

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring 2022
Program: B.Sc. Engineering (Civil)

Course Title: English Language II
Time: 1 hour

Credit Hour: 3.00

Course Code: HSS 103
Full Marks: 20

Instructions:

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

***Answer all the questions**

1. Rewrite the following changing the active sentences to passive or *vice versa*:

5×1 = 5

- a) The marvelous performance delivered by the children enthrall us.
- b) They are painting the walls.
- c) Your order has been shipped by us.
- d) The girl recited the poem beautifully.
- e) The child will impress everyone with his polite manners.

2. Complete the following using proper conditionals:

5×1 = 5

- a) If I had saved more money, ...
- b) If I win the lottery, ...
- c) If Hannah drove fast, ...
- d) If I miss the train, ...
- e) If the night sky was clear, ...

3. Suppose you are the CR of your class and recently you have observed that the staff at your department lack basic communication skills in English. Now, write a memo addressed to the Head of your department requesting to launch a program that will train the staff for required skills.

10×1=10

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid-Semester Examination Spring-2022
Program: B.Sc. in CE

Course Title: Chemistry

Course No.: Chem111

Credit: 3.00

Time: 1.00 Hour.

Full Mark: 60

There are **Four** Questions. Answer three questions including Q-1 and Q-2.

1. a. $1s^2 2s^2 2p_x^2 2p_y^1 2p_z^0$ and $1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$ are two possible electron configurations for nitrogen. Recognize the correct electron configuration and explain your answer. 12
 - b. Calculate the energy required to excite the hydrogen electron from level $n=1$ to level $n=2$. Also calculate the wavelength of light that must be absorbed by a hydrogen atom in its ground state to reach this excited state. 8
 2. a. Arrange O , O^+ and O^- according to their increasing order of radii and justify your answer. 12
 - b. Explain the higher ionization energy of nitrogen as compared to oxygen. 8
 3. a. Show the formation of pi bond in $CH_2 = CH_2$ molecule. Explain by drawing the orbital diagram. 12
 - b. Explain the high electrical conductivity of metals from the concept of bonding. 8
- OR**
4. a. Compare the concepts of ionic and covalent bonding. 12
 - b. Draw the geometry of the following: H_3O^+ , OF_2 . 8

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid-Semester Examination, Spring -2022
Program: B.Sc. in Civil Engineering

Course Title: Mathematics-II
 Credit: 3.00

Time: 1.00 Hour

Course Code: MTH 103
 Full Marks: 60

There are **Four** questions. Answer **Three**. All questions are of equal values, indicated in the right margin.

1. (a) Define (i) Position Vector (ii) Equal Vector (iii) Parallel Vector (iv) Opposite Vector(v) Null Vector. Find the unit vector of $4\hat{i} - 4\hat{j} + 7\hat{k}$. 10
- (b) If $\vec{A} = 4\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{B} = -2\hat{i} + \hat{j} - 2\hat{k}$, find a unit vector perpendicular to both \vec{A} and \vec{B} . 10

2. (a) If $a' = \frac{b \times c}{[abc]}, b' = \frac{c \times a}{[abc]}, c' = \frac{a \times b}{[abc]}$ then prove that 10

$$a = \frac{b' \times c'}{[a'b'c']}, b = \frac{c' \times a'}{[a'b'c']}, c = \frac{a' \times b'}{[a'b'c']}$$
- (b) A particle moves along the curve $x = 2t^3, y = t^2 - 4t, z = 3t^2 - 5$ where t is time. Find the components of its velocity and acceleration at time $t = -1$ in the direction $\hat{i} - 3\hat{j} + 2\hat{k}$. 10

3. (a) Find the angle between the surfaces $xy^2z = 3x + z$ and $3x^2 - y^2 + 2z$ at the point (1,-2,1). 10
- (b) Find the directional derivative of $f = 4e^{2x-y+z}$ at the point (1,1,-1) in the direction $2\hat{i} - 3\hat{j} + 6\hat{k}$. 10

4. (a) If $\vec{A} = xz^3\hat{i} - 2x^2yz\hat{j} + 2yz^4\hat{k}$, find $\text{Curl Curl } \vec{A}$ at (1,-1,1). 10
- (b) Show that vector $\vec{v} = (x + 2y + 4z)\hat{i} + (2x - 3y - z)\hat{j} + (4x - y + 2z)\hat{k}$ is irrotational. Also show that \vec{v} can be expressed as the gradient of a scalar function. 10

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2022
Program: B. Sc. Engineering (Civil)

Course Title: Engineering Mechanics II
 Time: 1 hour

Credit Hours: 3.0

Course Code: CE 103
 Full Marks: 30

ANSWER ALL THE QUESTIONS

1. A horizontal force Q is acting on block A while it rests on block B as shown in **Fig. 1**.

Given: Unit weight of block A = 24 kN/m^3 , width of block = 0.50 m

- a. If $Q = 0 \text{ lb}$, calculate the minimum co-efficient of friction required between block A and B to prevent downward motion of block A. [4]
- b. Calculate Q that causes block A to be on the verge of moving upward, if the co-efficient of static friction A and B is 0.33 . [6]

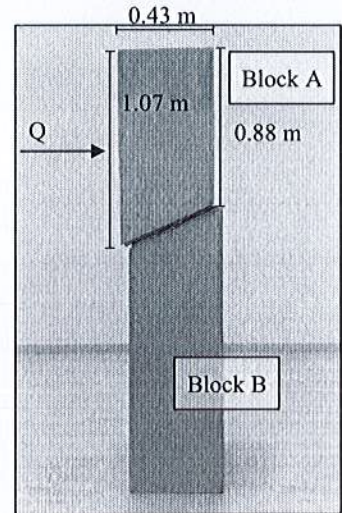


Fig. 1

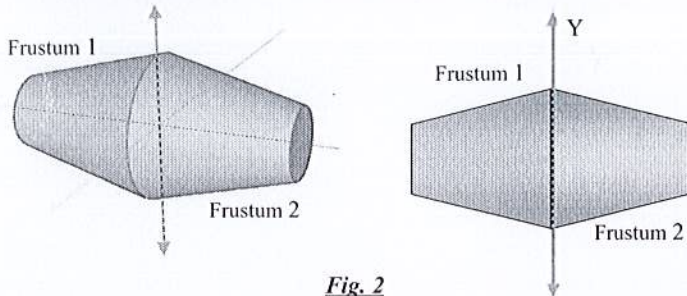


Fig. 2

2. The composite object shown in **Fig. 2** is made up of two solid frustums (as defined in the table).

Calculate the Moment of inertia of the object with respect to the Y axis shown in the figure. [7]

Object	Radius	Height	Unit weight
Frustum 1	6''(top)	1'	80 lb/ft ³
	1''(bottom)		
Frustum 2	6''(top)	1'	60 lb/ft ³
	1''(bottom)		

3. The composite object shown in **Fig. 3** consists of cubic prism with a hollow sphere at the center.

If the centroids of the prism and sphere coincide, calculate radius of gyration of the composite object with respect to the Y-axis (also shown in the figure).

Given: Sides of cube = $1'$, Radius of sphere $8''$, Unit weight = 100 pcf .

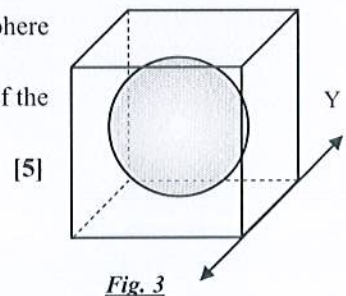


Fig. 3

- a. An object falls from rest and travels a height H to hit the ground. If the sound of the object hitting the ground is heard at the height H after 2.5 seconds, determine the speed of the object right before hitting the ground. Given, average speed of sound is 332 m/s . [3]
- b. A particle P is moving at an acceleration $a = t + 15 \text{ m/s}^2$. When $t = 0$, displacement = 0 and when $t = 4$ seconds, displacement = 10 m . Calculate the displacement when $t = 10$ seconds. [5]

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring 2022
Program: B.Sc. Engineering (Civil)

Course Title: Surveying
Time: 1 Hour

Course Code: CE 105
Full Marks: 100

1. Consider a field filled with depressions here and there and it also has a 3-story building and a pond with 40' x 30' dimension. Explain what method of surveying will you apply and also discuss your methods of overcoming these obstacles.
(25)
2. A 20 m chain was found to be 5 cm too long after chaining a distance of 2252 m. It was found to be 20 cm too long at the end of day's work after chaining a total distance of 3700 m. Find the true distance if the chain was correct before the commencement of the work.
(25)
3. a) In an old survey made in 1990 when the declination was $4^{\circ}W$, at that time the magnetic bearing of a given line was 210° . The declination in the same locality is now $10^{\circ}E$. What are the true and present magnetic bearing of the line?
(5)

b) The following are bearings taken on a closed compass traverse:

Line	FB	BB
AB	$80^{\circ}10'$	$259^{\circ}0'$
BC	$119^{\circ}20'$	$301^{\circ}50'$
CD	$171^{\circ}50'$	$352^{\circ}50'$
DE	$230^{\circ}10'$	$49^{\circ}30'$
EA	$310^{\circ}20'$	$130^{\circ}15'$

Compute the interior angles and correct them for observational errors. Assuming the observed bearing of the line CD to be correct adjust the bearing of the remaining sides.

4. Define the following:
a) Station b) Foresight, c) Backsight, d) Datum, e) Benchmark (5X5=25)