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

Course Title: English Language II

Course Code: HSS 103

Time: 3 hours

Credit Hour: 3.00

Full Marks: 50

Instructions:

***Marks are indicated in the right margin.**

***Answer all the questions**

Q1. Read the following passage and answer the questions that follow:

(1) The Akashi Kaiyko Bridge in southern Japan is the world's longest bridge. The Akashi Kaiyko Bridge spans the Akashi Strait, connecting Awaji Island to Kobe, an important industrial center. The bridge has a span of 5973 feet (1991 meters), making it over 25% longer than its nearest competition: the Humber Bridge in England. Strangely, there may be longer bridges in the world, but the Guinness Book of World Records measures the longest bridges according to their record-breaking spans.

(2) The Akashi Kaiyko Bridge is a suspension bridge. This means that the roadway is suspended from pillars by cables. The concrete pillars have to be tall enough to support the whole weight of the bridge. The pillars on the Akashi Kaiyko Bridge are 900 feet tall. These pillars had to be built to withstand not only huge waves but also high-speed winds, and possibly even violent earthquakes, which are not uncommon in the area. The bridge has survived one earthquake already: its span was extended by more than 3 feet by the Kobe earthquake of 1995.

(3) The cables weigh 50,000 tons and have a diameter of almost four feet each. Each cable contains 290 hexagonal strands; each strand is composed of 127 steel wires. The total length of the wire used is more than 200,000 miles, enough to circle the Earth 7.5 times!

(4) The first plans to connect Kobe to Naruto via Awaji Island were voiced in 1955, but it took the government thirty years to decide to really build the bridge. The next three years were spent surveying the site and construction commenced in 1988. In designing the bridge, special consideration was given to its effect on the surroundings, great emphasis was placed on a "pleasing balance between light and shade" and also on the choice of the perfect color.

(5) The construction of the bridge was a very complicated and technologically draining process, which took ten years to complete. Casting concrete in 300 feet of water, installing special pilot ropes over the strait by helicopter, and finally stretching the gigantic steel cables surely wasn't an easy job. Ten years after construction commenced in 1988, the bridge was finished and the six-lane highway finally opened to traffic. The bridge has made the transportation from island to island much easier, so in addition to breaking a record, the Akashi Kaiyko Bridge achieves the main goal of a bridge: to connect two places.

A. Write a summary of the passage using in 100 words.

B. Find out synonymous words from the above passage for the word belows: (1x5=5)

- i. Linking (Para-1)
- ii. Sustain (Para-2)
- iii. Crafting (Para-4)
- iv. Evaluating (Para-4)
- v. Begun (Para-5)

Q2: Complete the following using appropriate phrasal verbs: (1x10= 10)

keep track of	figure out	bring to mind	let down	look up
call off	run out	come in handy	take up	put across

- a) The toolkit I received during my engineering training has _____ numerous times.
- b) This guidebook will help you _____ any unfamiliar words you come across while reading.
- c) The speaker struggled to _____ her point clearly to the audience.
- d) We need to hurry; we're about to _____ milk for our morning cereal.
- e) It's important to _____ your expenses to manage your budget effectively.
- f) The old photographs _____ memories of our childhood adventures.
- g) Can you help me _____ how this machine works?
- h) I have decided to _____ a project management course to broaden my skill set as a civil engineer.
- i) I don't want to _____ my team by not delivering on my promises.
- j) The company had to _____ the bridge construction due to heavy rain.

Q3: Choose the correct form of verb that agrees with the subject: (1x5=5)

- a) Either the leader or the team members (have/has) responsibility for submitting the final project.
- b) The boxes of documents (require/requires) sorting before the end of the week.
- c) Ten percent of the data (is/are) missing from the spreadsheet.
- d) Statistics (plays/play) an essential role in research in various fields.
- e) One of the variables in the equation (affect/affects) the outcome significantly.

Q4: Join the following sentences using connectors or conjunctions given here. (1x10=10)

While	If	After	Because	Until
As a result	Otherwise	However	Therefore	Although

- a) There is no more food left. _____ there is plenty of drinks.
- b) Let us not be complacent with ourselves. _____ we may lose out in the final round.
- c) Tom and his wife decided to work overtime _____ they need more money.
- d) The baby did not take the food from the stranger _____ it was very hungry.
- e) We could not find a taxi. _____ we walked home.
- f) I like to relax _____ I am on holiday.
- g) _____ you've read the newspaper, can I have it?
- h) Lopez has experienced poverty and hardship before. _____ he has a sympathetic heart towards the poor and needy.
- i) I'm going to keep asking you to marry me _____ you say yes!
- j) _____ you wake up in the morning before me, please make me a cup of coffee.

Q5: Write an essay on any one of the following :(Word limit 300-350 words) 15

- a) Compose a descriptive essay capturing the vibrant sights, sounds, and festivities of "*Pohela Boishakh*" celebration on your campus.
- b) Compare and contrast the benefits and drawbacks of dining out at restaurants versus cooking and eating home-cooked meals.

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

Course Title: Physics II
Time: 03 hours

Credit Hour: 3.0

Course Code: PHY 103
Full Marks: 150

[There are **eight** questions. Answer **six including questions 5, 6, 7 and 8**. All questions are of equal value. Figures in the right margin indicate marks.]

1. (a) Write down the two postulates of Special Theory of Relativity. [05]
(b) Show that $E = mc^2$ where the symbols have their usual meanings. [20]

OR

2. Find out the equations of Lorentz transformation. [25]
3. (a) Define Compton Effect. [05]
(b) Show that $\Delta\lambda = \frac{h}{m_0c}(1 - \cos\phi)$ where the symbols have their usual meanings. [20]

OR

4. (a) Define x-rays. How can we produce x-rays? [05]
(b) Explain Bragg's law. Determine Bragg's equation. [20]
5. Show that the de Broglie wavelength of an electron is exactly equal to the circumference of the electron orbit with figure and derive the equation of orbital radii of Hydrogen atom. [25]
6. (a) Define Emissive power and absorptive power. [05]
(b) State and prove Kirchhoff's law. [20]
7. State and prove Stefan-Boltzman law. [25]
8. (a) State and explain Kepler's law of planetary motion. Derive Newton's law of gravitation from Kepler's law. [15]
(b) Define escape velocity. Derive an expression for escape velocity. [10]

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

Course Title: Chemistry
Time: 3 hours

Credit Hour: 3.0

Course Code: CHEM 111
Full Marks: 150

There are **eight** questions. Answer **six** questions including **Q-1, Q-2, Q-3** and **Q-4**. Figures in the right margin indicate marks.

1. a. State and explain Hess's law. Show the Born-Haber cycle for the formation of NaCl. [5+10]
b. Define heat of neutralization. Heat of neutralization of strong acids by strong bases is approximately constant- explain. [2+8]
2. a. Derive the integrated rate equation for a first order reaction. Show that the half-life of a first order reaction is independent of the initial concentration of the reactant. [10+5]
b. The rate constant for a first order reaction is, $k = 5.44 \times 10^{-4} \text{ s}^{-1}$. Calculate the half-life of the reaction and the time required for the concentration of the reactant to drop from 0.250 M to 0.0250 M. [5+5]
3. a. State Le Chatelier's Principle. Discuss the effect of change in temperature when a reversible reaction is at equilibrium. [3+12]
b. Show that at any temperature T, equilibrium constants K_p and K_c are related by the equation, $K_p = K_c(RT)^{\Delta n}$, where R is the molar gas constant and Δn is the difference between the mole numbers of the products and those of the reactants. [10]
4. a. State and explain Heisenberg's Uncertainty Principle. If the uncertainty in velocity of an object of 250g mass is $7.25 \times 10^{-23} \text{ m/s}$, find the uncertainty in position. [Planck's constant, $h = 6.626 \times 10^{-34} \text{ Js}$] [5+10]
b. Write down the physical significance of the four quantum numbers used to describe all the attributes of an electron. [10]
5. a. Discuss the Injection Method for the preparation of an emulsion. [10]
b. Define lyophobic and lyophilic sols. Differentiate between their properties. [5+10]

OR

- 6 a. Show the mechanism of addition polymerization mentioning all the steps involved. [10]

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

Course Title: Mathematics-II
Time: 3.00 Hours

Credit Hour: 3.00

Course Code: MTH 103
Full Marks: 150

There are **eight (8) questions**. Answer **six (6)** questions including **Q1, Q2, Q3 and Q4**.
Figures given in the right margin indicate the marks of the respective questions.

1. a. Find the equation of plane which is passing through $(3, 2, 1)$, $(2, 1, -1)$ and $(-1, 3, 2)$. Also find the perpendicular distance from the point $(2, 3, -4)$ to this plane. **10**
b. Find the equation of plane which is passing through $(-1, 2, -5)$ and perpendicular to two planes $2x - y + z = 1$ and $x + y - 2z = 3$. **15**
2. a. Find the two tangent planes to the sphere $x^2 + y^2 + z^2 + 2x - 4y + 6z - 11 = 0$ which is parallel to the plane $6x - 3y - 2z + 27 = 0$. **15**
b. Show whether the plane $x - 2y + 2z - 1 = 0$ cuts or touches the sphere $x^2 + y^2 + z^2 - 6x - 4y + 10z + 22 = 0$. **10**
3. a. Determine the equation of the curve $2x^2 + y^2 - 4x + 4y = 0$ when the origin is transformed to the point $(1, -2)$. Also identify the type of conic and describe the graph. **15**
b. Determine the equation of the curve $x^2 - y^2 - 2\sqrt{2}x - 10\sqrt{2}y + 2 = 0$ after rotating of axes through 45° . **10**
4. a. Prove that, the sum of the squares of direction cosines of every line is one. **10**
b. Check whether the lines AB and CD are parallel, perpendicular or neither to each other where $A(1, 2, 3)$, $B(-1, -2, -3)$, $C(-2, 1, 5)$, $D(3, 3, 2)$. **15**
5. a. Find the equation for the ellipse with foci $(\pm 3, 0)$ and minor axis with end points $(0, \pm 2)$. **10**
b. Sketch the graph of the equation $16x^2 - 25y^2 - 400 = 0$ and label the vertices, foci, and asymptotes. **15**

OR

6. a. Find the constant 'm' so that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + m\hat{j} + 5\hat{k}$ are coplanar. **15**

- b. Suppose, $\vec{A} = x^2z^2\hat{i} - 2y^2z^2\hat{j} + xy^2z\hat{k}$. Find $\text{curl curl } A$. 10
7. a. Find the acute angle intersection of the given planes $x + 2y - 2z = 5$ and $6x - 3y + 2z = 8$. 10
- b. Find the ratio in which the xy plane divides the line joining $(-2, 5, 7)$ and $(3, -4, 8)$. Also find the coordinates of that point. 15
- OR**
8. a. If $\vec{F} = (y^2\cos x + z^3)\hat{i} + (2y\sin x - 4)\hat{j} + (3xz^2)\hat{k}$, find it's scalar potential. 15
- b. Find the angle between the surfaces $x^2 - y^2 - z^2 = 11$ and $xy + yz - zx = 18$ at the point $(6, 4, 3)$. 10

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

Course Title: Surveying
Time: 3 hours

Credit Hour: 3

Course Code: CE 105
Full Marks: 120

[There are Seven (07) Questions. Answer All]

1. a) Describe the applications of Hydrographic Surveying. [04]
b) Explain the Principle of EDM with figure. [05]
c) Describe the advantages and disadvantages of Photogrammetry. [05]
d) Explain Reiteration Method in Theodolite Surveying. [05]
e) Describe Graphical Method with figure. [05]
f) Draw the appropriate contour lines for the followings: [06]
i. Overhanging Cliff ii. Vertical Surface iii. Steep Slope

2. A closed traverse was conducted round an obstacle and the following observations were made. Compute the missing values. [20]

Line	Length (m)	Bearing
OP	565	276° 27'
PQ	498	305° 15'
QR	?	58° 05'
RS	?	115° 27'
SO	612	157° 13'

3. The following observations were obtained during conducting a closed traverse round an obstacle: [10]

Line	Fore Bearing (F.B)	Back Bearing (B.B)
AB	90°25'	269°15'
BC	130°35'	312°5'
CD	240°25'	59°45'
DA	328°32'	148°02'

Calculate the interior angles and modify them by calculation for observational error.

4. Two tangents intersect at a 1200 m distance from a fixed point. The deflection angle of the curve is 60° and the radius of curvature is 340 m. Calculate the necessary data to set out the curve. [15]

5. a) Determine the values of stadia constants from the following observations: [06]

Inst. station	Staff Readings on	Distance (m)	Stadia Readings	
			Upper	Lower
O	A	75	2.75	1.255
	B	100	3.00	1.00
	F	125	3.255	0.751

- b) The following observations were made during a tacheometric survey where staff is held normal to the line of sight: [15]

Inst. station	Height of Instrument	Staff Station	Vertical Angle	Hair Readings	Remarks
P	1.7500	BM	-6°30'	0.542,1.013,1.935	RL of C= 378.700 m
P	1.7500	Q	+8°30'	0.456,1.054,1.247	
Q	1.978	R	+10°20'	0.875,1.402,1.880	

Calculate the gradient of the line joining Station P and Station Q.

USE MISSING DATA CALCULATED IN QUESTION NO. 5(a).

$$D = \frac{f}{i} \times S \cos \theta \times + (f + d) \cos \theta + h \sin \theta$$

$$D = \frac{f}{i} \times S \cos \theta \times + (f + d) \cos \theta - h \sin \theta$$

$$V = \frac{f}{i} \times S \sin \theta + (f + d) \sin \theta$$

6. The following staff readings were observed successively with a level and recorded in the following table. Calculate the missing values using the **Rise and Fall Method**. [18]

Station	B.S.	I.S.	F.S.	R.L.	Remarks
1	1.32			363.53	B.M.
2		1.86			
3	1.71		2.54		
4	3.05		1.18		
5		1.19			
6	1.46		2.68		
7			1.53		

All units are in meters.

7. You are asked to survey a hilly area with little vegetation. [3+3]
- Select the appropriate survey methods you need to carry out.
 - Suppose your client was not satisfied with the accuracy of the result. Recommend a suggestion to improve the survey observations.

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Final Examination Fall 2023
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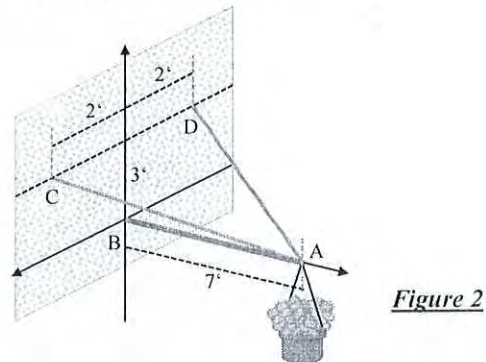
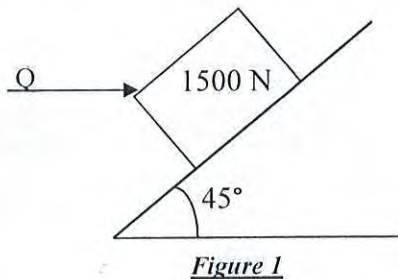
Course Title: Engineering Mechanics II
 Time: 3 hours

Credit Hours: 3.0

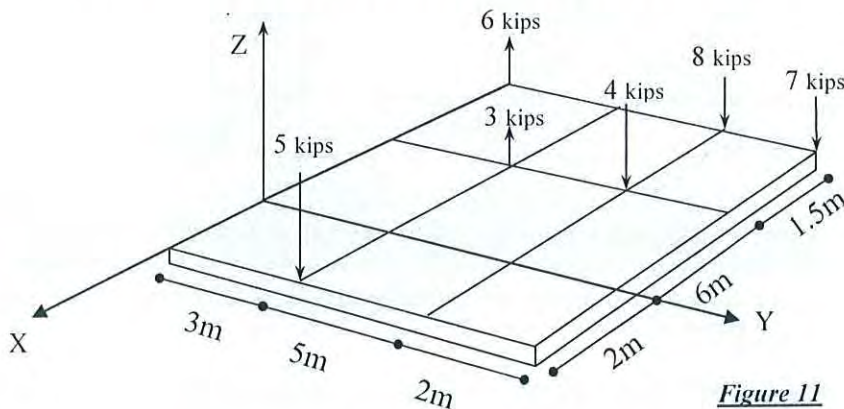
Course Code: CE 103
 Full Marks: 100

[Answer all questions]

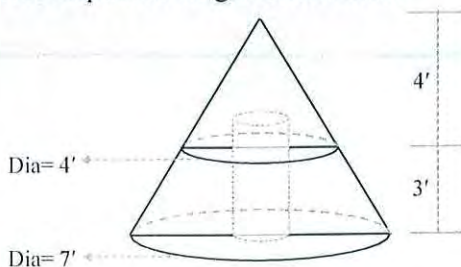
1. The 1500 N block shown in **Figure 1** below is resting on 45° inclined rough surface. The coefficient of static friction is 0.25. Calculate the value of the horizontal force Q necessary to (a) just start the block up the incline. (b) just prevent motion down the incline.



2. The system shown in **Figure 2** is used to support the flowerpot weighing 75 lb at A point. Calculate tension in wires AC and AD.
3. Six parallel forces act on a concrete slab as shown in the **Figure 3**. Determine the resultant of the forces and locate the intersection of the line of the resultant with the XY-plane.



4. Calculate mass moments of inertia of the heterogeneous composite body shown in **Figure 4** with respect to its geometric axis.



Unit weight of cone=	100 pcf
Unit weight of frustum=	120 pcf
Height of cylinder=	5 ft
Diameter of cylinder=	2 ft

5. Solid ball A is released from rest at the position $\theta = 0^\circ$, as shown in **Figure 5**. After falling to $\theta = 90^\circ$, it strikes a box B. If the block starts moving towards the right due to direct impact with the ball, how far will the block move before it comes to rest due to friction?
- Given: Coefficient of restitution, $e = 0.5$; Coefficient of friction between Block B and surface $= 0.3$;
Weight of A = 5 lb; Weight of B = 15 lb

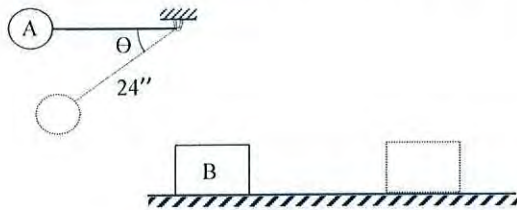


Figure 5

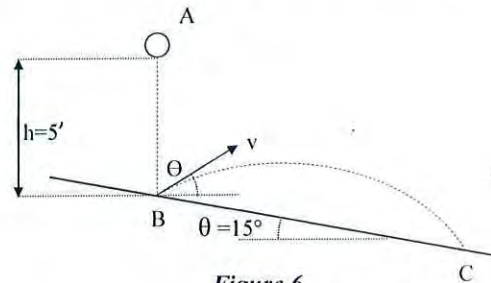


Figure 6

6. Ball A weighing 2 lb is dropped from $h = 5$ ft height on a smooth inclined plane, $\theta = 15^\circ$, as shown in **Figure 6**. If coefficient of restitution $e = 0.5$, calculate velocity of the ball just after impact at point B.
7. Velocity of a ball just after an oblique impact, as shown in **Figure 6**, is 20 ft/s with an angle of $\theta = 25^\circ$ with the horizontal. Calculate the time required for the ball to hit the ground again at C
8. A 2" diameter water jet having a velocity of 25 ft/s impacts on a single moving blade, as shown in **Figure 7**. If the blade moves with a constant velocity of 5 ft/s away from the jet, determine the horizontal and vertical components of force which the blade is exerting on the water.
- Given, unit weight of water $= 62.4 \text{ lb/ft}^3$.

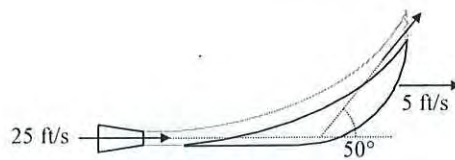


Figure 7

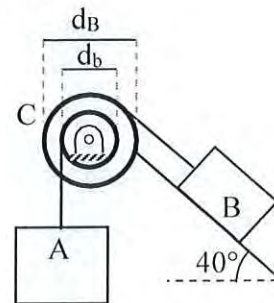


Figure 8

9. The bodies A and B, shown in **Figure 8** weigh $W_A = 65 \text{ lb}$, $W_B = 30 \text{ lb}$ with $d_b = 0.5 \text{ ft}$, $d_B = 1 \text{ ft}$. Rotating part C weighs 25 lb and has a radius of gyration 1.1 ft. with respect to its axis. Coefficient of kinetic friction for B and inclined surface is 0.2 and 0.33 respectively. If B moves 3 ft from rest, calculate velocity of A and B by applying work-energy principle
10. Calculate the work done by friction in slowing a 10.5 kg block travelling at 5.85 m/s to a rest at a distance of 9.65 m.
- What is the kinetic coefficient of friction between the block and surface?
 - How long does it take for the block to stop from initial velocity?