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University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Spring 2025
Program: B.Sc. in Civil Engineering
1st Year 1st Semester

Course Title: History of Bangladesh Independence, Society and Culture
Time: 1 hour

Credit Hour: 3.00

Course Code: HSS105
Full Marks: 60

Use separate answer scripts for Part-A and Part-B.

PART-A [30 MARKS]

QUESTION 1 [30 MARKS]

Explain the causes and consequences of the Partition of Bengal of 1905.

[30]

PART - B [30 MARKS]

QUESTION 2 [30 MARKS]

Define sociocultural evolution.

How did Gerhard Lenski relate the evolution of human societies with the innovation of technology? Briefly discuss Lenski's description of societies that had changed over the past 3 million years.

[30]

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Course Title: Engineering Mechanics
 Time: 1 hour

Credit Hour: 3.00

Course Code: CE 101(OBE)
 Full Marks: 50

Answer all the questions

PART A

QUESTION 1 [8 MARKS]

A cylindrical roller of weight 10 kN and of diameter 1.25 m has to be pulled over the obstruction of height 360 mm by applying a horizontal force F as shown in **Figure 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.

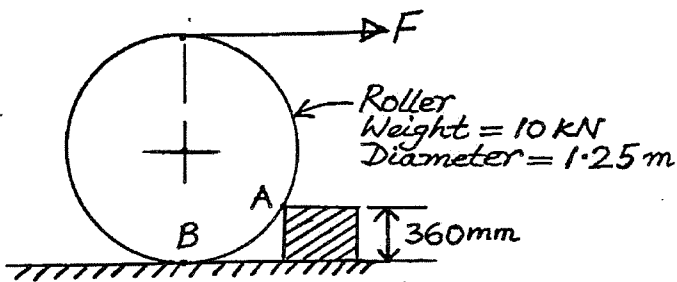


Figure 1

QUESTION 2 [8 MARKS]

A cylinder of weight 200 N has been suspended with the help of a cable, and it remains in equilibrium on a smooth inclined plane as shown in **Figure 2**. Calculate the values of tension in the cable BC and the reaction at the contact point A between the cylinder and the inclined plane. Also find the components of pin reaction at B.

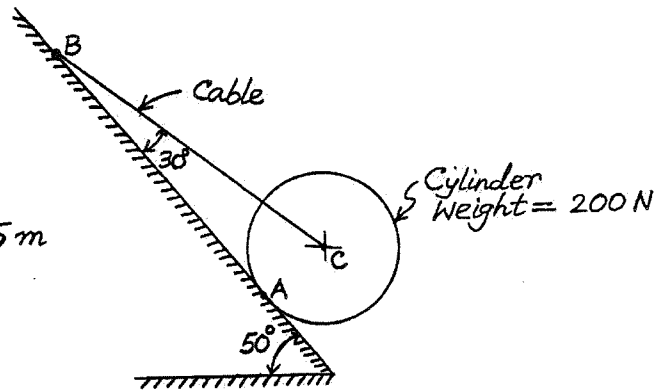


Figure 2

QUESTION 3 [9 MARKS]

For the simply supported beam shown in **Figure 3**, determine the reactions at support A and support B.

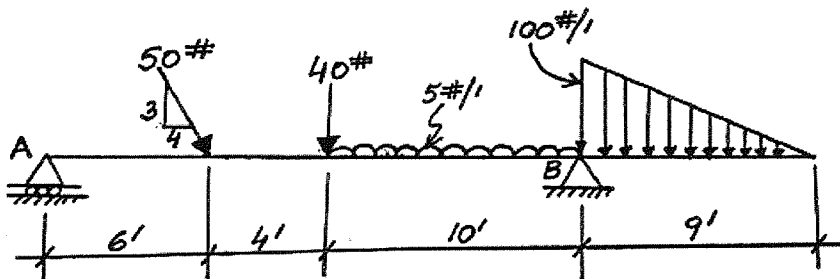


Figure 3

PART B

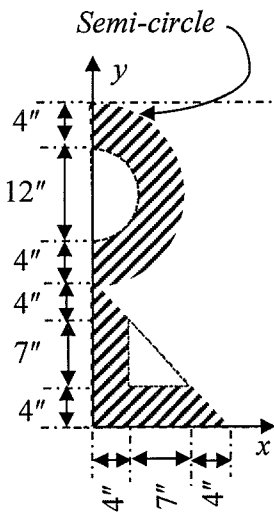


Figure 4

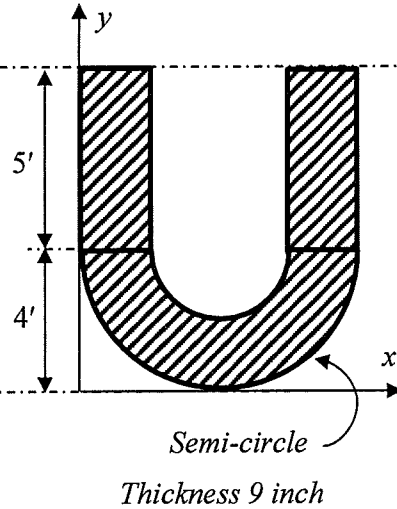


Figure 5

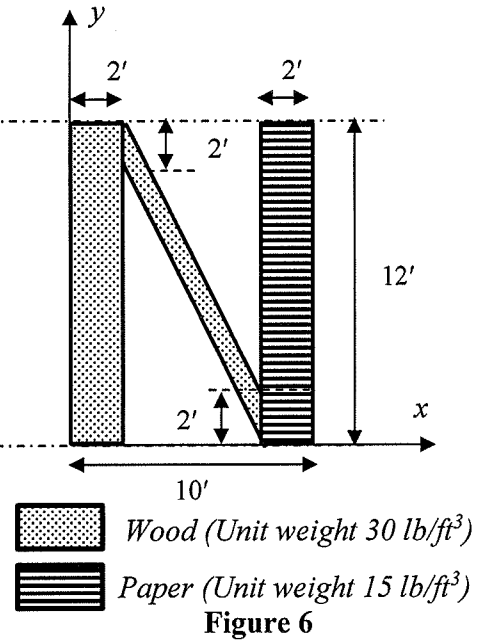


Figure 6

QUESTION 4 [7 MARKS]

Locate the centroid of the shaded composite area shown in **Figure 4** with respect to the given coordinate system.

QUESTION 5 [10 MARKS]

Compute the moment of inertia I_x and I_y as well as radius of gyration k_x and k_y with respect to the given coordinate system of the composite area shown in **Figure 5**.

QUESTION 6 [8 MARKS]

A body made of wood and paper has cross sectional view as shown in **Figure 6**. The dimension of this body in z axis is 15 ft. Locate the centroid of the composite weight with respect to the given coordinate system.

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Program: B.Sc. in Civil Engineering
1st Year 1st Semester

Course Title: Basic Electrical and Electronic Engineering
 Time: 1-hour

Credit Hour: 3.00

Course Code: ECE 101
 Full Marks: 60

Answer all the questions

QUESTION 1 [20 MARKS]

[10+10]

A simple DC circuit was developed to study the power vs voltage of a resistor. The result is shown in **Figure 1**. (a) **Determine** the resistance of the circuit and (b) **demonstrate/** propose a circuit to study such relationship based on Ohm's law.

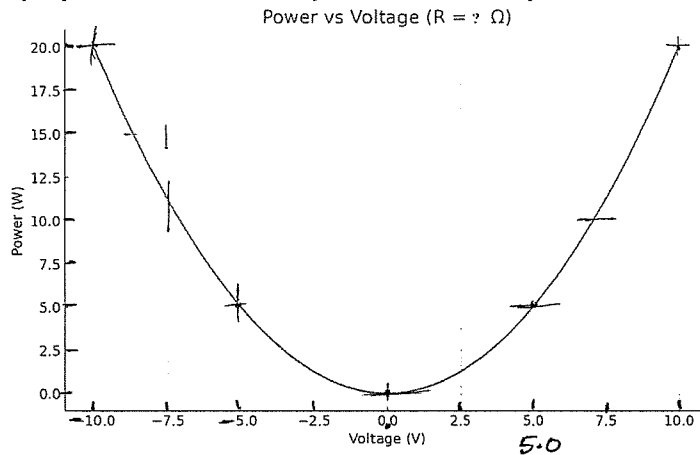


Figure 1

QUESTION 2 [20 MARKS]

[20]

While developing the circuit in **Figure 2**, accidentally all 40-ohm resistors were replaced by 10-ohm resistors. **Solve** the power delivered to the circuit?

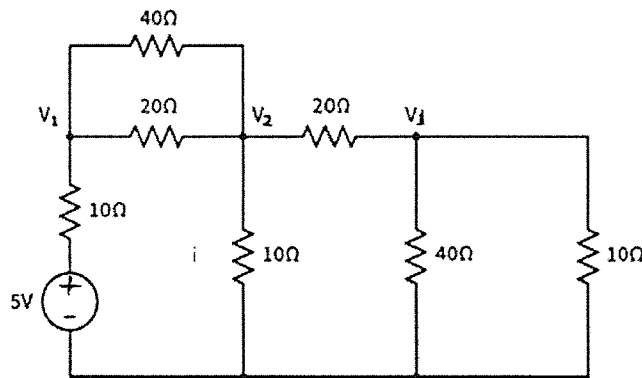


Figure 2

QUESTION 3 [20 MARKS]

[15+5]

For the circuit shown in **figure-3**, **determine** the value of equivalent resistance while replacing the 10-ohm resistor to ensure maximum power supply at its terminals. **Solve** the value of the maximum power?

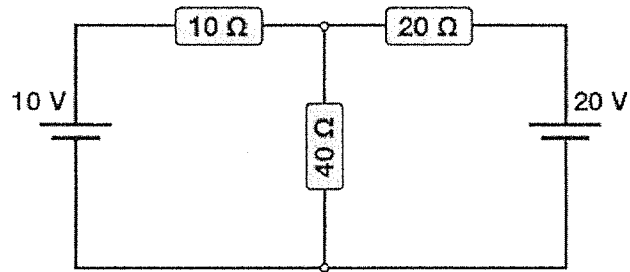


Figure 3

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1st Year 1st Semester

Course Title: Mathematics I

Course Code: MTH 101

Time: 1 hour

Credit Hour: 3.00

Full Marks: 60

Answer all the questions.

QUESTION 1 [20 MARKS]

a. Define function. Find the domain and range of the following functions [2+6+6]

1. $f(x) = \sqrt{\frac{x-5}{9-x}}$

2. $f(x) = \sqrt{x^2 - 5x + 6}$

b. Apply L'Hôpital's Law to find [4+4]

i) $\lim_{x \rightarrow 1} \frac{x^4 - 4x^3 + 6x^2 - 4x + 1}{x^3 - 3x^2 + 3x - 1}$

ii) $\lim_{x \rightarrow 1} (x)^{\frac{1}{x-1}}$

QUESTION 2 [20 MARKS]

a. Investigate continuity and differentiability of the function $f(x)$ at $x = 1$. Where, [6+6]

$$f(x) = \begin{cases} -x + 1 & ; x < 1 \\ 0 & ; x = 1 \\ x - 1 & ; x > 1 \end{cases}$$

b. Find the derivative of the following functions with respect to x . [4+4]

i) $[\ln\{\sqrt{1 + \ln x} - \sin x\}]$

ii) $\{(x^2 + 1)\sin^{-1}x + e^{\sqrt{1+x^2}}\}$

QUESTION 3 [20 MARKS]

a. If $y = \tan^{-1}x$, show that $(1 - x^2)y_{n+2} + 2(n + 1)xy_{n+1} + n(n + 1)y_n = 0$. [12]

And $(1 - x^2)y_{n+1} + 2nxy_n + n(n - 1)y_{n-1} = 0$.

b. Investigate the maximum and minimum value of the function [08]

$$f(x) = x^4 - 8x^3 + 22x^2 - 24x + 5$$

OR

a. If $y = \sin(m \sin^{-1}x)$, show that [12]

$$(1 - x^2)y_{n+2} = (2n + 1)xy_{n+1} + (n^2 - m^2)y_n.$$

$$(1 - x^2)y_{n+1} = [2n - 1]xy_n + \{(n - 1)^2 - m^2\}y_{n-1}.$$

b. Express the 5th order Maclaurin's polynomials of $f(x) = \ln(1 + x)$. [08]

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Course Title: Physics I

Course Code: PHY 101

Time: 1 hour

Credit Hour: 3.00

Full Marks: 60

Answer all the questions

QUESTION 1 [20 MARKS]

- a. Define simple harmonic motion. Show that average kinetic energy of a particle executing simple harmonic motion is given by $\pi^2 m a^2 n^2$, where the symbols have their usual meanings. [10]
- b. For a particle vibrating simple harmonically the displacement is 4 cm at the instant the velocity is 3 cm/sec and the displacement is 3 cm at the instant the velocity is 4 cm/sec. Calculate (i) amplitude, (ii) frequency, and (iii) time period. [10]

QUESTION 2 [20 MARKS]

- a. Show that work done per unit volume for shearing strain $W = \frac{1}{2} \times \text{stress} \times \text{strain}$, where the symbols have their usual meanings. [10]
- b. Calculate the total work done in stretching a uniform metal wire of area of cross section 10^{-7} sq mm and length 2.5 m through 6×10^{-3} mm. Given that $Y = 2.0 \times 10^{11} \text{ Nm}^{-2}$. [10]

QUESTION 3 [20 MARKS]

- a. Define beam and mention some uses of beam. [5]
- b. Derive that the bending moment of a beam is equal to $\frac{Y I g}{R}$, where the symbols have their usual meanings. [15]

OR

- a. Define Poisson's ratio and elasticity. [5]
- b. Derive that $K = \frac{Y}{3(1-2\sigma)}$, where the symbols have their meanings. [15]

