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University of Asia Pacific
Department of Civil Engineering
Mid-term Examination, Spring 2024
Program: B.Sc. in Civil Engineering

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. Explain the following: [10]
   - i) Environment
   - ii) Environmental science
   - iii) Environmental engineering
   - iv) Environmental ethics
   - v) Environmental pollution

2. a) What is 3R principle? [2]
   b) Discuss how 3R principle can minimize waste production? [3]
   b) Describe greenhouse effect. [5]
3. a) Differentiate between biotic and abiotic environments with examples. [2.5]
   b) Differentiate between micro and macro environment. [2.5]
4. a) Point out the major components of a building and discuss them in brief. [10]
   b) Calculate the weight of a brick in lb and kg, if its size is about 9.5 in × 11.43 cm [5]
× 63.5 mm. Consider unit weight of brick material is 120 lb/ft^3. 1 kg = 2.20 lb.

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination, Spring 2024
Program: B. Sc. Engineering (Civil)

Course Title: History of Bangladesh Independence, Society and Culture | Course Code: HSS 105
Time: 1 hour | Credit Hours: 03 | Full Marks: 60

Instructions:

- Use separate 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.	Discuss about the origin of the name of Bangladesh.	10
	b.	Identify the Pala dynasty's founder and describe its achievements.	20
2.	a.	Describe the main causes of the 1905 partition in Bengal.	15
	b.	What was the consequences of this partition?	15

Part - B

Answer ANY ONE.

3.	a.	Define sociological imagination.	5
	b.	Explain how and why 'offering a cup of tea/coffee' could be a subject matter of the course HSS 105?	25
4.	a.	Define socio-cultural evolution approach.	5
	b.	Explain the changing pattern of solidarity and neighbourhood both in rural and urban areas of modern societies through the lens of socio-cultural evolution approach.	25

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University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Spring 2024
Program: B.Sc. in Civil Engineering

Course Title: Engineering Mechanics | Course Code: CE 101(OBE)
Time: 1 hour | Credit Hour: 3.0 | Full Marks: 50

Answer all the questions.

[Assume reasonable data if required]

PART A

1. A cylindrical roller of weight 10 kN and of diameter 1.5 m has to be pulled over the obstruction of height 375 mm by applying a horizontal force F as shown in **Fig. 1**. Determine the minimum value of the force F to be applied to pull the roller over the obstruction. Also find the reaction at the contact point A between the roller and the obstruction. **[7]**

2. A vertical load of 50 N has been suspended with the help of two weightless cables AC and BC as shown in **Fig. 2**. Calculate the values of tension in the cables AC and BC. Also find the components of pin reactions at A. **[10]**

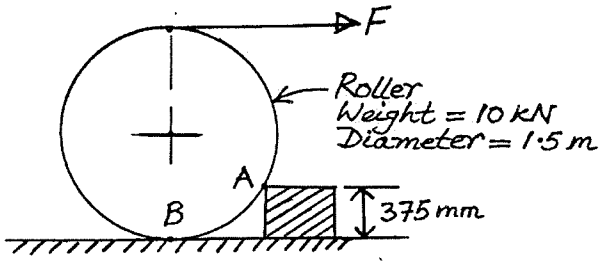

Fig. 1

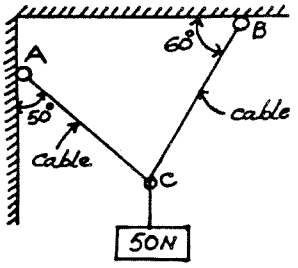

Fig. 2

3. For the simply supported beam shown in **Fig. 3**, determine the reactions at support A and support B. **[8]**

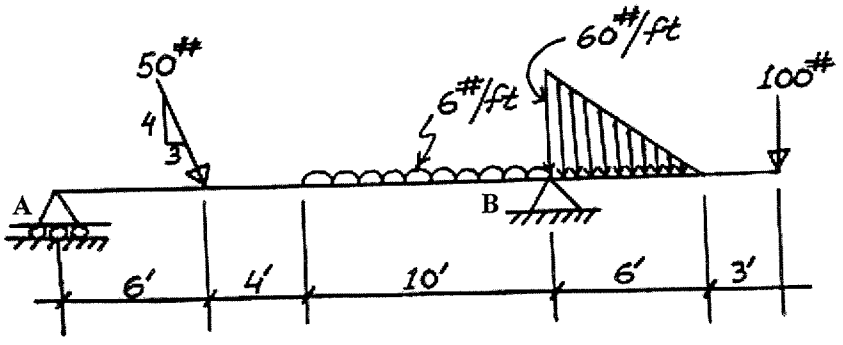

Fig. 3

PART B

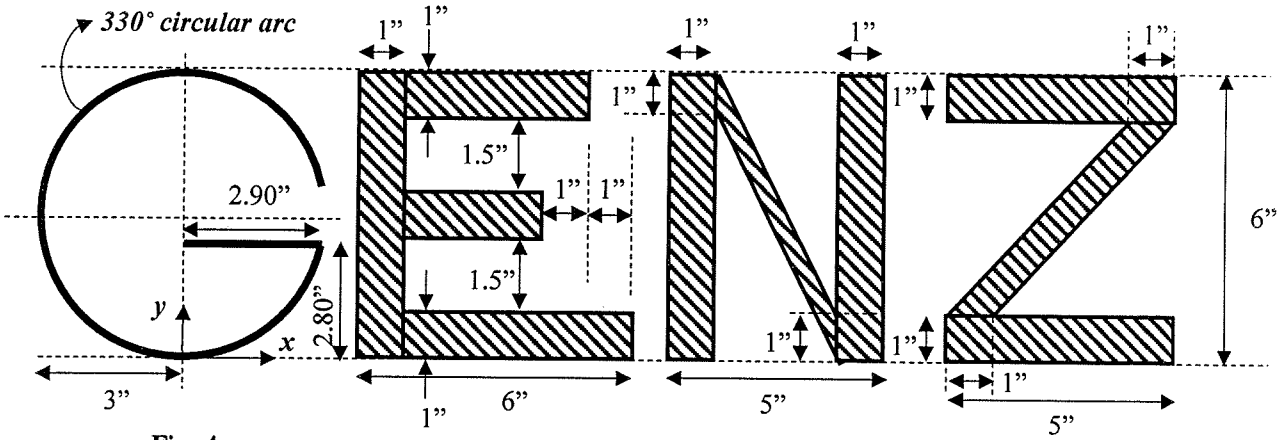

Fig. 4 Fig. 5 Fig. 6 Fig. 7

4. Locate the centroid of the composite line shown in **Fig. 4** with respect to the given coordinate system. [7]

5. Locate the centroid of the composite area shown in **Fig. 5.** [7]

6. Compute the moment of inertia $\mathbf{I_x}$ and $\mathbf{I_y}$ as well as radius of gyration $\mathbf{k_x}$ and $\mathbf{k_y}$ with respect to the centroidal axes of the composite area shown in **Fig. 6.** [11]

OR

Compute the moment of inertia $\mathbf{I_x}$ and $\mathbf{I_y}$ as well as radius of gyration $\mathbf{k_x}$ and $\mathbf{k_y}$ with respect to the centroidal axes of the composite area shown in **Fig. 7.**

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Spring 2024
Program: B.Sc. in Civil Engineering

Course Title: Engineering Mechanics | Course Code: CE 101(OBE)
Time: 1 hour | Credit Hour: 3.0 | Full Marks: 50

Answer all the questions.

[Assume reasonable data if required]

PART A

1. A cylindrical roller of weight 10 kN and of diameter 1.5 m has to be pulled over the obstruction of height 375 mm by applying a horizontal force F as shown in **Fig. 1**. Determine the minimum value of the force F to be applied to pull the roller over the obstruction. Also find the reaction at the contact point A between the roller and the obstruction. **[7]**

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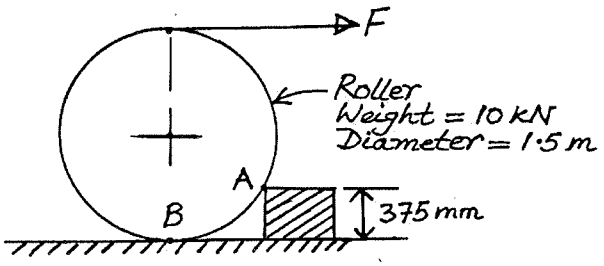

Fig. 1

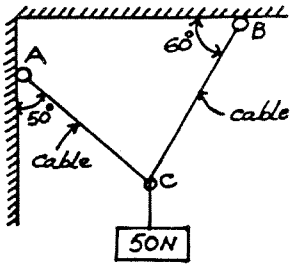

Fig. 2

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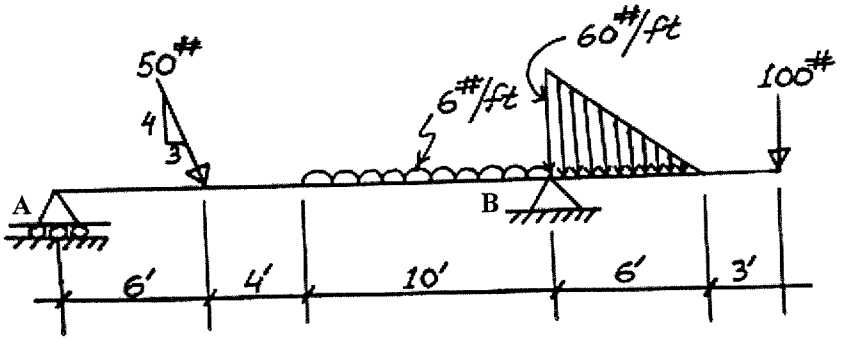

Fig. 3

PART B

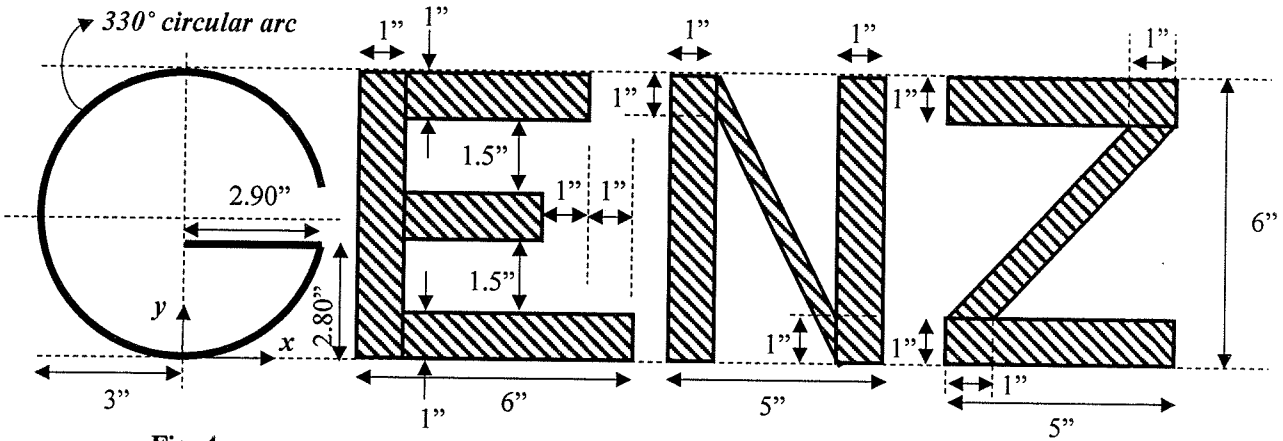

Fig. 4 Fig. 5 Fig. 6 Fig. 7

4. Locate the centroid of the composite line shown in **Fig. 4** with respect to the given coordinate system. [7]

5. Locate the centroid of the composite area shown in **Fig. 5.** [7]

6. Compute the moment of inertia $\mathbf{I_x}$ and $\mathbf{I_y}$ as well as radius of gyration $\mathbf{k_x}$ and $\mathbf{k_y}$ with respect to the centroidal axes of the composite area shown in **Fig. 6.** [11]

OR

Compute the moment of inertia $\mathbf{I_x}$ and $\mathbf{I_y}$ as well as radius of gyration $\mathbf{k_x}$ and $\mathbf{k_y}$ with respect to the centroidal axes of the composite area shown in **Fig. 7.**

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Spring 2024
Program: B.Sc. in Civil Engineering

Course Title: Physics I | Course Code: PHY 101
Time: 1 hour | Credit Hour: 3.0 | Full Marks: 60

There are **FOUR** questions. Answer any **THREE** including **Q-1** and **Q-4**. Figures in the right margin indicate marks.

1. a. Define moment of inertia & radius of gyration. [5]

   b. Show that moment of inertia of a uniform circular disc about an axis passing through its center and perpendicular to its plane is $0.5MR^2$, where the symbols have their usual meanings. [10]

   b. A circular disc of mass 100 g and radius 10 cm is making 120 rpm about an axis passing through its center and perpendicular to its plane. Calculate its kinetic energy. [5]

2. a. Explain Poisson's ratio. Show that the range of Poisson's ratio will be $-1 < \sigma < 0.5$ [5]

   b. Show that the bulk modulus of elasticity $K = \frac{Y}{3(1-2\sigma)}$, where the symbols have their usual meanings. [10]

   c. A 10 kg mass is attached to one end of a copper wire of length 5 m long and 1 mm in diameter. Calculate the extension and lateral strain, if Poisson's ratio is 0.25. Young's modulus of the wire $Y = 11 \times 10^{10}\ N\ m^{-2}$ [5]

OR

3. a. State the perpendicular axis theorem. [5]

   b. Prove that moment of inertia of a rectangular lamina about an axis passing through its center and perpendicular to its plane is $I = \frac{M}{12}(l^2 + b^2)$ [10]

   c. Calculate the moment of inertia about the geometric center of the given structure made up of one thin rod connecting two similar solid spheres as shown in Figure 3(c). [5]

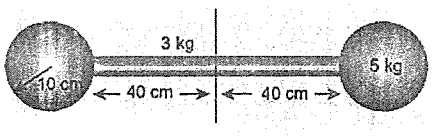

Figure: 3(c)

4. a. Define Hooke's law and rigidity modulus (use figure if necessary) **[5]**

b. Prove that in case of shearing strain, the work done per unit volume is equal to $\frac{1}{2} \times Stress \times Strain$ **[10]**

c. An iron wire of diameter 0.8 cm and length 3 m is fixed at both ends so that it cannot expand, then it is heated from 10°C to 100°C . Calculate the force exerted on each end of the wire where, $Y = 2 \times 10^{11}\ Nm^{-2}$ and $\alpha = 18 \times 10^{-6} K^{-1}$ **[5]**

University of Asia Pacific

Department of Civil Engineering

Mid – Semester Examination, Spring – 2024

Program: B.Sc. in CE (1st Year/1st Semester)

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

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. **Compute** the power of 'R_2' in Figure 1. **[20]**

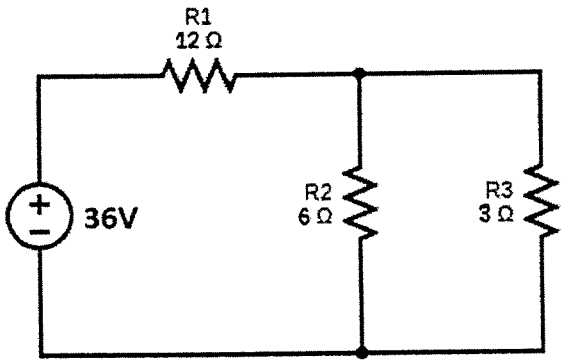

Figure 1

2. **Compute** the value of current through 'R_2' in Figure 2 **[20]**

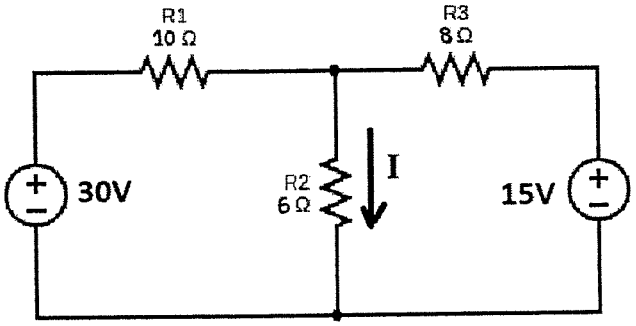

Figure 2

3 For the circuit in Figure 3, construct the smallest equivalent circuit [one voltage source and a resistor] with respect to the load resistor RL. **[20]**

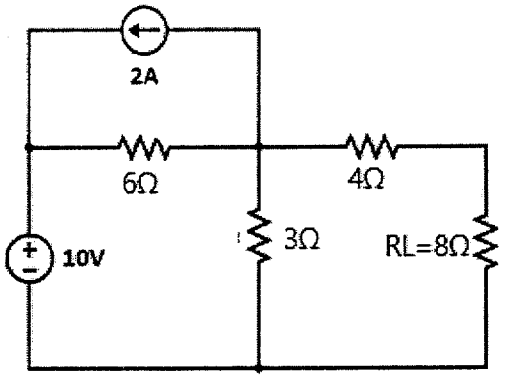

Figure 3

OR

4. For the circuit in Figure 3, construct the smallest equivalent circuit [one current source and a resistor] with respect to the load resistor RL. **[20]**

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Spring 2024
Program: B.Sc. in Civil Engineering

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. Define domain of the function. Find the domain of the following functions: **10**

I. $f(x) = \sqrt{\frac{x-3}{5-x}}$ II. $f(x) = \sqrt{x^2 - 7}$

b. Show that $f(x)$ is continuous at $x = 0$ also investigate its differentiability at $x = 0$ where, $f(x) = \begin{cases} -x & ; x \leq 0 \\ x & ; 0 < x < 1 \\ 1 - x & ; x \geq 1 \end{cases}$. **10**

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

b. Obtain the equation of tangent and normal of the function $y = 3x^2 + 5x - 9$ at $x = 1$. **10**

3. a. 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**

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

OR

4. a. Verify Mean Value theorem for the function $f(x) = x(x - 1)(x - 2)$ on the interval $(0, \frac{1}{2})$. **10**

b. Express the 5^{th} order Maclaurin's polynomials of $f(x) = ln\,(1 + x)$. **10**

University of Asia Pacific
Department of Civil Engineering
Mid-term Examination Spring-2024
Program: B.Sc. Engineering (Civil)

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

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

1. a. Find domain of the following functions: 12

I. $f(x) = \sqrt{\frac{x-2}{3-x}}$ II. $f(x) = \sqrt{4-x^2}$

b. Find the domain and range of the following piecewise function 08

$$f(x) = \begin{cases} 2x-6 & -4 \le x \le 0 \\ 6 & 0 < x < 2 \\ 2x+6 & 2 \le x \le 4 \end{cases}.$$

2. Show that $f(x)$ is continuous at $x = 0$ and investigate its differentiability at $x = 1$ where, $(x) = \begin{cases} -x & x \le 0 \\ x & 0 < x < 1 \\ 1-x & x \ge 1 \end{cases}$. 20

3. a. Differentiate the following functions with respect to the independent variable 10

I. $\sqrt{x}e^x$ II. $\ln(cose^{t^2})$

b. If $y = e^{-x}cosx$ then prove that $\frac{d^4y}{dx^4} + 4y = 0$ 10

OR

4. a. Find the first six Maclaurin polynomial of $cosx$ at $x = 0$. 10

b. Find the maximum and minimum value of $f(x) = x^3 - 3x^2 - 9x$. 10