Course Code: CE 211   Time: 1 (one) Hour
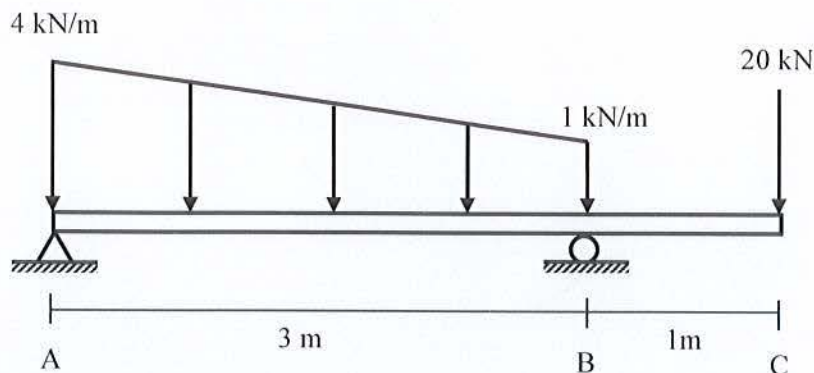Course Title: Mechanics of Solids I   Full Marks: 40

Answer all questions.
Each question carries equal marks

1. Use singularity function to draw SFD and BMD of the beam shown below.   [12]

10 Kip

Internal hinge

5 ft   5 ft   5 ft   10 ft
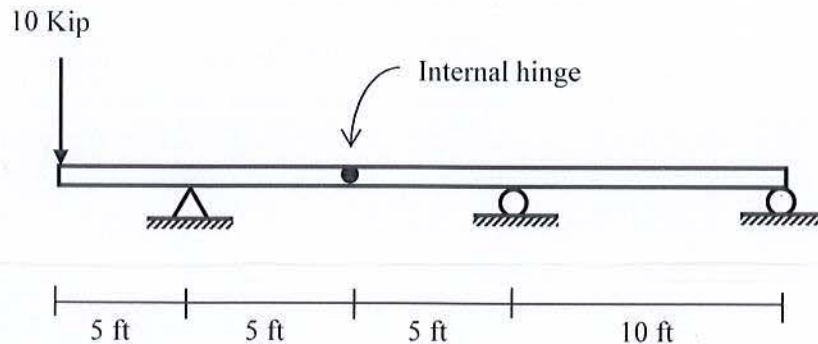
2. Determine the bending moment at *B* for the following beam.   [20]

4 kN/m

20 kN

1 kN/m

3 m   1m

A   B   C

3. Find the maximum weight of the stock of blocks being carried by the crane   [10]
   boom with two metal wires AB (area: 800 mm² and allowable stress: 110 MPa)
   and AC (area: 400 mm² and allowable stress: 120 MPa).
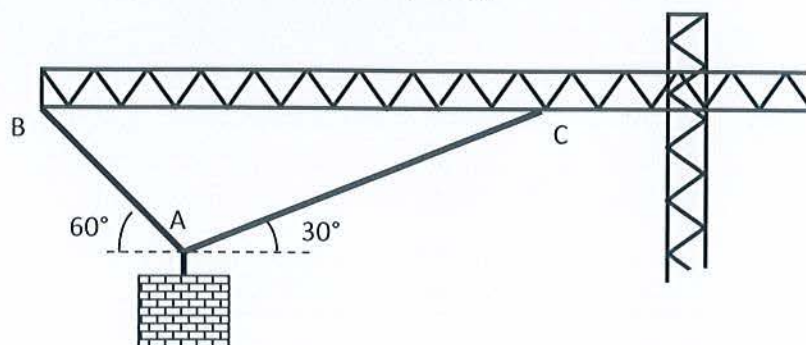
B

C

60°   A   30°

| Course Title: Engineering Materials | Credit Hour: 4.00 | Course Code: CE 201 |
| Time: 1 hour | | Full Marks: 80 |

Answer all FOUR questions.

1. A mortar mix is prepared to provide a smooth coat finish on the interior side of a wall having an opening of 1.5m x 1m for a window. The ratio of cement to sand to water is 1: 3: 0.5 by weight. The mortar mix has a unit weight of 2000 kg/m³.
   Wall dimensions: 10m long, 3m high and coat thickness: 25mm.
   - i) Calculate the volume of the mortar required for the work including 10% extra considered for loss during application.
   - ii) Calculate the amount of each ingredient of mortar in kg necessary to provide the smooth coat finish onto the wall.
   - iii) Given, unit weight of cement is 2400 kg/m³. Determine unit weight and volume of sand in the mix. (Assume, 1% air content and no bulking) [5+8+7]

2. (a) Draw strain response diagram of an elasto-plastic material for the given loading-unloading sequence. $[t_1 - t_0 = t_2 - t_1]$
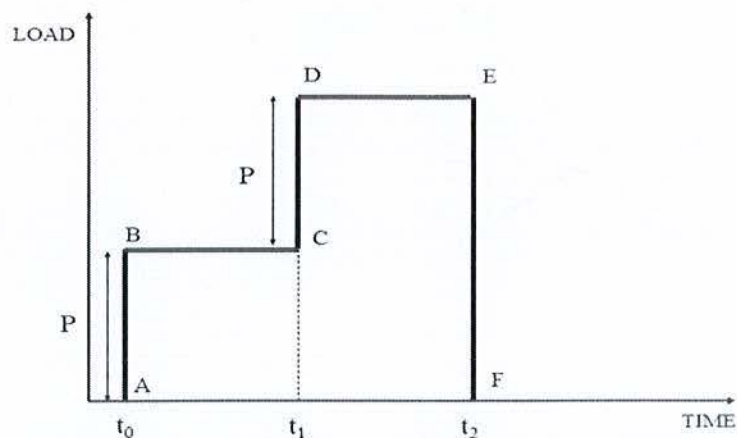
(b) "A brittle material can be resilient but not tough." Do you agree with the statement? Provide reasoning. Also distinguish between creep and relaxation. [12+8]

3.   (a) Among four mineral constituents, describe only the roles of those minerals that are accounted for strength development of cement.

        (b) Sometimes white patches are observed on the surface of red brick walls. Name and explain this phenomenon.   [12+8]

4. The sieve analysis result of a sample of sand, conducted at UAP materials lab is given below:

Sieve Size	Materials retained (gm)
#4	0
#8	50
#10	?
#16	180
#30	200
#50	340
#100	60
Pan	20

Weight of the total sample is 1kg.

     i.   Calculate the FM of the sample and comment on the type of sand.

     ii.   In what ratio shall this sample be mixed with another sample of sand having FM of 2.2 in order to achieve a FM of 2.4.   [15+5]

Course Title: Mathematics-III Course Code: MTH 201

Time: 1 hour Credit Hour: 3.00 Full Marks: 60

There are FOUR (4) questions. Answer THREE (3) questions including Q2 and Q3. Figures given in the right margin indicate the marks of the respective questions.

1. a. If $A = \begin{pmatrix} 2 & 1 & 3 \\ 1 & -2 & 2 \\ 1 & 2 & 1 \end{pmatrix}$ then, find the value of $A^3 - 2A^2 - 9A$. **10**

   b. If $A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & 4 \end{pmatrix}, B = \begin{pmatrix} 1 & 2 \\ 0 & 1 \\ 1 & 0 \end{pmatrix}, C = \begin{pmatrix} 1 & 5 \\ -1 & -2 \end{pmatrix}$ then, prove that $(AB)C = A(BC)$. **10**

OR

2. a. Find the rank of the matrix $\begin{pmatrix} -6 & 1 & 0 & 3 & 2 \\ 2 & -4 & 3 & -7 & 0 \\ 0 & 1 & -2 & -1 & 5 \\ -4 & -1 & -1 & -6 & 12 \end{pmatrix}$. **10**

   b. Given $A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, B = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}, C = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$. Prove the following relations: **10**
   $A^2 = B^2 = C^2 = I$, $AB = -BA$, $AC = -CA$, $BC = -CB$.

3. a. Using the property of determinant, Solve $\begin{vmatrix} a+b+c & -c & -b \\ -c & a+b+c & -a \\ -b & -a & a+b+c \end{vmatrix}$. **10**

   b. Find the inverse of matrix $A = \begin{pmatrix} 2 & -1 & 3 \\ 4 & 0 & -1 \\ 3 & 3 & 2 \end{pmatrix}$. **10**

4. a. Solve the system of linear equations using Gaussian elimination method **10**
   $$x + 2y - 3z = -1$$
   $$3x - y + 2z = 7$$
   $$5x + 3y - 4z = 2$$

   b. Using Cramer's rules solve the following system of linear equations **10**
   $$2x + 4y + 6z = 22$$
   $$3x + 8y + 5z = 27$$
   $$-x + y + 2z = 2$$

Course Title: Basic Electrical Engineering   Course Code: ECE 201   Credit Hours: 3.00
Time: 1.00 Hour   Full Marks: 60

[There are **four** questions. Answer any **three** including **question 1 and 2**. Figures in the right margin indicate marks]

1. a. For the circuit given in figure 1, calculate: [10]
   i) The equivalent resistance R_{eq}.
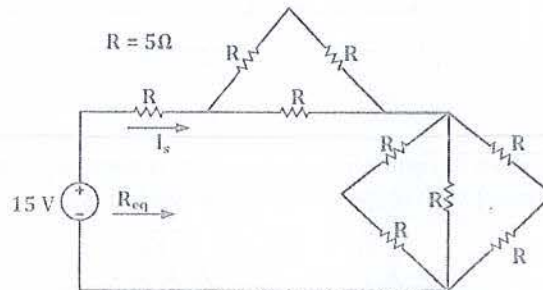   ii) The current I_s.

Figure 1

   b. Using nodal analysis, compute the node voltages shown in figure 2   [10]
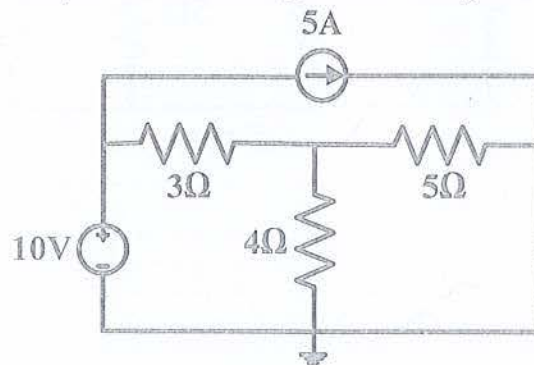

Figure 2

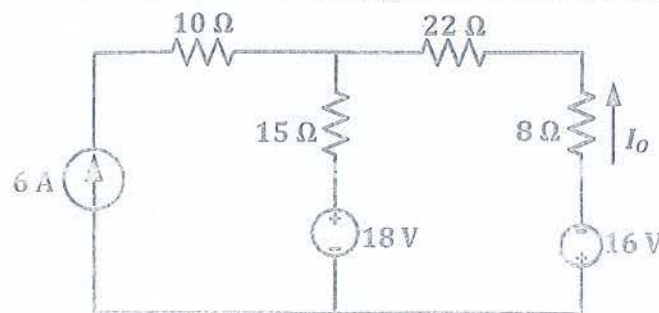2. Using superposition theorem, calculate current, I_O for the circuit shown in figure 3.   [20]

Figure 3

3. For the circuit shown in figure 4, construct the smallest equivalent circuit [one voltage [20] source and a resistor] with respect to the load resistor R_L.
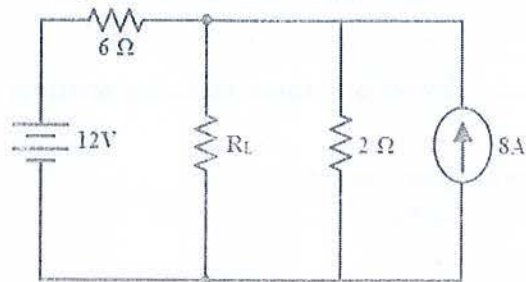

Figure 4

OR

4. For the circuit shown in figure 5, construct the smallest equivalent circuit [one current [20] source and a resistor] with respect to the load resistor R_L.
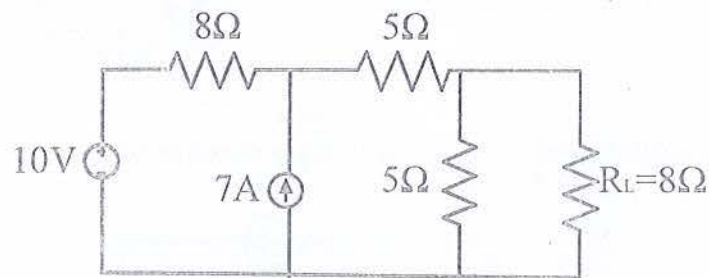

Figure 5

University of Asia Pacific
Department of Basic Sciences and Humanities
Midterm Examination Fall 2022
Program: B.Sc. Engineering (Civil)

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

Time: 1 hour   Credit Hour: 2   Full Marks: 40

Answer TWO questions including question no. 3

1. a. What do you know about sociology? Describe.   5

    b. Discuss how sociological knowledge might be used in everyday life.   15

<div align="center">OR</div>

2. a. Define social stratification.   5

    b. Discuss the major forms of stratification.   15

3. a. What does Lenski mean by socio-cultural evolution?   5

    b. Discuss, in brief, the main characteristics of agrarian societies and   15
        postindustrial societies.

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid Semester Examination, Fall 2022
Program: B. Sc. Engineering (Civil)

Course Title: Bangladesh Studies: History   Course Code: HSS211(b)
Time: 1 hour   Credit Hour: 2   Full Marks: 40

There are **three** questions. Answer **two questions including Q-1**

1. a. Explain Matsyanyayam.   10

    b. Discuss how Matsyanyaym ended and by whom?   10

2. a. What was independent sultanate?   5

    b. Explain the social changes in the Muslim period.   15

<div align="center">OR</div>

3. a. Who were the Bara Bhuiyans?   5

    b. Write down in brief who defeated them and how.   15