University of Asia Pacific
Department of Civil Engineering
Mid Examination Spring 2023
Program: B. Sc. Engineering (Civil)

Course Title: Engineering Mechanics   Credit Hours: 3.0   Course Code: CE 101
Time: 1-hour   Full Marks: 40

ANSWER ALL THE QUESTIONS

1. **_Fig.1_** shows a system of forces acting on a structure. Calculate the magnitude, direction, and location of resultant of the forces. **10**
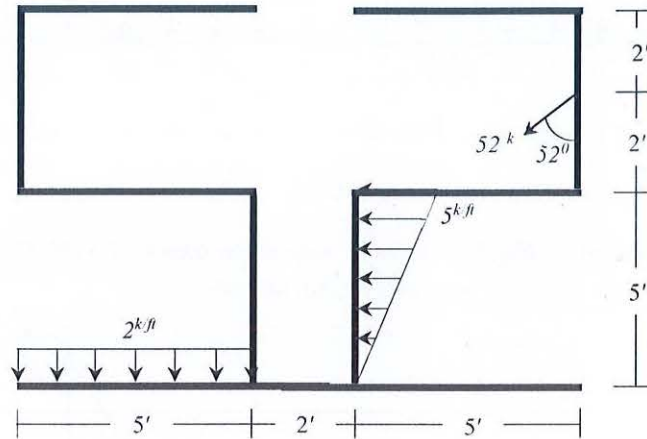

Fig.1

2. Two spheres A and B are at rest against smooth surfaces shown in **_Fig.2_**. Sphere A weights 250 *lb*. and sphere B weights 520 *lb*. Calculate the normal reactions at **C, D** and **E**. **05**
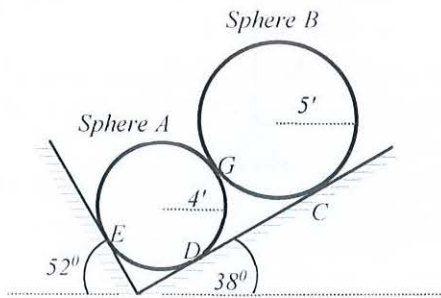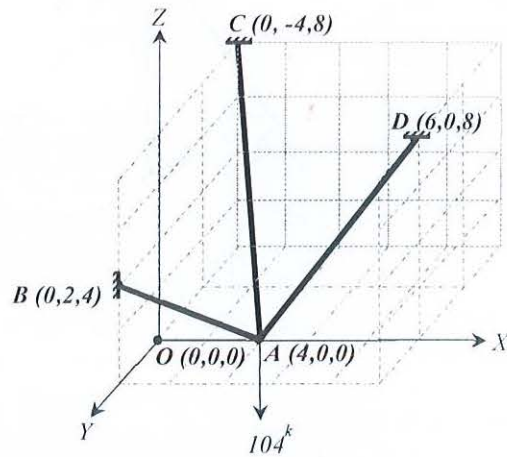

Fig.2

Fig.3

3. Calculate the tensions in cord AB, AC and AD used to support the 104 kips load (which acts in the Z direction) shown in **_Fig.3_**. **05**

4. In the beam loaded as shown in **_Fig.4_**, calculate the (i) reactions at supports **b** and **e**, and (ii) shear force and bending moment at point **c**.   **10**
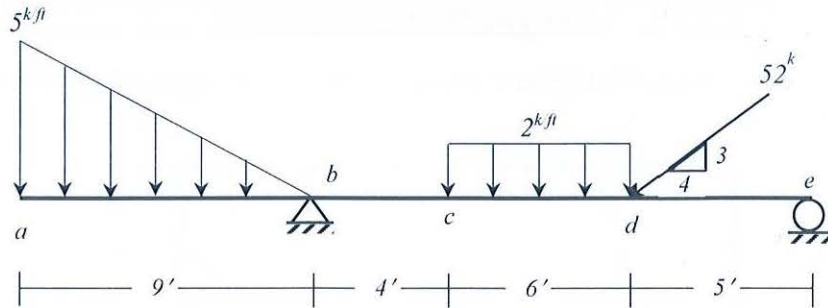

Fig.4

5. In the truss loaded as shown in **_Fig.5_** (i) Identify zero force member(s) (ii) Calculate the reactions at support **f** and **h** (ii) Calculate forces in members **be**, **bd**, and **ab**.   **10**
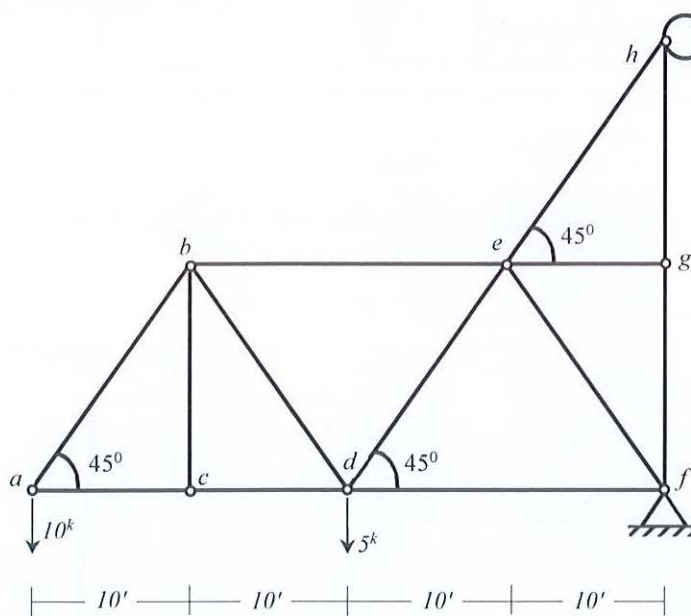

Fig.5

There are **FOUR** questions. Answer any **THREE** including **Q-1** and **Q-2**. Figures in the right margin indicate marks.

1. a. Interpret projectile motion. Establish the expression of horizontal range for a projectile motion.   **[5+10]**

    b. A body is thrown with a velocity of 49 ms^{-1} at an angle of projection 45°. Calculate maximum height, time of flight and horizontal range of the projectile. (g = 9.8 ms^{-2}).   **[5]**

2. a. Illustrate radius of gyration. State and prove perpendicular axis theorem of moment of inertia.   **[4+8]**

    b. Calculate the moment of inertia of a ring about an axis passing through its center.   **[8]**

3. a. Derive the equation $Y = 2\eta(1 + \sigma)$, where the symbols have their usual meanings.   **[5]**

    b. A steel wire of length 2.0 m is stretched through 2.0 mm. The cross-sectional area of the wire is 4.0 mm^2. Calculate the elastic potential energy stored in the wire in the stretched condition. Young's modulus of steel = 2.0×10^{11} Nm^{-2}.   **[5]**

    c. Explain Poisson's ratio. Show that the maximum possible value of Poisson's ratio is 0.5.   **[10]**

OR

4. a. Draw and analyze the stress-strain graph of a wire in case of increasing load.   **[10]**

    b. Prove that $Y = 3K(1 - 2\sigma)$, where the symbols have their usual meanings.   **[5]**

    c. Calculate the Poisson's ratio of a material, having $Y = 12.25 \times 10^{10}$ Nm^{-2} and $\eta = 4.55 \times 10^{10}$ Nm^{-2}.   **[5]**

Course Title: Mathematics-I	Course Code: MTH 101
Time: 1.00 Hour	Credit: 3.00	Full Marks: 60

There are **four (4) questions**. Answer **three (3) including Q1 and Q2**. Figures given in the right margin indicate the marks of the respective questions.

1. a. Evaluate $\lim\limits_{x \to -2} f(x)$ and $\lim\limits_{x \to 3} f(x)$ 12

   where, $f(x) = \begin{cases} \frac{1}{x+2}; & x < -2 \\ x^2 - 5; & -2 < x \leq 3 \\ \sqrt{x+13}; & x > 3 \end{cases}$

   Also, find the domain and range of the given function $f(x)$.

   b. Sketch the graph of (i) $y = 2x - 1$ (ii) $y = (x+3)^2 + 1$ 8
                   (iii) $y = 1 - x^4$ (iv) $y = \sqrt{-x+1}$.

2. a. Test the differentiability of $f(x)$ at $x = \frac{\pi}{2}$ 10

   where, $f(x) = \begin{cases} 1 + \sin x & \text{for } 0 \leq x < \frac{\pi}{2} \\ 2 + (x - \frac{\pi}{2})^2 & \text{for } \frac{\pi}{2} \leq x \end{cases}$.

   b. Find the maximum and minimum value of the function   10
   $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 5$.

3. a. State the Leibniz theorem. If $y = \tan^{-1} x$ then show that   10
   $(1 + x^2)y_{n+2} + 2(n+1)xy_{n+1} + n(n+1)y_n = 0$.

   b. State the Rolle's theorem. Show that the function $f(x) = x^2 - 5x + 4$ satisfies the hypotheses of Rolle's theorem over the interval $[1, 4]$, and find all values of c in the interval $(1, 4)$.   10

OR

4. a. If $y = \sin(ax + b)$ find y_n.   10

   b. If $u = \tan^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\sin 2u$.   10

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

Course Title: Basic Electrical   Course Code: ECE 101   Credit Hours: 3.00
             and Electronic Engineering

Time: 1.00 Hour   Full Marks: 60

There are **four** questions. Answer any **three including Q1 and Q2**. All questions are of equal value. Figures in the right margin indicate marks.

1. a) **Define** Ohm's law and **draw** its I-V characteristics graph.   [3+2]

   b) For the circuit given in figure 1, calculate: [5+2+4
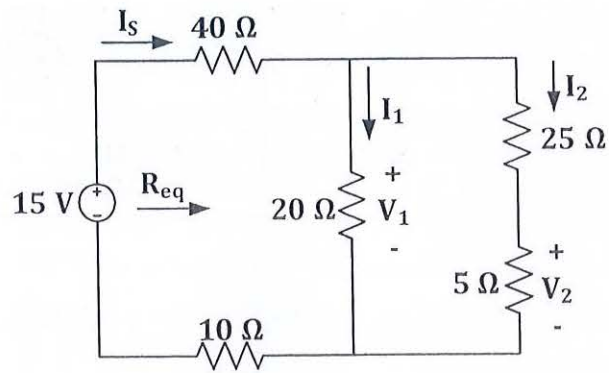   i) R_{eq} +4]
      ii) I_s
      iii) I_1 & I_2
      iv) V_1 & V_2

Figure 1

2. Using Superposition Theorem, determine V_O in figure 2.   [20]
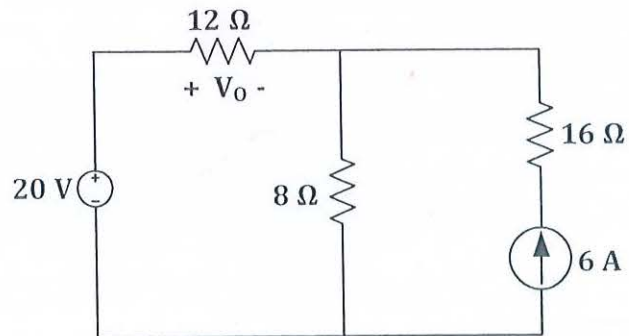

Figure 2

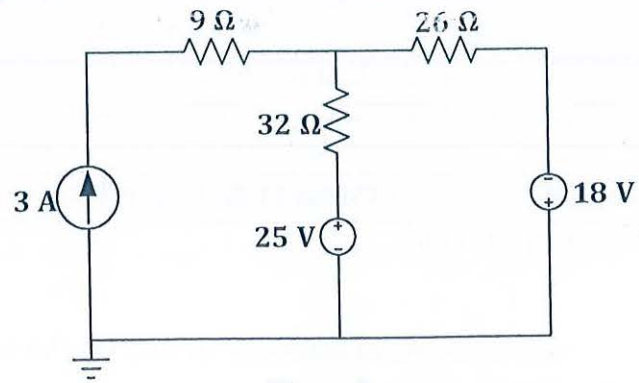**3.** Using nodal analysis, **determine** the node voltages in figure 3. [20]

Figure 3

OR

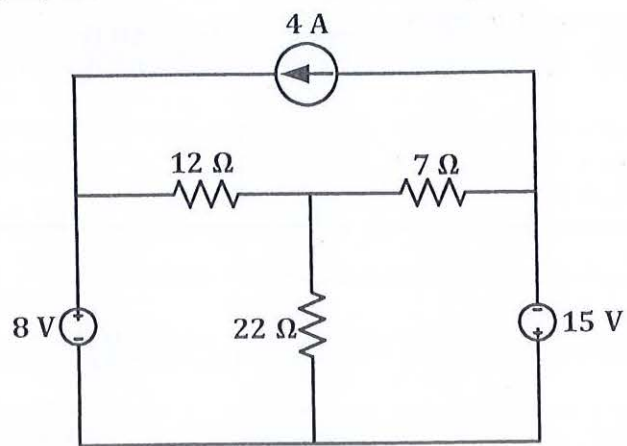**4.** Using mesh analysis, **determine** the mesh currents in figure 4. [20]

Figure 4

Course Title: History of Bangladesh Independence, Society and Culture Course Code: HSS 105
Time: 01 hour   Credit Hours: 03   Full Marks: 60

Use separate answer scripts for Part-A and Part-B. All questions are of equal value. Figures in the right margin indicate marks.

Part - A

Answer **ANY ONE.**

1.	a.	Write in brief about the partition of India in 1947.	10
	b.	Explain the main causes of partition of India in 1947.	20
2.	a.	Write about the United Front.	10
	b.	Evaluate the success of United Front in 1954 election.	20

Part - B

Answer **ANY ONE.**

1.	a.	Explain sociological imagination with examples.	10
	b.	Define social structure and explain the components of social structure.	10
	c.	Define social order and discuss how we can ensure social order in our lives.	10
2.	a.	Define social institution and discuss the importance of social institutions in our life.	10
	b.	Define social construction and explain the social construction concept with examples.	10
	c.	Define social change and discuss the sources of social change.	10

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring 2023
Program: B.Sc. Engineering (Civil)

Course Title: Introduction civil & env. engg.　　　　　　　　Course Code: CE 107
Time: 1 hour　　　　　　　　　　Credit Hour: 2.0　　　　　　Full Marks: 40

**(Answer all the questions. All questions are of equal value. Figures
in the right margin indicate marks)**

1. What is civil engineering? What do the civil engineers do? [10]

2. a) Differentiate between natural and built environment. [2]

　b) Discuss how 3R principle can minimize waste production? [3]

　c) Explain the necessity of studying environmental science. [5]

3. a) Discuss the importance of environmental ethics. [5]

　b) Discuss the ecosystem hierarchy. [5]

4. a) Discuss the impacts of floods in Bangladesh. [5]

　b) A box measures 3.12 ft in length, 0.0455 yd in width, and 7.87 inches in height. [5]
　What is its volume in cubic centimeters?