1-1

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

Course Title: History of Bangladesh Independence, Society and Culture Course Code: HSS 105
Time: 3 hours Credit Hours: 03 Full Marks: 150

Use separate answer scripts for Part-A and Part-B. Figures in the right margin indicate marks.
Answer the following questions.

Part A

1. Discuss the Six-point Programme . 30

2. a) Describe the background of the Liberation War of Bangladesh. 15
   b) Write a short note on the Mujibnagor Government. 15

3. Discuss the importance of Language Movement in the development of Bengali nationalism 15

OR

4. Explain the contribution of Raja Rammohon Roy to the society. 15

Part B

5. Differentiate between material and non-material culture with examples. In the context of cultural differences between you and your parents/grandparents explain the factors of cultural development around the world. 30

6. Define socialization. Suppose, A and B, a boy and a girl, 25 years old university going students from Bangladesh and X and Y, a boy and a girl, 25 years old university going students from the USA. The Bangladeshi pair and USA pair of boys and girls are in relationships. Do you think there will be any differences between the two pairs in terms of interaction and behaviour to each other? Give your answer in light of process of socialization and self-development. 30

7. Define social Darwinism. Explain the idea of socio-cultural evolution in the context of the movie 'Television'. 15

OR

8. State different features of counter-culture with particular reference of Holey Artisan Bakery incident in Dhaka. Explain cultural lag and ethnocentrism with example for each from your society. 15

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

Course Title: Physics I | Course Code: PHY 101
Time: 3.0 hours | Credit Hour: 3.0 | Full Marks: 150

There are **eight** questions. Answer **six** including questions **1, 2, 5** and **6**. Figures in the right margin indicate marks.

1. a. Explain Lissajous figures. A particle is subjected to two SHMs (acting at right angles to each other) represented by the following equations, **20**

$$x = a_1 \sin \omega t \ , \qquad y = a_2 \sin(2\omega t + \delta)$$

Discuss the formation of Lissajous figures due to superposition of these two vibrations & specifically show the figures for $\delta = \pi$ and $\delta = \frac{\pi}{2}$

b. Two simple harmonic motions acting simultaneously on a particle are given by the equations, $y_1 = 2\,sin\left(\omega t + \frac{\pi}{6}\right)$, $y_2 = 3\,sin\left(\omega t + \frac{\pi}{3}\right)$. **05**

Calculate (i) amplitude, (ii) phase Constant, (iii) time period of the resultant vibration.

2. a. State the Bernoulli's theorem for a fluid having streamline motion. Prove that, for an ideal fluid having steady flow of streamline motion, $\frac{P}{\rho g} + h + \frac{v^2}{2g} = constant$, where the symbols have their usual meaning. **20**

b. Water is flowing smoothly through a closed pipe system. At one point the speed of water is $3\ ms^{-1}$, while at another point 3 m higher, the speed is $4\ ms^{-1}$. If the pressure is 80kPa at the lower point, what is the pressure at the upper point? **05**

3. a. Explain the First Law of thermodynamics. Show that for adiabatic process, $TV^{\gamma-1} = constant$, where the symbols have their usual meaning. **20**

b. A quantity of air at 27°C and atmospheric pressure is suddenly compressed to half of its original volume. Find the final (i) pressure and (ii) temperature. $[\gamma = 1.4]$ **05**

OR

4. a. Explain the Carnot's cycle briefly. Find the total work done and efficiency of an ideal heat engine. **20**

b. Find the efficiency of a Carnot's engine working between the temperature 227°C and 27°C. **05**

5. **a.** Show that the differential equation of a progressive wave is **15**

$$\frac{d^2y}{dt^2} = v^2 \frac{d^2y}{dx^2}$$

where the symbols have their usual meaning.

b. The equation of a progressive wave is given by, **10**

$$y = 10 \sin \frac{2\pi}{100}(36000t - 20)$$

Calculate the (i) amplitude, (ii) wave velocity, (iii) wavelength, (iv) frequency, (v) time period of the wave.

6 **a.** Show that for a particle executing simple harmonic motion (SHM), the instantaneous velocity is $\omega\sqrt{a^2 - y^2}$ and instantaneous acceleration is $-\omega^2 y$. Also give graphical representation of SHM. **15**

b. A simple harmonic motion is given by the equation, $y = 20 \sin(10t - \frac{\pi}{6})$, where y is measured in meter, t in sec and phase angle in radians. Calculate its (i) amplitude, (ii) frequency, (iii) time period, and (iv) velocity and acceleration at time, $t = 1.5$ sec **10**

7. **a.** Show that the range of Poisson's ratio is given by, $-1 < \sigma < 0.5$ **10**

b. Prove that the bulk modulus of elasticity $K = \frac{Y}{3(1-2\sigma)}$, where the symbols have their usual meaning. **15**

OR

8. **a.** Define Hooke's Law and Young's Modulus. Prove that, in case of longitudinal strain, the work done per unit volume is equal to $\frac{1}{2} \times$ Stress $\times$ Strain **15**

b. 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 the Poisson's ratio is 0.25. Given Young's modulus of the wire, $Y = 11 \times 10^{10}\ Nm^{-2}$ **10**

University of Asia Pacific
Department of Civil Engineering
Semester Final Examination Spring-2024 (Self Study)
Program: B.Sc. in Engineering

Course Title: Mathematics-I | Course Code: MTH 101
Time: 3.00 Hours | Credit Hour: 3.00 | Full Marks: 150

There are eight questions. Answer any six. Figures given in the right margin indicate the marks of the respective questions.

1. a) Find the area of the region which is enclosed between the curves $y = x^2$ and $y = x + 6$. 15

   b) Use cylindrical shells to find the volume of the solid generated when the region enclosed between $y = \sqrt{x}, x = 1, x = 4$ and the x axis is revolved about the y axis. 10

2. Using Beta and Gamma function solve the followings 25

   (i) $\int_o^1 x^5(1-x)^{\frac{5}{2}}\,dx$ (ii) $\int_0^{\frac{\pi}{2}} sin^4\theta cos^6\theta d\theta$

3. Solve the followings using partial fraction 25

   (i) $\int \frac{1}{x^2+x}dx$ (ii) $\int \frac{2x-1}{x(x-1)(x-2)}dx$

4. Solve the followings- (any five) 25

   i. $\int lnx\,dx$

   ii. $\int x^2e^x\,dx$

   iii. $\int cos^3x\,dx$

   iv. $\int \frac{sin^4x}{cos^8x}dx$

   v. $\int \frac{dx}{1-siinx}$

   vi. $\int \frac{cos2x-cos2a}{cosx+cosa}dx$

5. a) Find the maximum and minimum value of $x^4 - 8x^3 + 22x^2 - 24x + 5$. 15

   b) Verify that the hypothesis of Rolle's theorem are satisfied on the given interval and find all values of c in that interval that satisfy the conclusion of the theorem$(x) = (x-1)(x-2)(x-3)$ on (0,4). 10

6 a) Find the maximum and minimum value of $x^3 - 3x^2 - 9x$. 10

   b) Verify that the hypothesis of Mean value theorem are satisfied on the given interval and find all values of c in that interval that satisfy the conclusion of the theorem $f(x) = x^2 + 5x - 6$ on (-6,1). 15

7 Differentiate the followings with respect to the independent variable 25

(a) $\frac{x^3-27}{x^2+3x+9}$ (b) $x^2 lnx - 6e^x cosx+7$ (c) $\frac{sint+cost}{sint-cost}$

(d) $\sqrt{x} + \sqrt[4]{x} + \frac{3}{x}$ (e) $\tan(\ln(\sin e^{\sqrt{x}})$

8 If $u = sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}tanu.$ 25

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

Course Title: Engineering Mechanics | Course Code: CE 101(OBE)
Time: 3 hours | Credit Hour: 3.0 | Full Marks: 150

Answer all the questions.

[Assume reasonable data if required]

PART A

1. **(a)** Using the system of frictionless pulleys, a weight W has to be lifted by applying a pulling force of P as shown in **Fig. 1.** Find the value of W if P = 200 N. **[5]**

(b) A bar AB of weight 500 N is hinged to a vertical wall at A and has been supported by a cable as shown in **Fig. 2.** The length of the bar is 10 m. Determine the tension in the cable and components of pin reactions at A and C. **[10]**

(c) A ladder **AB** of length 4 m and weighing 200 N is placed against a vertical wall. The ladder also supports a man weighing 550 N as shown in **Fig. 3.** The coefficient of static friction between the wall and the ladder is 0.3 and that between the floor and the ladder is 0.2. Calculate the minimum horizontal force P to be applied at the bottom of the ladder to prevent slipping of the ladder. **[10]**

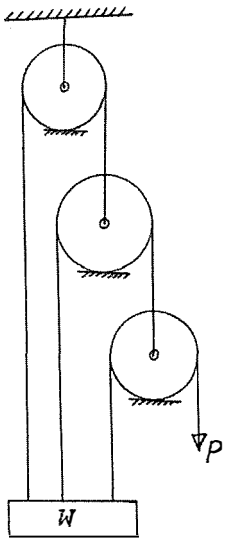


Fig. 1

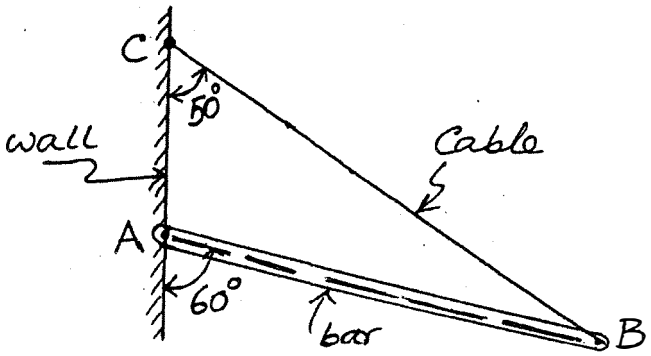


Fig. 2

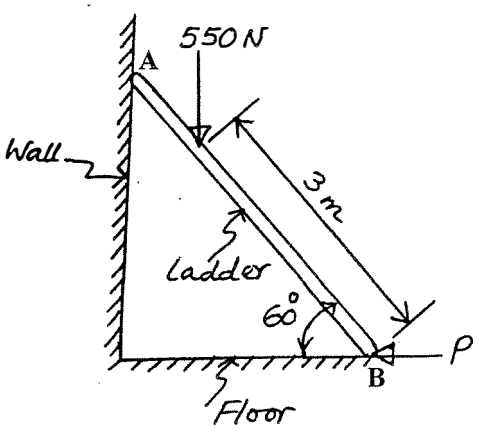


Fig. 3

2. (a) In **Fig. 4** the body A weighing 300 N rests over the body B weighing 600 N. The coefficient of static friction for all contact surfaces is 0.4. Calculate the value of the force P that will cause the body B to have impending motion toward right. **[8]**

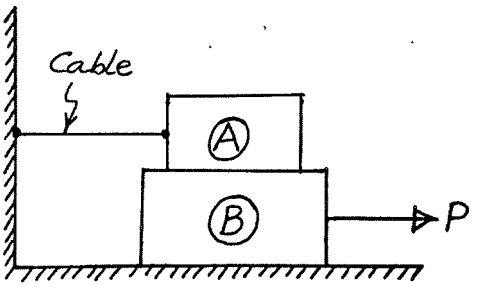


Fig. 4

(b) The frame shown in **Fig. 5** consists of two horizontal members AD and BE, a vertical member DE and an inclined member CF. All the members have been assumed to be weightless. **[10]**

(i) Identify the two-force member(s).
(ii) Calculate the components of pin reaction at B.
(iii) Determine the force in the two-force member(s).

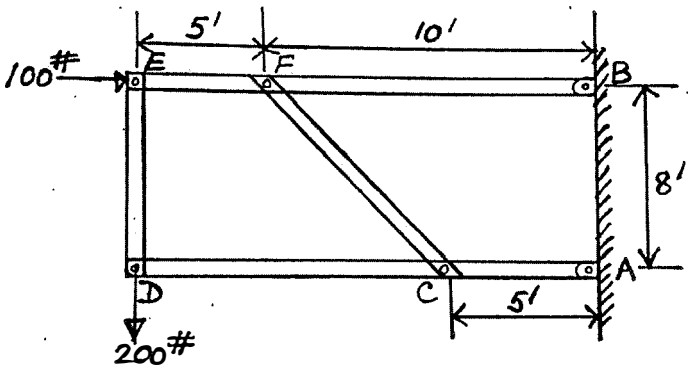


Fig. 5

(c) A cylindrical oil drum is pulled by a force P as shown in **Fig. 6.** The drum weighs 1500 N. The value of coefficient of static friction for all surfaces is 0.5. Determine the magnitude of the force P when the drum just starts spinning. **[7]**

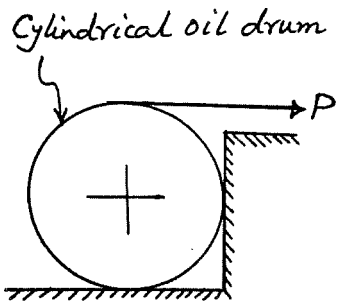


Fig. 6

3. **(a)** For the truss shown in **Fig. 7**, find the force in the members *ae, bf, cf* and *cd*. **[8]**

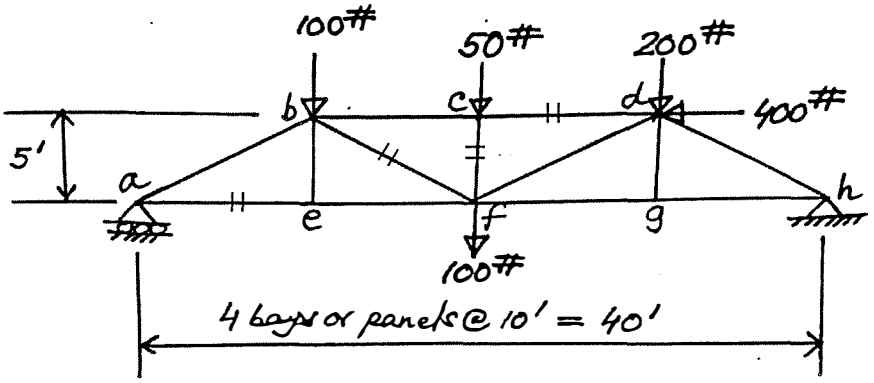


Fig. 7

(b) The body A in **Fig. 8** weighs 100 lb. The coefficient of static friction between the body and the inclined plane is 0.5, and the coefficient of static friction between the rope and drum 1 is 0.4 while it is 0.3 between the rope and drum 2. What value of W will cause motion of the body A to impend up the plane? **[9]**

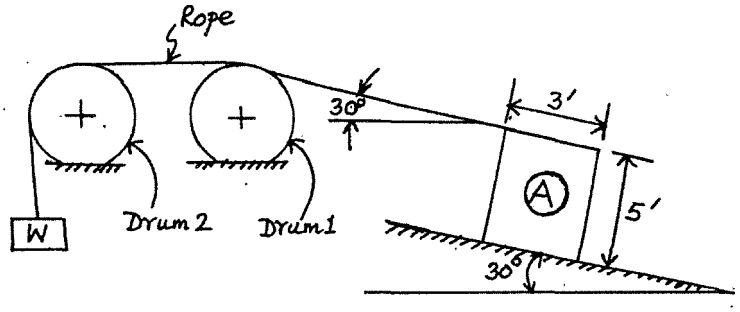


Fig. 8

(c) **Fig. 9** shows a boom made of two timbers AB and AC. The cable AE holds the timbers in a horizontal plane and supports a load of 3000 lb. The line BC is the intersection of the horizontal plane of the boom with the vertical plane BCGF. Determine the force in the timbers AB and AC and tension in the cable AE. Given, AB = 15 ft, AC = 20 ft, AD = 10 ft and DE = 12 ft. **[8]**

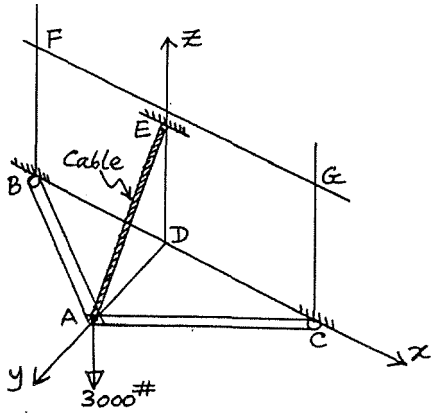


Fig. 9

PART B

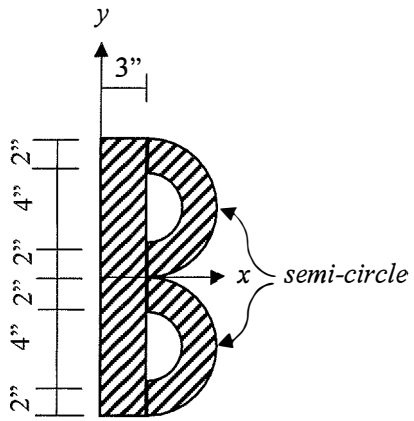


Fig. 10

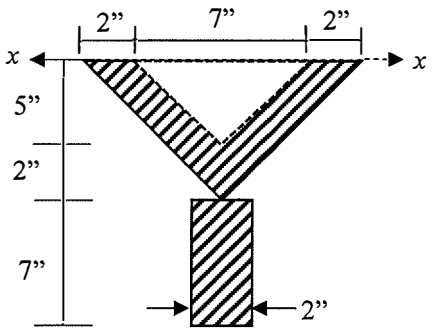


Fig. 11

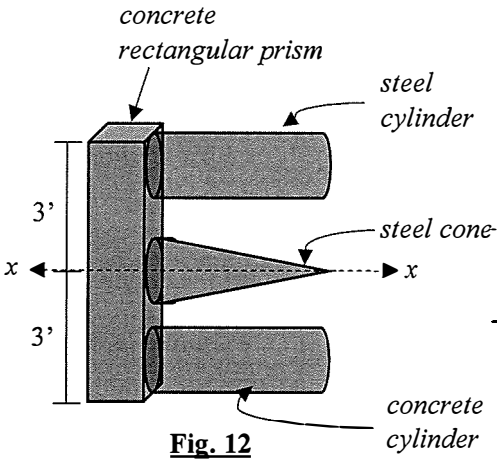


Fig. 12

4. (a) Locate the centroid of the composite area shown in **Fig. 10** with respect to the given coordinate system. (Given, $\bar{y} = 0$) **[7]**

(b) Compute the moment of inertia $\mathbf{I_x}$ and radius of gyration $\mathbf{k_x}$ with respect to the given **X** axis of the composite area shown in **Fig. 11.** **[8]**

(c) Calculate the moment of inertia of mass shown in **Fig. 12** about shown **X** axis. (The unit weight of concrete is 150 lb/ft^3 and the unit weight of steel is 490 lb/ft^3) **[10]**

Shape	Dimension
Cylinder	Radius = 0.75 ft; Height = 5 ft
Rectangular prism	Cross section = 1.5 ft X 1.5 ft; Height = 6 ft
Cone	Radius = 0.75 ft; Height = 5 ft

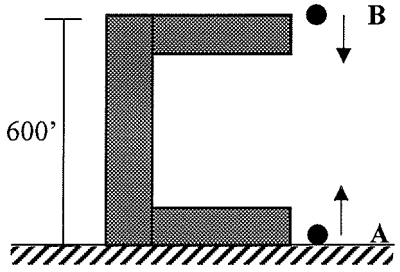


Fig. 13

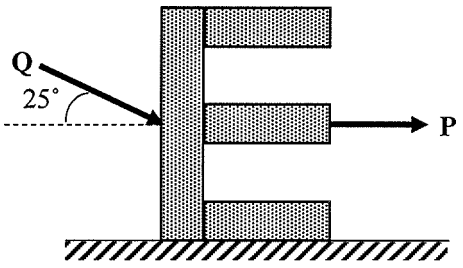


Fig. 14

5. (a) In **Fig. 13** a body **B** is projected vertically downward from 600 ft hanging cliff with an initial velocity of 5 fps. One second later, a body **A** is projected vertically upward from the bottom of the cliff with an initial velocity of 80 fps. **[14]**

(i) Measure the time to pass one another from the beginning of the motion of **A**)

(ii) Determine the distance from the bottom of the cliff at which they pass each other.

(iii) Calculate the direction of motion and speed of **A** when they pass.

(b) A 120 *lb.* body is moving toward the left with a velocity $v_1 = 50$ fps. At that instant two forces P = 40 lb. and Q = 100 lb. are applied as shown in the **Fig. 14.** The kinetic friction coefficient of the surface is $f_k = 0.22$. Determine the body's velocity after 7 sec. **[11]**

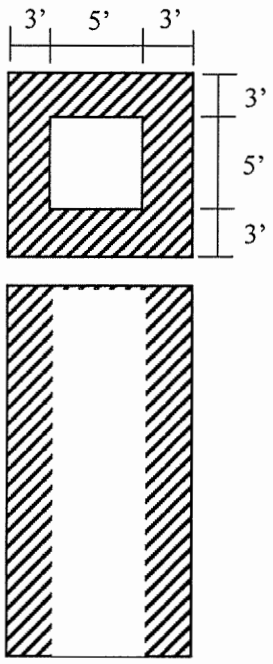


Fig. 15

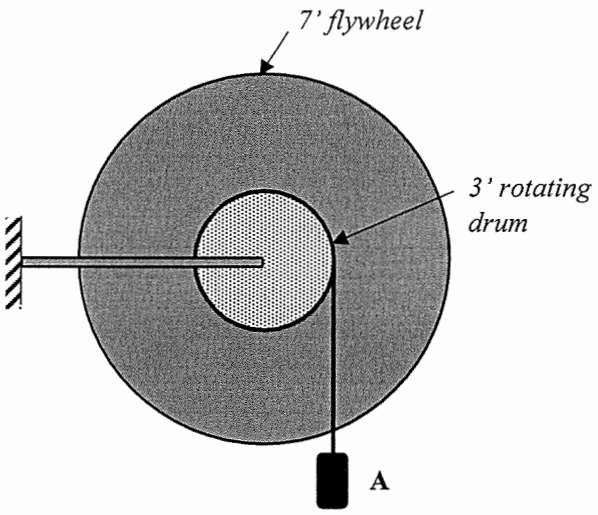


Fig. 16

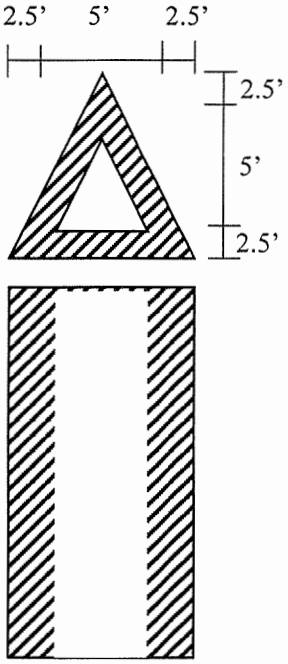


Fig. 17

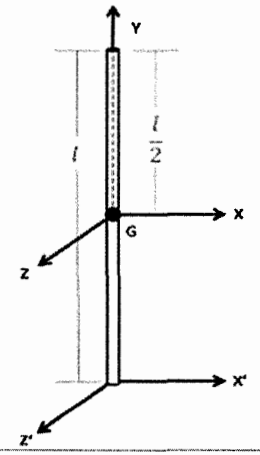
6. (a) The rectangular prismatic masonry chimney in **Fig. 15** is 300 ft. high. The outer and inner dimension of the cross section are shown. Determine the work done against gravity in lifting the materials to its place. (The masonry unit weight 110 lb/ft^3) **[10]**

OR

The triangular prismatic masonry chimney in **Fig. 17** is 300 ft. high. The outer and inner dimension of the cross section are shown. Determine the work done against gravity in lifting the materials to its place. (The masonry unit weight 110 lb/ft^3)

(b) In **Fig. 16** a weight **A** is supported from a cable which is wound about a 3ft. drum. A 7 ft. flywheel turns with the drum. The total weight of the rotating part is 1449 lb., and the radius of gyration is 2 ft. While A travels 60 ft. vertically downward, the speed of the rotating parts changes from 15 rpm to 100 rpm. Determine the weight of the object **A.** **[15]**

Slender Rod

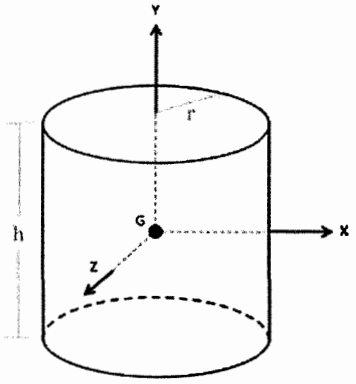


$$I_{xx} = I_{zz} = \frac{1}{12}ml^2$$

$$I_{yy} = 0$$

$$I_{xx'} = I_{zz'} = \frac{1}{3}ml^2$$

Cylinder

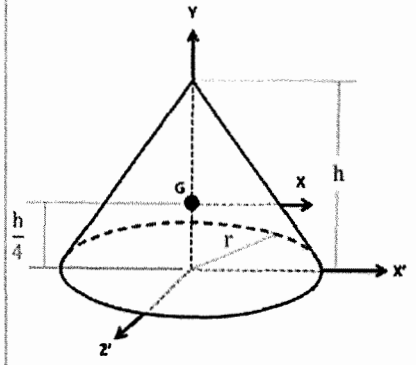


$$I_{xx} = I_{zz} = \frac{1}{12}m(3r^2 + h^2)$$

$$I_{yy} = \frac{1}{2}mr^2$$

$$Volume = \pi r^2 h$$

Right Circular Cone



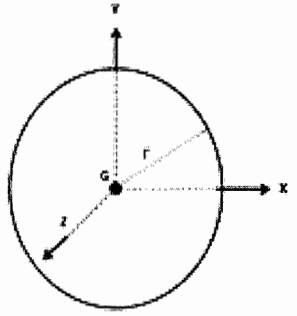
$$I_{xx} = I_{zz} = \frac{3}{80}m(4r^2 + h^2)$$

$$I_{yy} = \frac{3}{10}mr^2$$

$$I_{xx'} = I_{zz'} = \frac{1}{20}m(3r^2 + 2h^2)$$

$$Volume = \frac{1}{3}\pi r^2 h$$

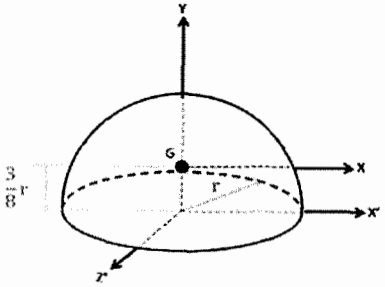
Sphere



$$I_{xx} = I_{yy} = I_{zz} = \frac{2}{5}mr^2$$

$$Volume = \frac{4}{3}\pi r^3$$

Hemisphere



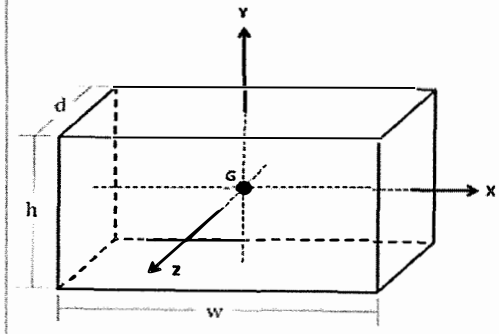
$$I_{xx} = I_{zz} = \frac{83}{320}mr^2$$

$$I_{yy} = \frac{2}{5}mr^2$$

$$I_{xx'} = I_{zz'} = \frac{2}{5}mr^2$$

$$Volume = \frac{2}{3}\pi r^3$$

Rectangular Prism



$$I_{xx} = \frac{1}{12}m(h^2 + d^2)$$

$$I_{yy} = \frac{1}{12}m(d^2 + w^2)$$

$$I_{zz} = \frac{1}{12}m(h^2 + w^2)$$

$$Volume = dhw$$

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

Course Title: Introduction to Civil and Environmental Engineering | Course Code: CE 107
Time: 2 Hours | Credit Hours: 2.00 | Full Marks: 100

(Answer all the questions. Figures in the right margin indicate marks)

1. a) Define biodiversity hotspot. Explain why we need to protect biodiversity. [3+3]
   b) Discuss the types of biodiversity and identify the direct benefits of biodiversity. [4+5]

2. a) When moderate to heavy rainfall occurs, particular areas of Dhaka city experiences temporary flooding situation including the surroundings of UAP campus. Which type of flood do you believe it was? Investigate the management approach against this flood. [10]
   b) Explain what factors make Bangladesh more vulnerable during flood. [5]

3. a) Define ecology and ecosystem. Describe the purposes of studying ecology. [4+6]
   b) Explain ecosystem hierarchy in brief. [5]

4. a) Discuss the purpose of soil test and site classification. [6]
   b) Demonstrate the components of soil test and discuss them in brief. [10]

5. a) Classify field survey based on the instruments used and discuss any two of them. [3+4]
   b) Differentiate between national highway and regional highway. [4]
   c) Discuss on different types of loads that can act on a structure. [8]

6. A five-storied residential building is to be constructed. Estimate the total construction cost as per the PWD schedule. The particulars of the building are as follows: [20]

Serial No	Particulars	Specification
1	Land Size	Determine from plot layout as shown in Figure 1
2	Building type	Residential (Economy)
3	Allowable Bearing Capacity (q_a)	4 ksf
4	Floor Level	Five
5	Plinth Area	70 % of land size
6	Construction Material	24 MPa, RCC Structure 1: 1.5 : 3 (Stone Chips)
7	Ground Floor	Car Parking
8	Rooftop RCC water tank	1500 Gallon
9	Structure type	RCC Frame Structure
10	Underground water reservoir	4000 Gallon
11	Boundary wall	RCC Frame
12	Contingency Cost	Consider 10 % for this building

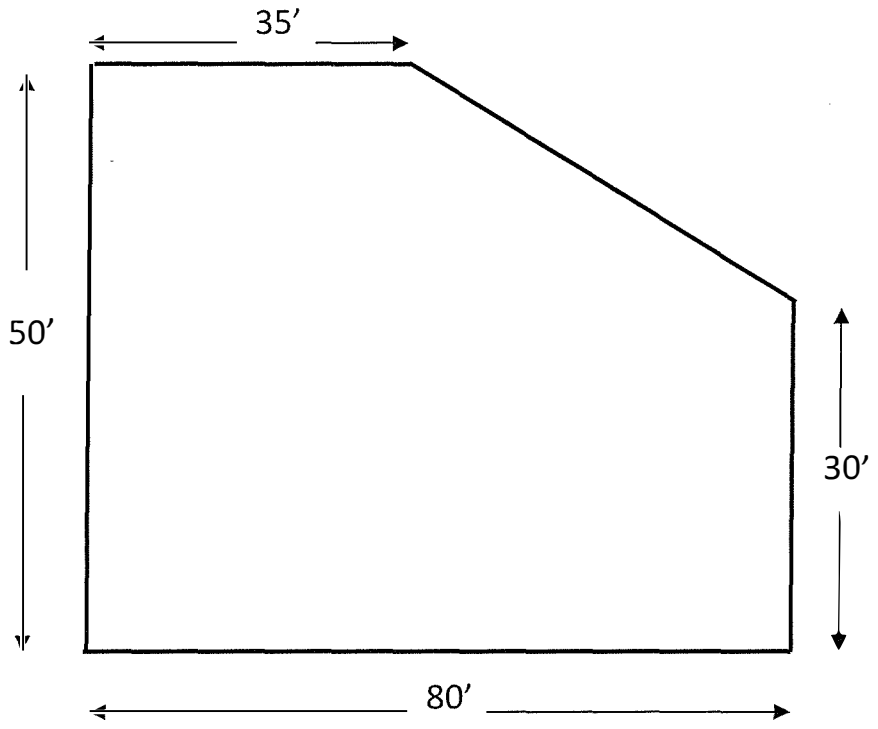


Figure 1

University of Asia Pacific

Department of Civil Engineering

Semester Final 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: 3 hours | Full Marks: 150

[There are **SIX** questions. Answer any **FOUR including Q1 to Q4**. Figures in the right margin indicate marks]

1. For the circuit give in figure 1, where all resistances are of equal value, $R = 5\ \Omega$, **solve** the voltage V_O. [25]

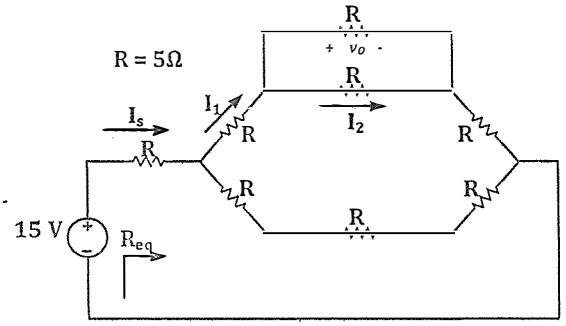


Figure 1

2. The current though a capacitive reactance, $X_C = 4\Omega$ is given by, [25]

$$i(t) = 40\ sin\ (100t + 15)A$$

i) **Solve** the expression for the voltage, v.

ii) **Sketch** $v(t)$ and $i(t)$ on the same axis.

3. **Calculate** the value of power factor of R-C branch for the circuit displayed in Figure 2. [25]

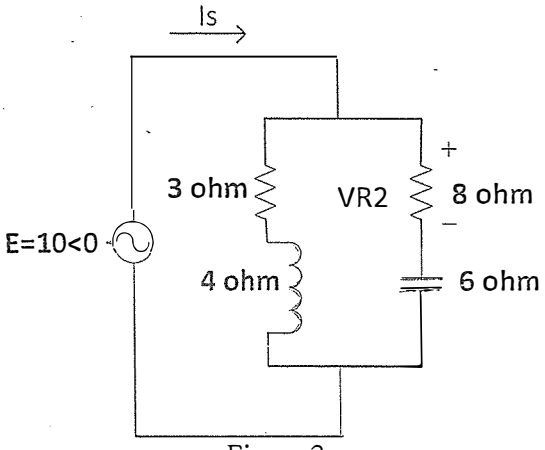


Figure 2

4. For the series magnetic circuit given in the figure 3, **solve**:
i) the current I required to develop a flux of $\varphi = .75 \times 10^{-4} Wb$.
ii) Determine μ_r of the materials. [25]

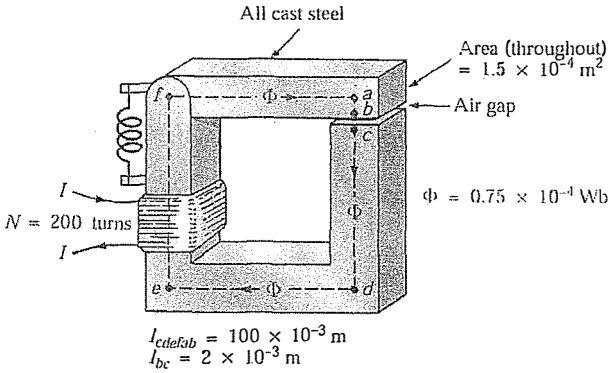


Figure 3

5. (a) **Solve** voltage across 7-ohm resistor in figure 4. [25]

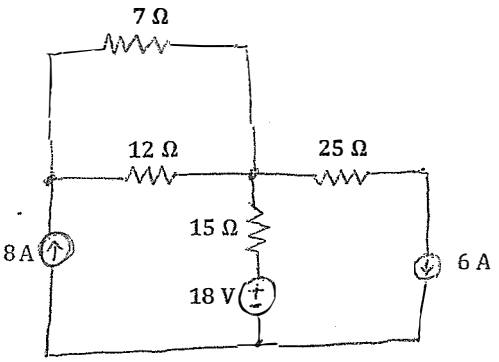


Figure 4

OR

5. (b) **Solve** current through 15-ohm resistor in figure 4. [25]

6. (a) For the circuit given in figure 5, **solve** power factor of the circuit. [25]

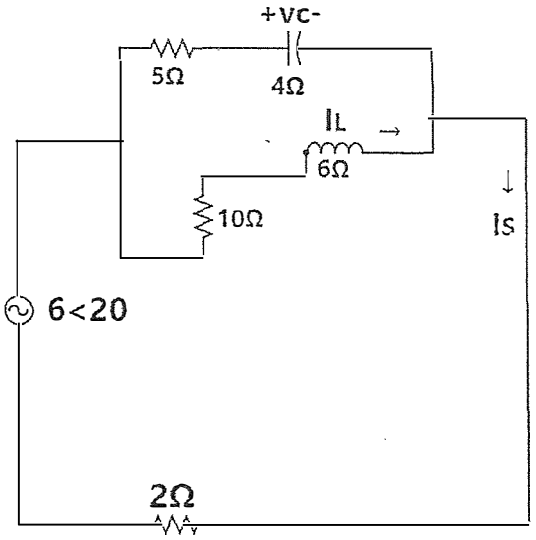


Figure 5

OR

6. (b) For the circuit given in figure 6, **solve:**

i) I_s

ii) I_L

iii) v_c

[25]

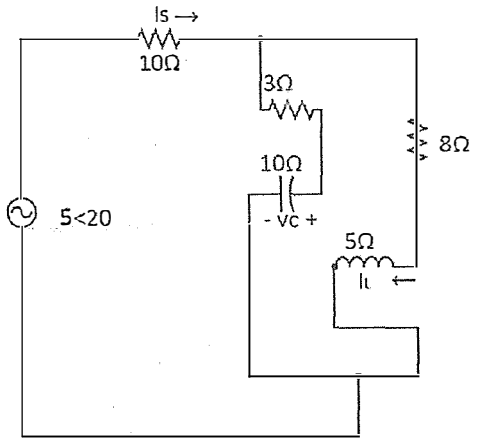
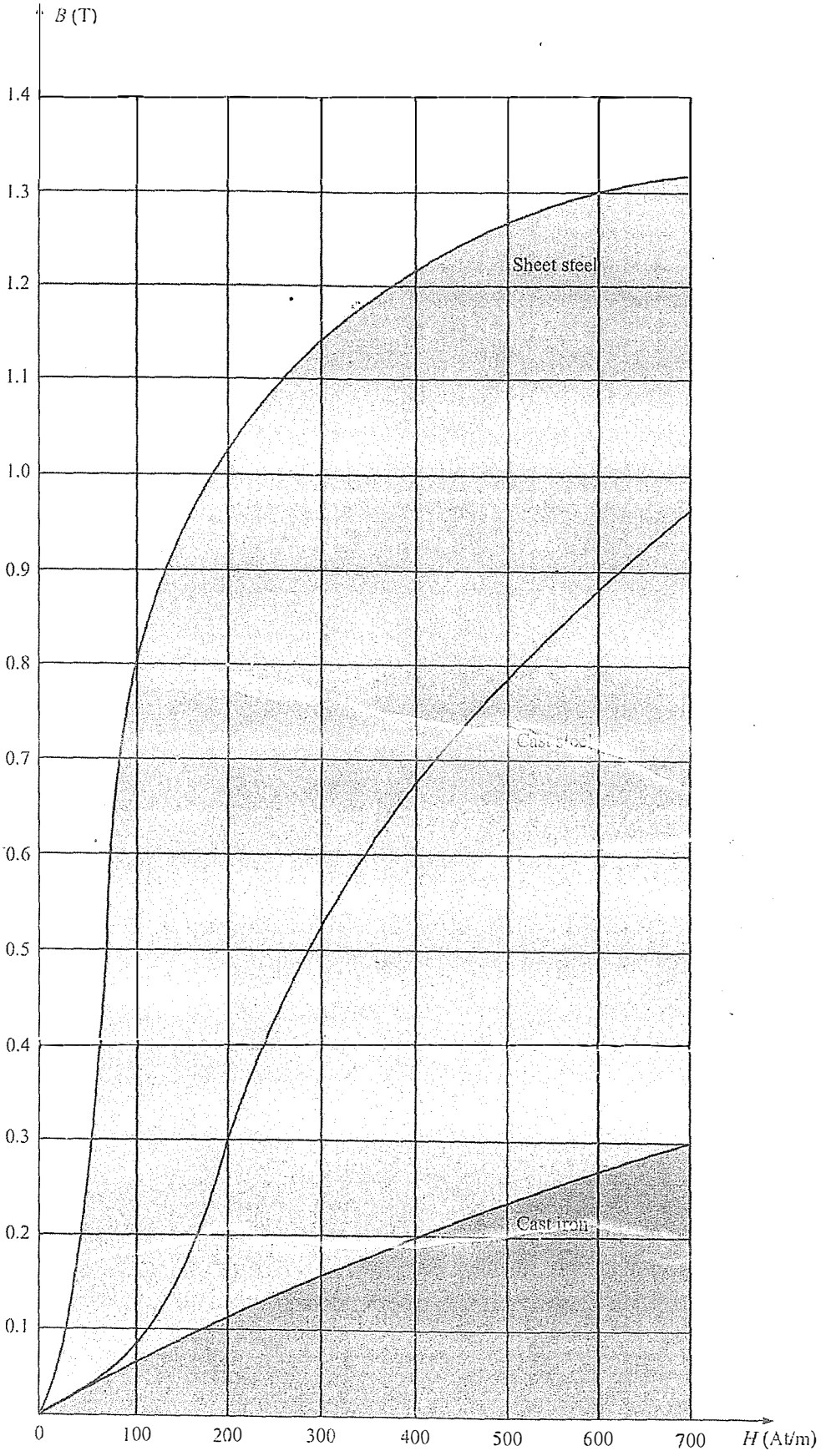


Figure 6.


B (T)
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Sheet steel
Cast steel
Cast iron
0
100
200
300
400
500
600
700
H (At/m)