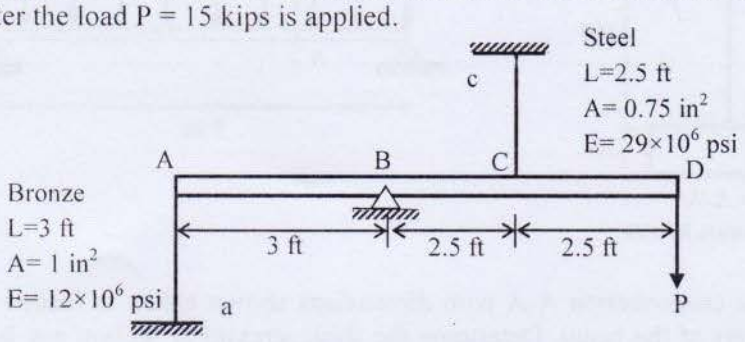
Circuit diagram for question 8(b)

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2019
Program: B.Sc. Engineering (Civil)

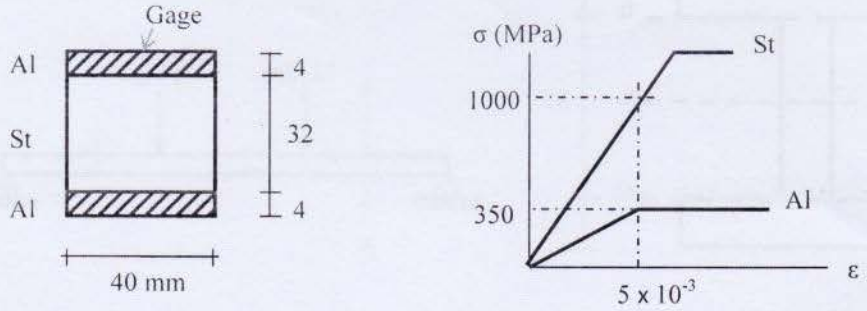
Course Title: Mechanics of Solids I | Course Code: CE 211
Time: 3:00 hours | Credit Hour: 3.0 | Full Marks: 10 × 15 = 150

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

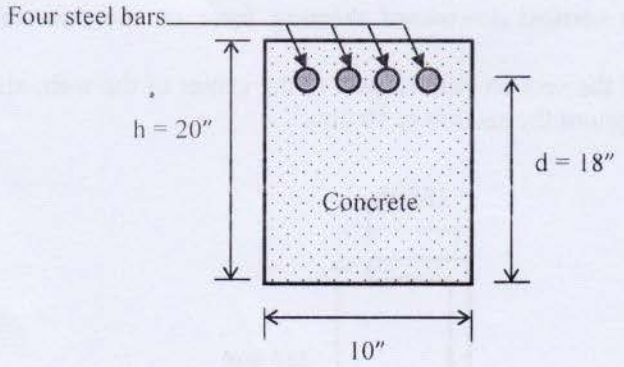
1. The light rigid bar ABCD shown below is pinned at B and connected to two vertical rods Aa and Cc. Assuming that the bar was initially horizontal and the rods stress-free, determine the stress in each rod after the load P = 15 kips is applied.



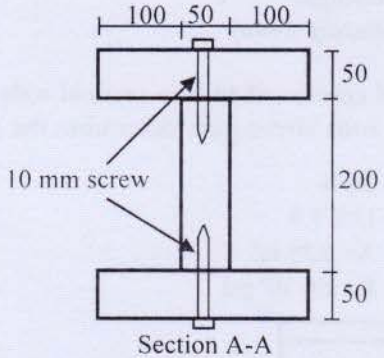
2. A small sandwich beam spanning 400 mm is made up by bonding two Aluminum alloy strips to an alloy steel bar as shown below. The idealized stress-strain diagrams are shown in the figure. What is the magnitude of the applied bending moment if it causes -7.5 x 10 $^{-3}$ longitudinal strain in the gage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



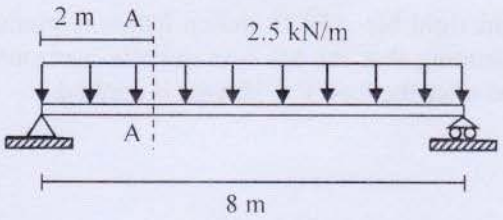
3. Calculate the maximum stress in the concrete and the steel for a reinforced concrete beam with the section shown below if it is subjected to a negative bending moment of 60 kip-ft. The reinforcement consists of four 1″ steel bars. Assume cracked section and n = 8.



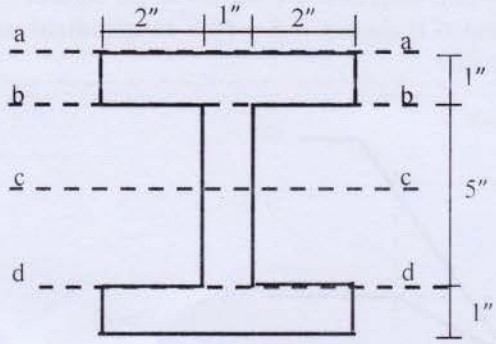
4. A simple beam on 8-m span carries a load of 2.5 kN/m including its own weight. Specify the spacing of 10-mm screw (as shown) necessary to fasten the parts together at
(i) quarter point of the beam i.e., section A-A and
(ii) maximum shear zone. Assume that allowable shear capacity for a 10-mm screw is 3kN.



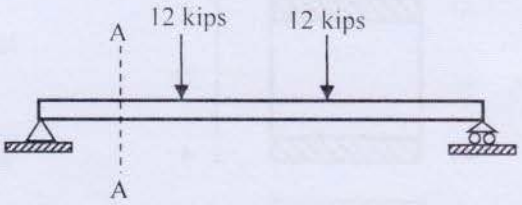
Section A-A
All dimensions in mm



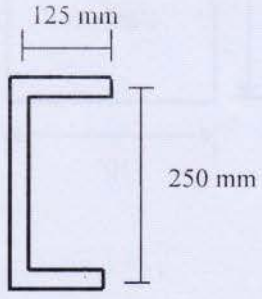
5. An I beam having the cross-section A-A with dimensions shown below is loaded with two point loads at one third points of the beam. Determine the shear stresses at section a-a, b-b, c-c and d-d. Section c-c is at neutral axis.



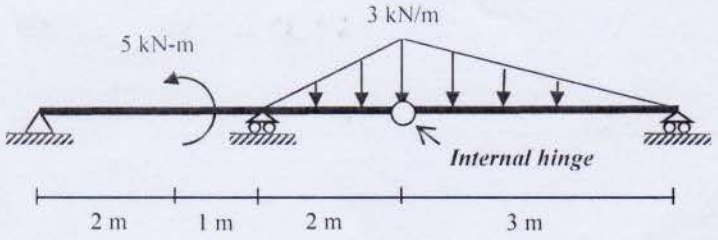
Section A-A



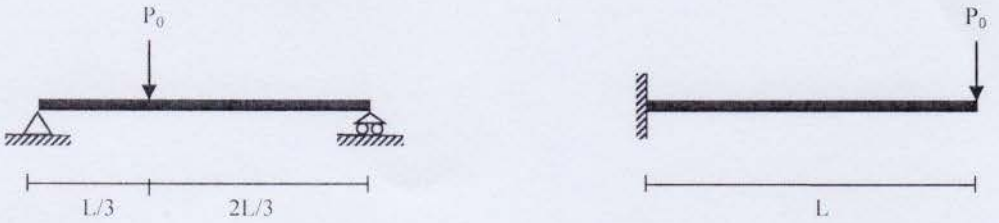
6. Define shear center. The vertical downward shearing force on the thin-walled C section shown below in 200 kN.
Locate the shear center of the section with respect to the center of the web; also draw the shear flow diagram. Thickness throughout the section is 10 mm.



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



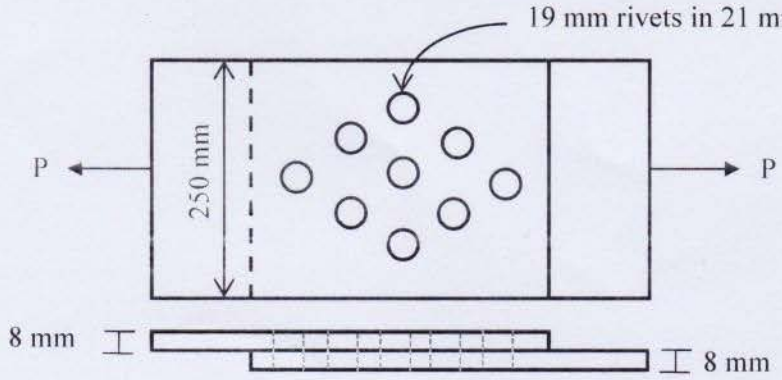
8. Derive equations for shear force and bending moment by singularity function for the following two beams.



9. (a) In a thin walled cylindrical pressure vessel if the pressure is raised to the bursting point, at which section will the failure occur? Justify your answer.

   (b) Calculate the minimum wall thickness for cylindrical vessel that is to carry a gas at a pressure of 1400 psi. The diameter of the vessel is 2 ft. and the stress is limited to 12 ksi.

10. Calculate the safe load, P on the lap connection (250 mm wide) shown in the following figure if the rivets are of 19-mm diameter (assume 21-mm holes) and plates are 8 mm thick.
    Use allowable shearing stress of 95 MPa, tearing stress of 140 MPa and bearing stress of 220 MPa.



University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination, Fall -2019
Program: B.Sc. in Civil Engineering

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

There are Eight questions. Answer any Six including 1, 2,3 and 4. All questions are of equal values, indicated in the right margin.

1. (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. **12**

(b) Suppose the current measurements in a strip of wire are assumed to follow a normal distribution with a mean of 10 milliamperes and a variance of 4 $(\text{milliamperes})^2$. What is the probability that a measurement will exceed 13 milliamperes? What is the probability that a current measurement is between 9 and 11 milliamperes? **13**

2. (a) Three balls are drawn successively from the box containing 6 red balls, 4 white balls, and 5 blue balls. Determine the probability that they are drawn in the order red, white, and blue if each ball is (a) replaced and (b) not replaced. **13**

(b) Ten percent of the tools produced in a certain manufacturing process turn out to be defective. Find the probability that in a sample of 10 tools chosen at random exactly 2 will be defective by using (a) the binomial distribution and (b) the Poisson approximation to the binomial distribution. **12**

3. (a) For any set of observations $x_1, x_2, \ldots, x_n$, show that $\beta_2 \geq \beta_1 + 1$, where $\beta_1 = \mu_3^2/\mu_2^3$ and $\beta_2 = \mu_4/\mu_2^2$ are respectively the measures of skewness and kurtosis of the data. **10**

(b) The first four moments of a distribution about the value 4 of the variable are $-1.5, 17, -30, 108$. Find the moments about the mean, β_1 and β_2. **15**

4. (a) Show that the coefficient of correlation lies between $+1$ and -1. 7

(b) Distinguish between regression and correlation. 8

(c) Calculate Karl Pearson's coefficient of correlation from the following data and comment on the result: 10

x :	10	12	21	4	7
y :	8	7	17	2	6

5. (a) If $A = \begin{pmatrix} 2 & 1 & 3 \\ 1 & -2 & 2 \\ 1 & 2 & 1 \end{pmatrix}$, then find the value of $A^3 - 2A^2 - 9A$. 17

(b) If $A = \begin{pmatrix} 1 & 5 \\ 0 & 1 \\ 1 & 0 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 5 & 6 \\ 2 & 4 & 0 \end{pmatrix}$ prove that $A^T + B = (A + B^T)^T$. 8

OR

6. (a) Using Gaussian Elimination method solve the following system of linear equations 15

$$\begin{cases} x + 2y - 3z = -1 \\ 3x - y + 2z = 7 \\ 5x + 3y - 4z = 2 \end{cases}$$

(b) Express the vector v as a linear combination of vectors v_1, v_2, v_3 where 10

$$v = (3, 7, 8),\ v_1 = (1, 1, 1),\ v_2 = (0, 1, 1),\ v_3 = (1, 2, 2).$$

7. Find a matrix P that diagonalizes $A = \begin{pmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{pmatrix}$ also determine $P^{-1}AP$. 25

OR

8. (a) Find rank and nullity of the following transformation 18

$$T : \Re^4 \to \Re^3 : T = \begin{pmatrix} 1 & 2 & 0 & 1 \\ 2 & -1 & 2 & -1 \\ 1 & -3 & 2 & -2 \end{pmatrix}$$

(b) Test whether the transformation defined as follows are linear or not. 7

$$T : \Re^3 \to \Re^3 : T(x, y, z) = (x + y, x + 1, z + x)$$