

University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2023
Program: B.Sc. Engineering (Civil)

Course Title: Oral and Written Skills
 Time: 3 hours

Credit Hour: 3

Course Code: HSS 101
 Full Marks: 50

1. Choose the correct modal verb to fill out the blanks:

10×1 =10

shouldn't	couldn't	have to	might	ought to
can	was able	must	need	would have

- a) It's very cold today. Do you think it ----- snow later?
- b) You ----- leave your door unlocked when you go out.
- c) They ----- have filled the car with petrol before they set off.
- d) My motorbike broke down in the middle of nowhere, but luckily I ----- to fix it.
- e) Mum says we ----- watch TV after we've finished our homework.
- f) You don't ----- pick me up at the station. I can get a taxi.
- g) This is impossible, it ----- be a mistake!
- h) Jim ----- have seen me because he walked past without saying 'Hello'.
- i) You ----- not worry about the news!
- j) The word ----- spread soon if you tell him.

2. Complete the following using proper conditionals:

5×1 = 5

- a) If you heat ice at 100° C, it _____ (melt).
- b) If they _____ (sell) their car, they would be able to pay off their debt.
- c) If I were rich, I _____ (travel) around the world.
- d) If I hadn't been in a hurry, I _____ (order) a full course meal.
- e) I wish I _____ (decide) earlier, so I could have left on the evening flight.

3. Use correct prepositions to complete the sentences:

10×1 = 10

- a) The players should stand _____ a line.
- b) He was sitting _____ the corner inside the baker's shop, waiting to be served.
- c) Meet me _____ the entrance to the supermarket _____ High Street.
- d) The meeting is _____ half past two _____ the afternoon _____ next Monday.
- e) We normally start lunch _____ about two _____ the afternoon _____ weekends.

4. Complete the sentences with the right forms of subject-verb agreement: 10×1=10

- a) UAP, one of the top private universities, (are/is) at the cutting edge of research.
- b) The committee members (has/have) expressed different opinions about the issue.
- c) Neither my cousins nor my sister (have/has) any clue about what is going on.
- d) One of the visitors (were/was) reported lost in the area.
- e) Every one of those books (are/is) novel.
- f) Discovered in the soil of our city garden (was/were) a button dating from the Civil War.
- g) The main source of income for Bangladesh (is/are) garments and agriculture.
- h) (Is/Are) the news on at five or six?
- i) (Is/Are) the tweezers on the table?
- j) The guard or the children (is/are) outside.

5. Write an argumentative essay on either (A) or (B): 1×15 = 15

A) In some countries the government promotes public transport as the primary means of transportation and discourages private vehicle ownership.

B) Smoking makes a person ethically/morally bad. Give your opinion.

University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2023
Program: B.Sc. in Civil Engineering

Course Title: Introduction to Civil and Environmental Engineering
Time: 2 Hours

Credit Hours: 2.00

Course Code: CE 107
Full Marks: 100

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

1. a) Discuss the measures to conserve biodiversity. [6]
b) Discuss the types of biodiversity and identify the direct benefits of biodiversity. [4+5]
2. a) Just a few days ago, UAP area was surrounded by stagnant water with almost entire city flooded. Which type of flood do you believe it was? Investigate the management approach against this flood. [10]
b) List the major components of a building. [5]
3. a) Discuss the sub-disciplines of civil engineering. [10]
b) Discuss the types of shallow foundation. [5]
4. a) Discuss the difference between soil test and site classification. [5]
b) Demonstrate the components of soil test and discuss them in brief. [10]
5. a) Classify and discuss surveying based on the nature of field survey. [8]
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

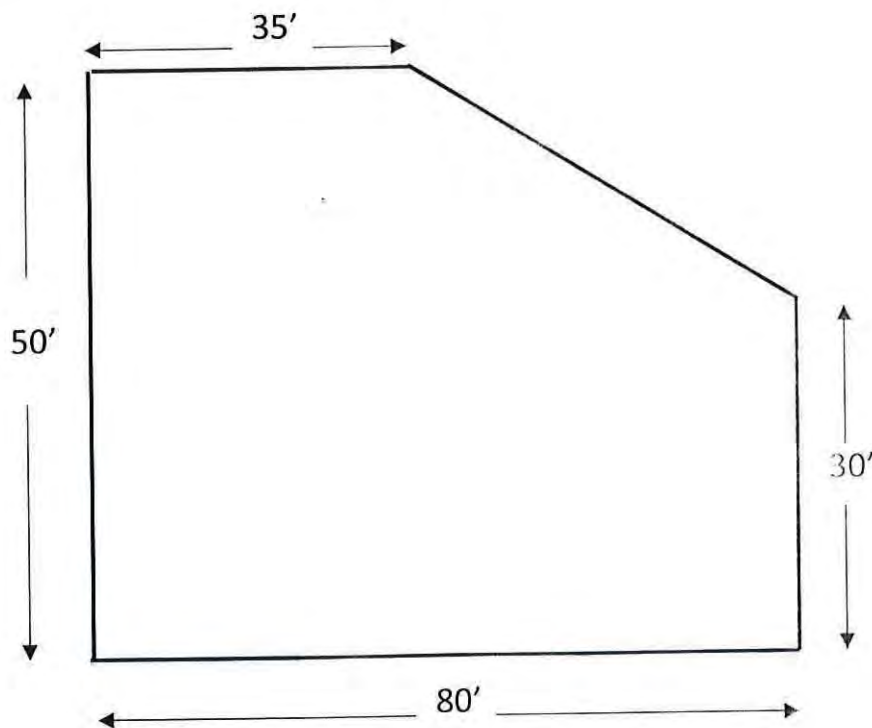


Figure 1

Annexure: PWD SCHEDULE**1. Foundation Cost upto PL (per m² of Plinth Area)**

Storey	q _a = 2 ksf	q _a = 2.50 ksf	q _a = 3.0 ksf	q _a = 3.5 ksf	q _a = 4.0 ksf	q _a = 4.5 ksf	q _a = 5.0 ksf
1	3982	3875	3811	3769	3740	3718	3702
2	4684	4381	4199	4080	3997	3936	3830
3	5591	5036	4702	4482	4329	4217	4133
4	6566	5811	5296	4958	4723	4551	4421
5	8001	6774	6035	5550	5212	4965	4778
6	9495	7851	6862	6213	5759	5429	5178
7	10961	8908	7673	6862	6296	5883	5571
8		10043	8544	7560	6873	6371	5992
9		11252	9471	8302	7487	6891	6441
10		12529	10451	9088	8136	7441	6915

2. Superstructure Cost (per m² of Plinth Area)

Building Category													
		Non-Residential (fc=19-21 MPa, Brick Chips)			Residential (fc=19-21 MPa, Brick Chips)			Non-Residential (fc=22-25 MPa, Stone Chips)			Residential (fc=22-25 MPa, Stone Chips)		
Level	Floor	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior
0	GF Park	5449	5812	6538	5654	6010	6761	5922	6317	7107	6124	6532	7349
0A	Habitation	8345	9601	12674	8837	9929	13166	9020	10135	13378	9631	10792	14274
1	1 st Floor	8242	9360	12224	8523	9376	12640	8699	9776	12903	9289	10409	13767
2	2 nd Floor	8365	9399	12407	8651	9720	12830	8830	9921	13096	9568	10565	14180
3	3 rd Floor	8491	9540	12593	8780	9866	13023	8962	10070	13293	9835	10723	14606
4	4 th Floor	8618	9683	12782	8912	10014	13218	9097	10221	13492	10151	10884	15044
5	5 th Floor	8748	9829	12974	9046	10154	13416	9233	10374	13694	10455	11046	15495
6	6 th Floor	8835	9927	13104	9156	10265	13550	9326	10478	13831	11030	11158	15960

3. Boundary Wall: Tk.3500/m
4. External Water Supply: Tk.60.00/gallon
5. Gas Connection:
 - GF: Tk.260/sqm
 - Other floors: Tk.100/sqm
6. Internal Electrification:
 - (i) Residential Building
 - Economy: Tk.1030 /sqm
 - Standard: Tk.1290 /sqm
 - Superior: Tk.1550 /sqm
 - (ii) Non- Residential Building
 - Economy: Tk.775 /sqm
 - Standard: Tk.970 /sqm
 - Superior: Tk.1160 /sqm
7. Internal Sanitary and Water Supply:
 - (i) Residential Building
 - Economy: Tk. 475 /sqm
 - Standard: Tk.715 /sqm
 - Superior: Tk. 1070 /sqm
 - (ii) Non-Residential Building
 - Economy: Tk.360 /sqm
 - Standard: Tk.540 /sqm
 - Superior: Tk.800 /sqm
8. Floor Finish Work: Tk.1000.00/ sqm
9. Roof top RCC water Tank: Tk.85.00/gallon

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall 2023
Program: B.Sc. in Civil Engineering

Course Title: Physics I
Time: 3.0 hours

Credit Hour: 3.0

Course Code: PHY 101
Full Marks: 150

There are **eight** questions. Answer any **six including Q-1, Q-4, Q-7, and Q-8**. Figures in the right margin indicate marks.

1. a) Define a projectile with angular projection. Show that the trajectory of a projectile with angular projection is a parabola. [05+10]
- b) A ball is projected vertically upward with a speed of 50 ms^{-1} . Find (i) the maximum height and (ii) time to reach the maximum height. Take $g = 9.8 \text{ ms}^{-2}$. [10]

2. a) Derive the relation between three elastic constants [08]

$$\eta = \frac{3YK}{9K - Y}$$

where the symbols have their usual meanings.

- b) Explain Poisson's ratio. Show that Poisson's ratio lies between -1 to +0.5. [12]
- c) The Young's modulus of a metal is $2 \times 10^{11} \text{ Nm}^{-2}$ and its breaking stress is $1.078 \times 10^9 \text{ Nm}^{-2}$. Calculate the maximum amount of energy per unit volume which can be stored in the metal when stretched. [05]

OR

3. a) Derive the relation between three elastic constants [08]

$$K = \frac{Y\eta}{9\eta - 3Y}$$

where the symbols have their usual meanings.

- b) Describe briefly the behavior of a wire under an increasing load. [12]
- c) Calculate the Poisson's ratio for a material. Given $Y = 12.25 \times 10^{10} \text{ Nm}^{-2}$ and $\eta = 4.55 \times 10^{10} \text{ Nm}^{-2}$. [05]
4. a) State the first law of thermodynamics. Give the sign convention for dQ and dW . [05]
- b) Derive Mayer's relation for an ideal gas. [10]

- c) Calculate the work done by a gas as it is taken from the state a to b, b to c, and c to a as shown in figure 4(c). [10]

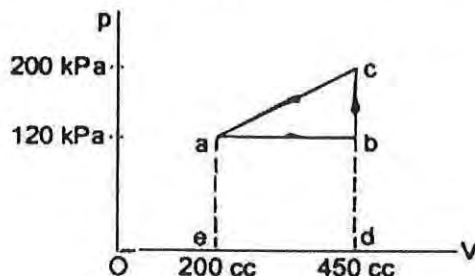


Figure: 4(c)

5. a) Show that for an ideal gas in an adiabatic process [15]

$$PV^\gamma = \text{constant}$$

where the symbols have their usual meanings.

- b) A 0.5 mole of gas at temperature 300 K expands isothermally from an initial volume of 2 L to 6 L. Calculate (i) the work done by the gas, (ii) estimate the heat added to the gas, and (iii) What is the final pressure of the gas? (The value of gas constant, $R = 8.31 \text{ Jmol}^{-1}\text{K}^{-1}$) [10]

OR

6. Describe Carnot cycle in brief and calculate the work done in a Carnot cycle. [25]

7. a) Show that for a liquid in stream line motion [15]

$$\frac{P}{\rho} + gh + \frac{v^2}{2} = \text{constant}$$

where the symbols have their usual meanings.

- b) Water flows through a horizontal pipe line of varying cross-section. At a point where the pressure of water is 0.05 m of Hg the velocity of flow is 0.25 m/s. Calculate the pressure at another point where the velocity of flow is 0.4 m/s. [Density of water = 10^3 kgm^{-3} ; $g = 9.8 \text{ ms}^{-2}$] [10]

8. a) State Hook's law of elasticity. Show that in case of longitudinal strain the work done per unit volume is equal to $\frac{1}{2} \times \text{stress} \times \text{strain}$. [05+15]

- b) A load of 10 kg is suspended by a metal wire 3 m long and having a cross-sectional area 4 mm^2 . Find (i) the stress, (ii) the strain, and (iii) the elongation. Young's modulus of the metal is $2.0 \times 10^{11} \text{ Nm}^{-2}$. [05]

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall 2023
Program: B. Sc. Engineering (Civil)

Course Title: History of Bangladesh Independence, Society and Culture
Time: 03 hours

Credit Hours: 03

Course Code: HSS 105
Full Marks: 150

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

Answer the following questions.

Part - A

1. a. What was the background of the Liberation war of Bangladesh? 15
b. Explain why Bangladesh won this war? 15
2. a. Explain the causes of the Language Movement in East Pakistan. 15
b. Write the significance of this movement. 15
3. Discuss the six point movement of East Pakistan in 1966. 15

OR

4. Discuss the importance of the Mass Upsurge in 1969 in East Pakistan. 15

Part - B

5. a. Explain different systems of social stratification with relevant examples. 20
b. Write the importance of studying society and culture for the students of Civil Engineering. 10
6. a. Discuss various systems of family that are commonly seen in Bangladesh. 20
b. Explain the importance of family as a social institution. 10
7. Write a short note on Industrial Revolution and early development of sociology as a separate discipline. 15

OR

8. Discuss different categories of social mobility with relevant examples. 15

University of Asia Pacific
Department of Civil Engineering
Semester Final Examination, Fall – 2023
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 **Eight** questions. Answer any **Six** including **Q1 to Q4**. Figures in the right margin indicate marks]

1. Calculate the followings for the circuit shown in Figure 1, where three light bulbs are connected to a 9-V battery.

[25]

- i) The total current supplied by the battery.
- ii) The current through each bulb.
- iii) The resistance of each bulb.

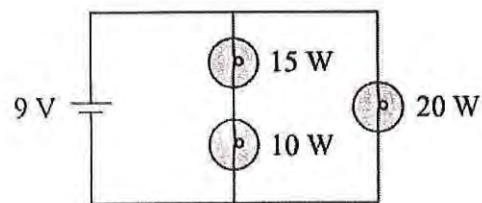


Figure 1

2. Compute V_o for the circuit shown in Figure 3, using Nodal or Mesh analysis.

[25]

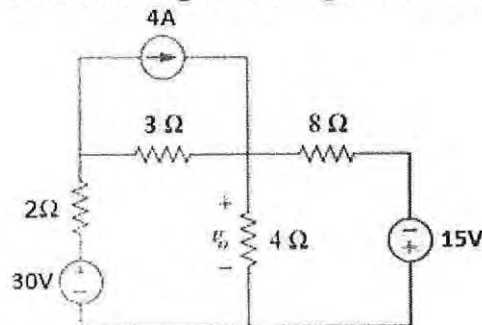


Figure 3

3. For Figure 3,
- i. Calculate the value of i_L and v_c .
 - ii. Calculate the energy stored in the inductor.
 - iii. Calculate the energy stored in the capacitor.

[25]

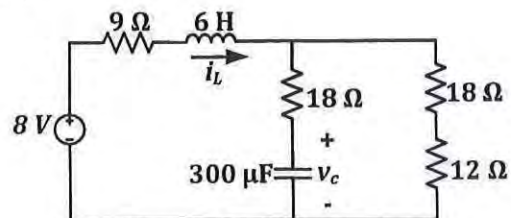


Figure 3

4. For the series magnetic circuit given in the figure 4, find the current I required to develop a flux, $\phi = 8 \times 10^{-4} \text{ Wb}$. [25]

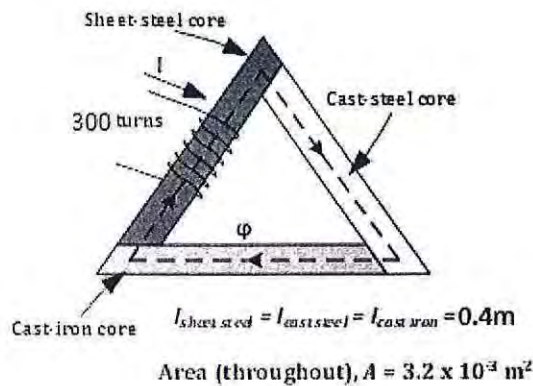


Figure 4

5. For the circuit shown Figure 5 [25]
- Draw the Thevenin's equivalent circuit at the terminal marked a and b . ($a - b$ are the load terminals).
 - Find the value of R_L for maximum power transfer.

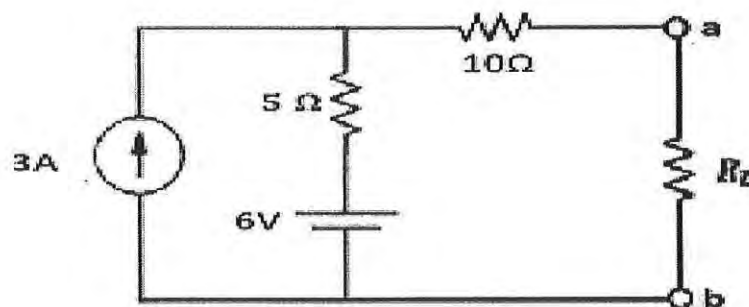


Figure 5

OR

6. For the circuit shown Figure 5 [25]
- Draw the Norton's equivalent circuit at the terminal marked a and b . ($a - b$ are the load terminals).
 - Find the value of R_L for maximum power transfer.

7. a. The current through an capacitive reactance, $X_C = 4 \Omega$ is given by, [12.5]

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

- Find the expression for the voltage, v .
- Sketch v and i on the same axis.

- b. Calculate the average and the R.M.S value of the wave shape given in Figure 6. [12.5]

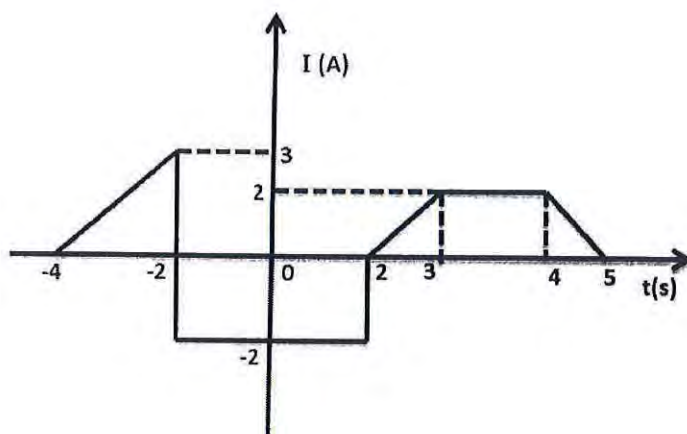


Figure 6

OR

8. Calculate the Power factor of the source for the circuit shown in Figure 7. [25]

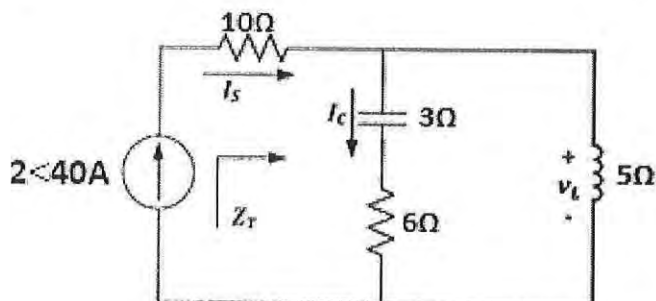
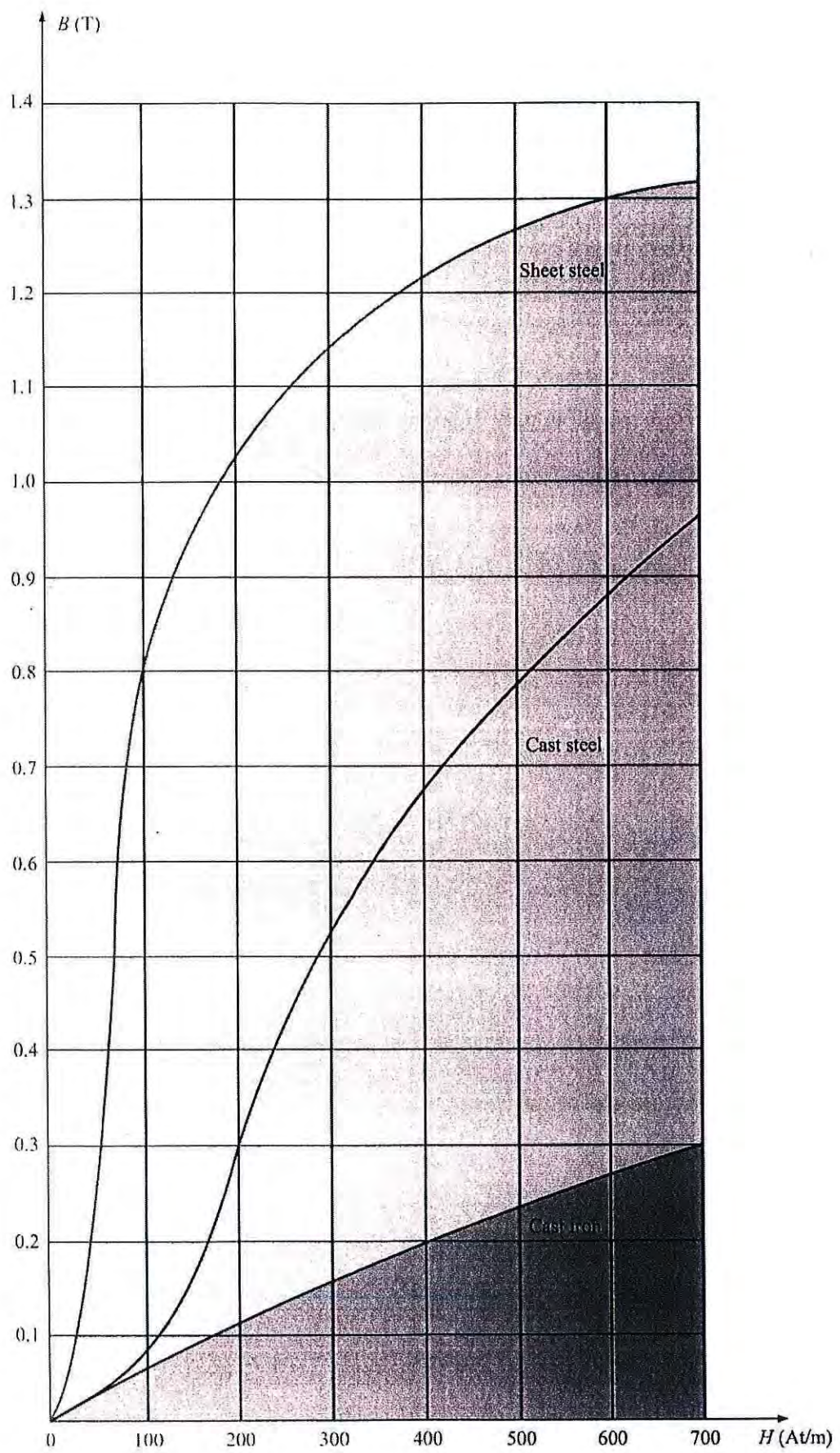


Figure 7



University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall-2023
Program: B. Sc. in Civil Engineering

Course Title: Mathematics I

Course Code: MTH 101

Time: 3.00 Hours.

Credit Hours: 3.00

Full Marks: 150

Answer **six** questions **including 1 and 2**. Figures in the right margin indicate marks.

1. (a) Evaluate $\lim_{n \rightarrow \infty} \left\{ \left(1 + \frac{1}{n^2}\right)^{\frac{2}{n^2}} \left(1 + \frac{2^2}{n^2}\right)^{\frac{4}{n^2}} \left(1 + \frac{3^2}{n^2}\right)^{\frac{6}{n^2}} L \left(1 + \frac{n^2}{n^2}\right)^{\frac{2n}{n^2}} \right\}$. 15
- (b) Integrate any **two** of the followings: 10
- (i) $\int \frac{dx}{(3x+2)\sqrt{2x+1}}$ (ii) $\int \frac{\cos x}{\sin x + 2 \cos x} dx$ (iii) $\int \frac{2x+3}{\sqrt{x^2+x+1}} dx$
2. (a) Obtain reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$. Use the formula to evaluate $\int_0^{\frac{\pi}{2}} \sin^4 x dx$. 15
- (b) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$. 10
3. (a) Use a double integral to find the volume of the solid that is bounded above by the plane $z = 40 - 2xy$ and below by the rectangle $R = \{(x, y) : 1 \leq x \leq 3, 2 \leq y \leq 4\}$. 15
- (b) Evaluate $\iint_R xy dA$ 10
- over the region R enclosed between the lines $y = \frac{1}{2}x$, $y = \sqrt{x}$, $x = 2$, and $x = 4$.
4. (a) Evaluate the improper integral $\int_1^4 \frac{dx}{(x-2)^{\frac{2}{3}}}$. 10
- (b) Find the perimeter of the Cardioid $r = a(1 + \cos \theta)$. 15
5. (a) Find the area of a loop of the curve $r = a \cos 2\theta$. 10
- (b) Find the area of the surface generated by revolving the circle $x^2 + y^2 = a^2$ about the x -axis. 15
6. (a) Evaluate $\int_0^1 \int_0^1 \frac{x}{(xy+1)^2} dy dx$. 15

- (b) Prove that $\int_0^{\infty} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$. 10
7. (a) If $u = \tan^{-1} \left(\frac{x^3 + y^3}{x - y} \right)$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$. 15
- (b) If $y = \sin(ax)$ find y_n . 10
8. (a) Find the radius and height of the right circular cylinder of largest volume that can be inscribed in a right circular cone with radius 6 inches and height 10 inches. 10
- (b) For $y = \tan^{-1} x$, show that $(1 + x^2) y_{n+2} + 2(n+1)xy_{n+1} + n(n+1)y_n = 0$. 15

University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2023
Program: B.Sc. in Civil Engineering

Course Title: Engineering Mechanics I (Self-Study)
 Time: 3 hours

Credit Hour: 3.00

Course Code: CE 101
 Full Marks: 100 (10x10)

THERE ARE 10 QUESTIONS. ANSWER ALL THE QUESTIONS

1. Locate the centroid of the composite area shown in **Fig.1** with respect to the given coordinate system.
2. In the structure shown in **Fig.2**, draw the free-body diagram of member *abc*, *be*, *aed*; supports at *c* and *d* [Consider all the members are weightless].

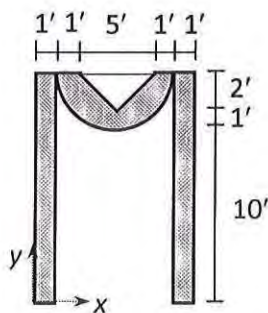


Fig.1

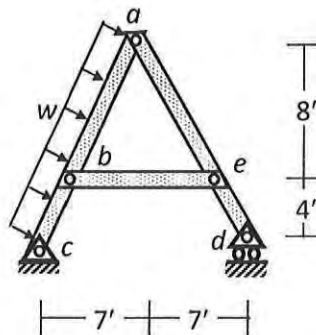


Fig.2

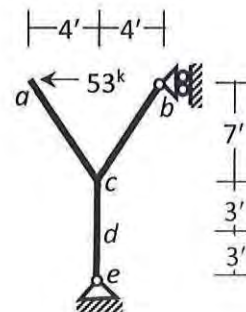


Fig.3

3. For the frame *abcde* loaded as shown in **Fig.3**, calculate the (i) reactions of supports *b* and *e* and (ii) shear force and bending moment at *d* (mid-point of member *ce*).
4. Locate the centroid of the composite line shown in **Fig.4** with respect to the given coordinate system.

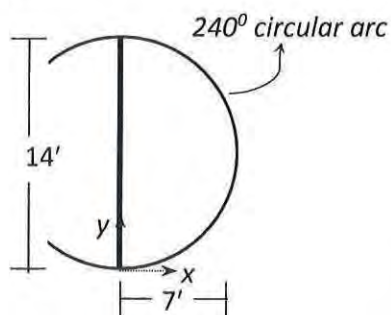


Fig.4

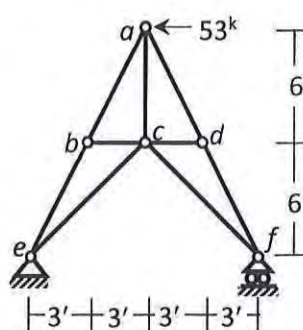


Fig.5

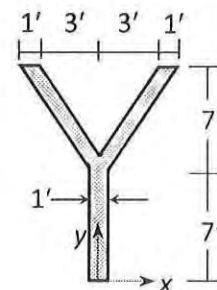


Fig.6

5. In the truss loaded as shown in **Fig.5**, (i) identify the zero force members, Calculate (ii) the reactions at supports, and (iii) forces in members *ab* and *ac*.
6. Compute the moment of inertia I_x and I_y as well as radius of gyration k_x and k_y of the composite area with respect to given coordinate system shown in **Fig.6**.

7. Locate the centroid of the composite weight with respect to given coordinate system shown in **Fig.7**.

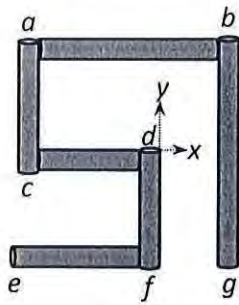


Fig.7

Member	Type	Diameter (ft)	Length (ft)	Unit weight (lb/ft ³)
<i>ab</i>	Cylinder	1	10	51
<i>cd</i>	Cylinder	1	6	51
<i>ef</i>	Cylinder	1	7	51
<i>ac</i>	Cylinder	1	6	101
<i>df</i>	Cylinder	1	6	101
<i>bg</i>	Cylinder	1	12	101

8. Compute the moment of inertia (I_x , and I_y) of the shaded area shown in **Fig.8** with respect to the given coordinate system.
9. Compute the product of inertia P_{xy} , the minimum moment of inertia I_{min} , and the maximum moment of inertia I_{max} about the centroidal axes of the shaded area shown in **Fig.9**.

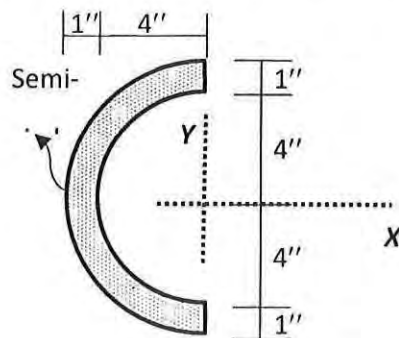


Fig.8

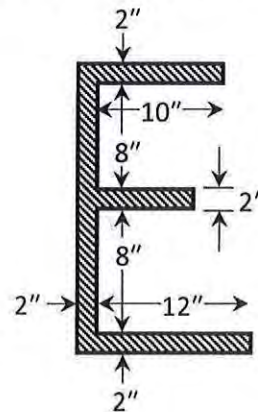


Fig.9

10. The cable MAY shown in **Fig.10** weighs 0.51 lb/ft and is subjected to a horizontal tension of 510 lb . Calculate d , a , and the maximum tension in the cable assuming it to be a (i) parabola, or (ii) catenary.

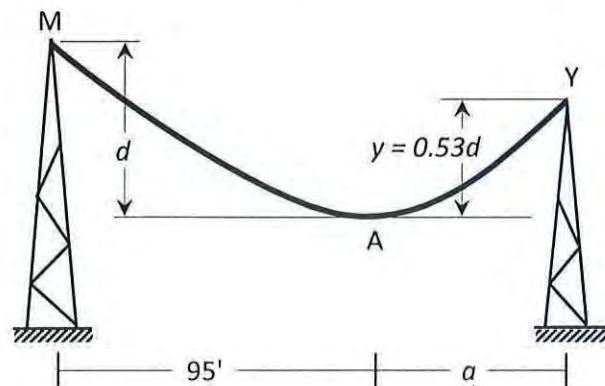


Fig.10

University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2023
Program: B.Sc. in Civil Engineering

Course Title: Engineering Mechanics
Time: 3 hours

Credit Hour: 3.00

Course Code: CE 101
Full Marks: 150 (75+75)

ANSWER ALL THE QUESTIONS FOR BOTH PART-A AND PART-B

Use separate answer scripts for each part

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 $P = 100$ N. (5)

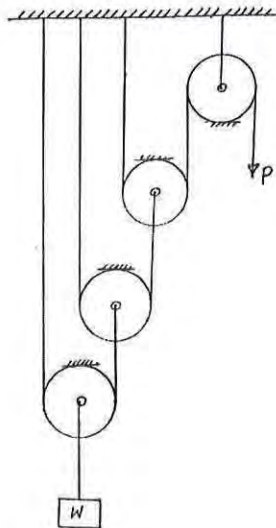


Fig.1

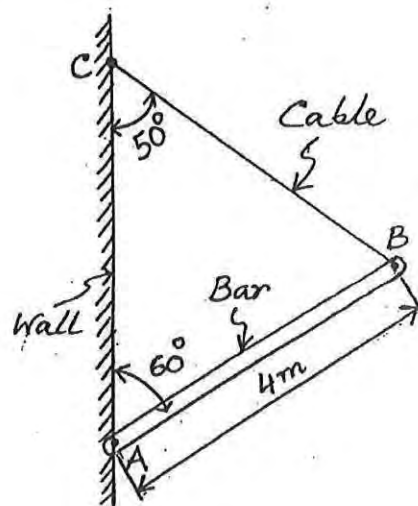


Fig.2

- b) A bar of weight 200 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 4 m. Determine the tension in the cable and components of pin reactions at A and C. (10)
- c) The body A weighing 400 N rests over the body B weighing 800 N as shown in **Fig. 3**. The coefficient of static friction for all contact surfaces is 0.3. Calculate the value of the force P that will cause the body B to have impending motion toward right. (10)

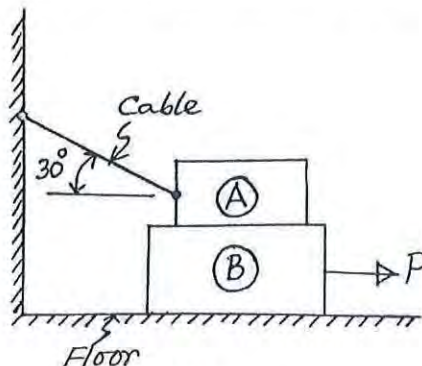


Fig.3

2. a) A glass rod AB of weight 4 N is placed in a glass beaker in a position of equilibrium as shown in Fig. 4. Considering all the surfaces to be smooth, determine the length of the glass rod and reactions at contact points A and E. (6)

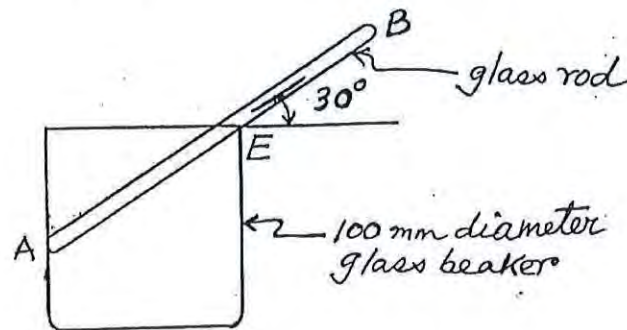


Fig.4

- b) The frame shown in Fig. 5 consists of two horizontal members AE and BF, a vertical member EF and an inclined member CD. All the members have been assumed to be weightless.

- Identify the two force member(s).
- Calculate the components of pin reactions at A.
- Determine the force in the two force member(s).

(11)

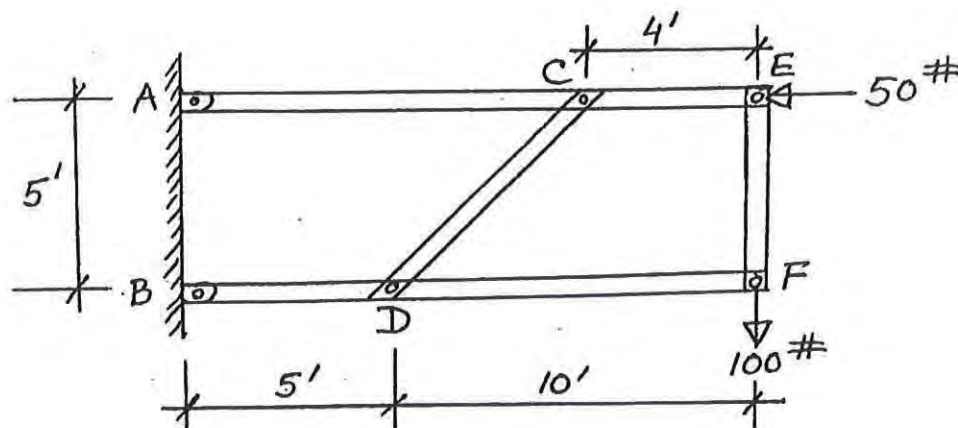


Fig.5

- c) A cylindrical oil drum is pulled by a force Q as shown in Fig. 6. The drum weighs 1200 N. The value of coefficient of static friction for all surfaces is 0.5. Determine the magnitude of the force Q when the drum just starts spinning. (8)

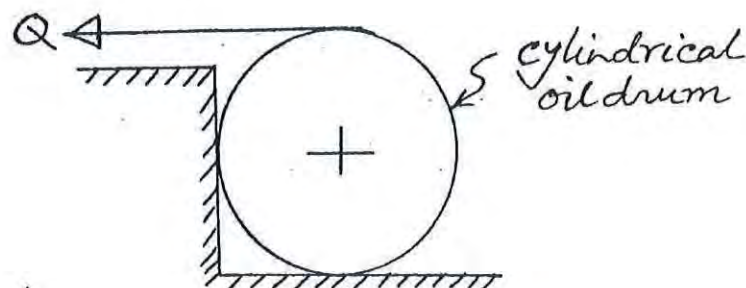


Fig.6

3. a) For the truss shown in Fig. 7, find the force in the members ac, cd, cf, eg and hi. (10)

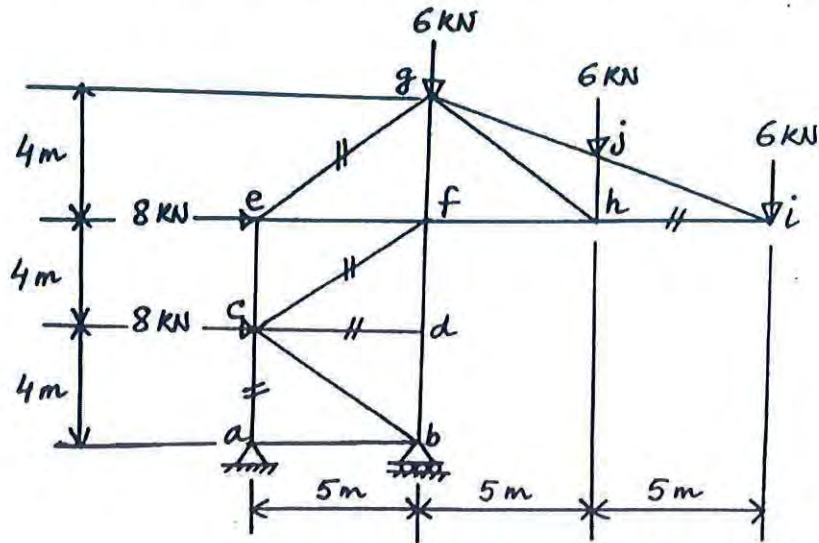


Fig.7

- b) The body A in Fig. 8 weighs 200 lb. The coefficient of static friction between the body and the inclined plane is 0.4, and the coefficient of static friction between the rope and the drums is 0.3. Determine the value of W when motion of the body A impends up the plane. (9)

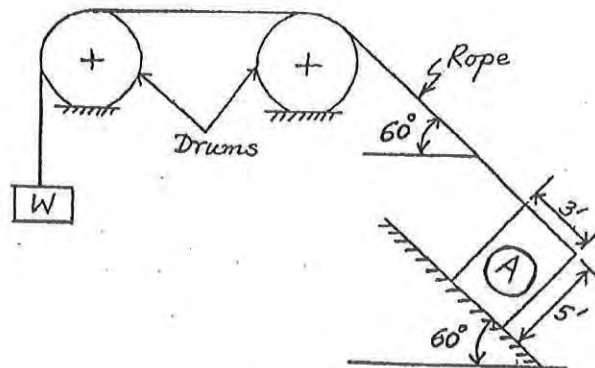


Fig.8

- c) A right-angled bend pipe is supported in a horizontal plane with the help of three cables AB, CD and EF as shown in Fig. 9. The pipe weighs 20 lb per foot. Calculate the tension in the cables AB, CD and EF. (6)

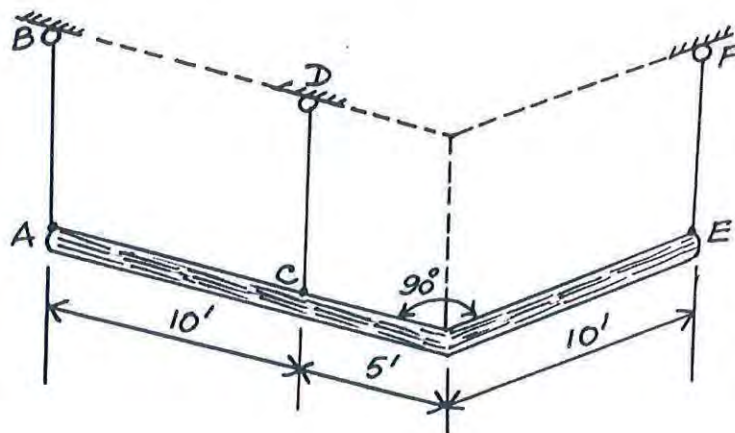


Fig.9

PART-B

4. Compute the product of inertia P_{xy} , the minimum moment of inertia I_{min} , and the maximum moment of inertia I_{max} about the centroidal axes of the shaded area shown in **Fig.10**. (20)

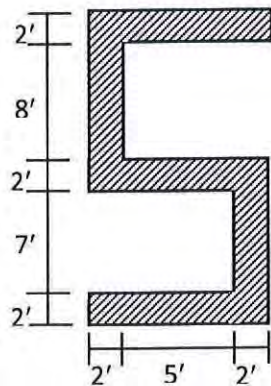


Fig.10

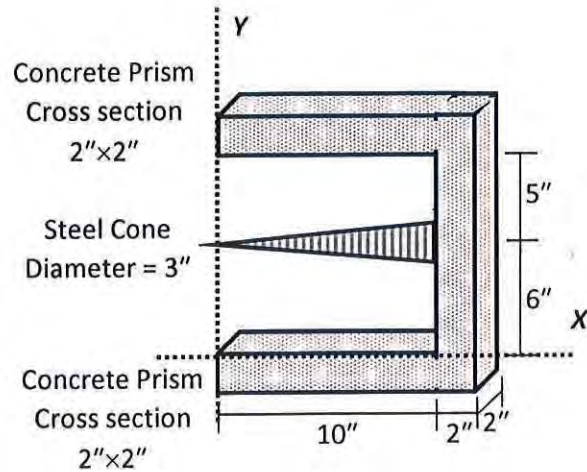


Fig.11

5. Calculate the moment of inertia of mass shown in **Fig.11**, about X axis and Y axis. (The unit weight of concrete is 150 pcf and the unit weight of steel is 490 pcf) (20)

6. Calculate the work done by friction in slowing a 23 kg block traveling at 12.5 m/s to rest at a distance of 13.25 m. Also determine the following:

- a) What is the kinetic coefficient of friction between the block and surface?
 - b) How long does it take for the block to stop from initial velocity?
- (15)

7. A jet of steam is issued from a nozzle with a velocity of 450 fps and an absolute rate of 5.3 lb per sec. It enters a fixed blade and is turned through an angle of 125° as shown in **Fig.12**. It has a negligible frictional loss and is discharged with a velocity of 250 fps.

Calculate the resultant force exerted upon the fixed blade. (10)

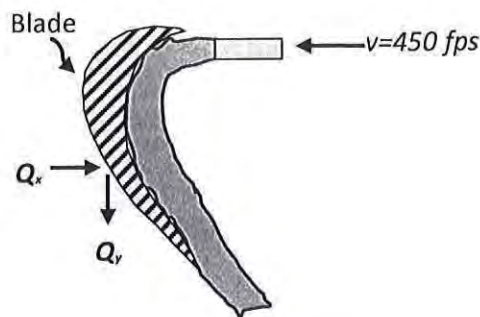


Fig.12

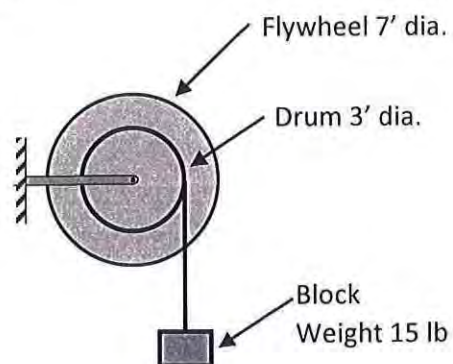
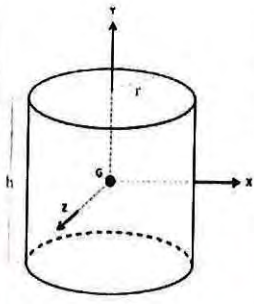
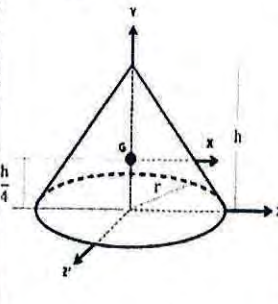
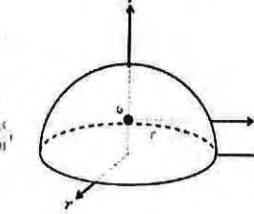
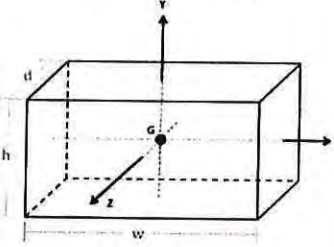


Fig.13

8. A cord is wrapped around a drum of 3 ft diameter which turns with a 7 ft diameter flywheel as shown in **Fig.13**. If a 15 lb block is suspended from the cord and released from rest, after 3 seconds flywheel's angular velocity is 4.5 rad/sec. Calculate the moment of inertia of the rotating part with respect to its rotating axis. (10)

Formula:

Cylinder  Volume = $\pi r^2 h$	$I_{xx} = I_{yy} = \frac{1}{12} m(3r^2 + h^2)$ $I_{zz} = \frac{1}{2} mr^2$	Right Circular Cone  Volume = $\frac{1}{3} \pi r^2 h$	$I_{xx} = I_{yy} = \frac{3}{80} m(4r^2 + h^2)$ $I_{zz} = \frac{3}{10} mr^2$ $I_{xx'} = I_{yy'} = \frac{1}{20} m(3r^2 + 2h^2)$
Hemisphere  Volume = $\frac{2}{3} \pi r^3$	$I_{xx} = I_{yy} = \frac{83}{320} mr^2$ $I_{zz} = \frac{2}{5} mr^2$ $I_{xx'} = I_{yy'} = \frac{2}{5} mr^2$	Rectangular Prism  Volume = dhw	$I_{xx} = \frac{1}{12} m(h^2 + d^2)$ $I_{yy} = \frac{1}{12} m(d^2 + w^2)$ $I_{zz} = \frac{1}{12} m(h^2 + w^2)$

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

Course Title: Basic Electrical Engineering.
Time: 3 hours

Course Code: ECE 201

Credit Hours: 3.00

Full Marks: 150

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

1. Calculate the followings for the circuit shown in Figure 1, where three light bulbs are connected to a 9-V battery.

[25]

- i) The total current supplied by the battery.
- ii) The current through each bulb.
- iii) The resistance of each bulb.

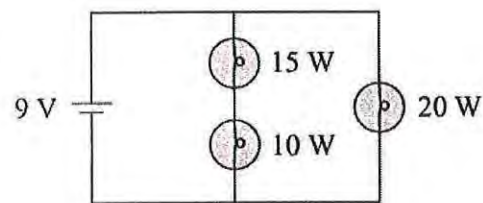


Figure 1

2. Compute V_o for the circuit shown in Figure 3, using Nodal or Mesh analysis.

[25]

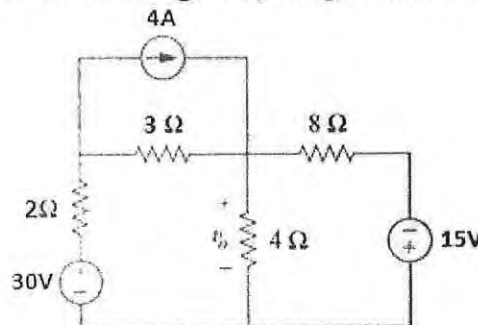


Figure 3

3. For Figure 3,
- i. Calculate the value of i_L and v_c .
 - ii. Calculate the energy stored in the inductor.
 - iii. Calculate the energy stored in the capacitor.

[25]

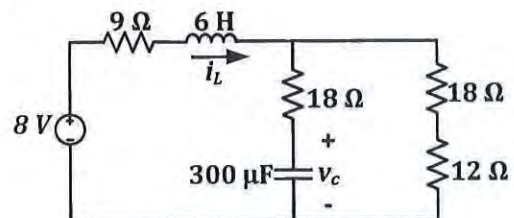


Figure 3

4. For the series magnetic circuit given in the figure 4, find the current I required to develop a flux, $\phi = 8 \times 10^{-4} \text{ Wb}$. [25]

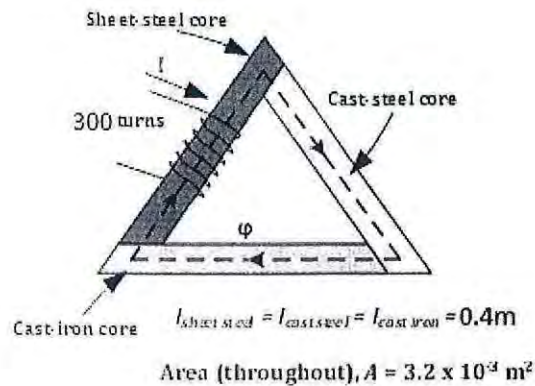


Figure 4

5. For the circuit shown Figure 5 [25]
- Draw the Thevenin's equivalent circuit at the terminal marked a and b . ($a - b$ are the load terminals).
 - Find the value of R_L for maximum power transfer.

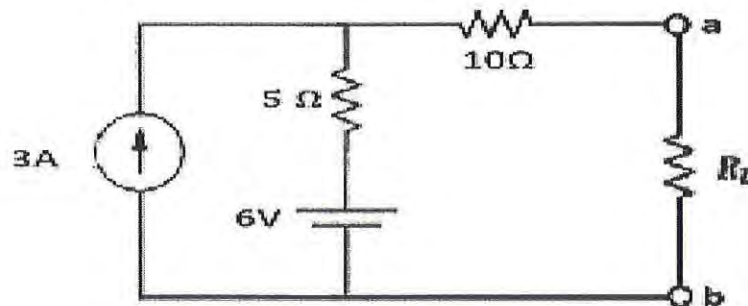


Figure 5

OR

6. For the circuit shown Figure 5 [25]
- Draw the Norton's equivalent circuit at the terminal marked a and b . ($a - b$ are the load terminals).
 - Find the value of R_L for maximum power transfer.

7. a. The current through an capacitive reactance, $X_C = 4 \Omega$ is given by, [12.5]

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

- Find the expression for the voltage, v .
- Sketch v and i on the same axis.

- b. Calculate the average and the R.M.S value of the wave shape given in Figure 6. [12.5]

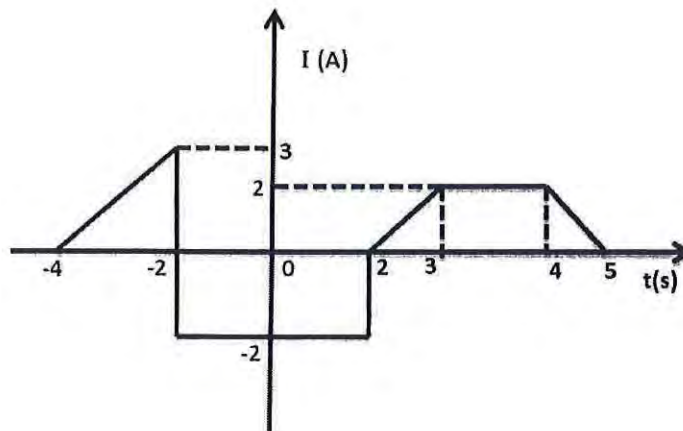


Figure 6

OR

8. Calculate the Power factor of the source for the circuit shown in Figure 7. [25]

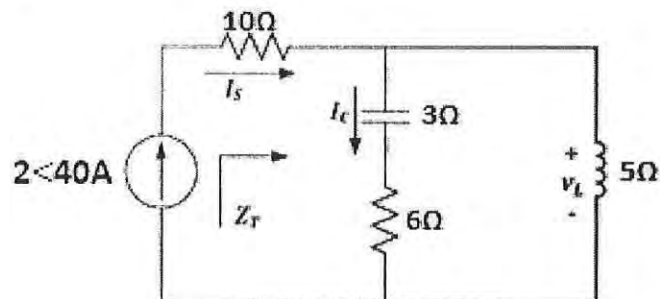


Figure 7

