University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2023
Program: B. Sc. Engineering (Civil)

Course Title: Engineering Mechanics II   Credit Hours: 3.0   Course Code: CE 103
Time: 1 hour   Full Marks: 30

ANSWER ALL THE QUESTIONS
[Assume any reasonable values if needed]

1. Box A is positioned on a rough surface inclined at an angle of 20°. The box is connected to another block B weighing 50 pounds, as shown in *Figure 1*, through a cable that passes over a rough pulley.

   a. If the box is on the verge of starting to move upward along the inclined surface, calculate the weight of the box. [5]

   b. If the box is on the verge of starting to move downward along the inclined surface, calculate the weight of the box. [5]

   Given: coefficient of static friction for all contact surfaces, $\mu_s = 0.25$
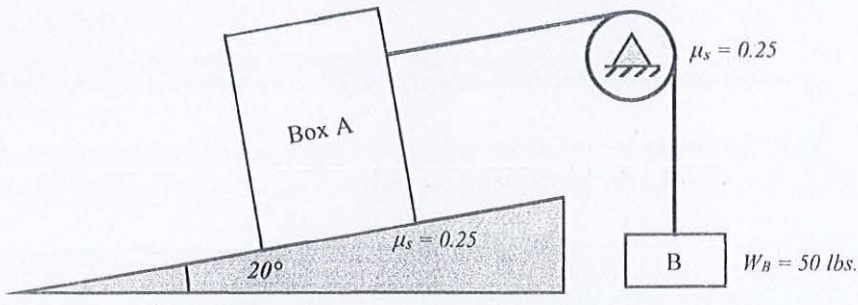

Figure 1

2. The composite object shown in *Figure 2* is made up of a cylinder, three embedded rectangular prisms and a frustum (as defined in the table). One of the prisms has a cylindrical hole at its own CG.

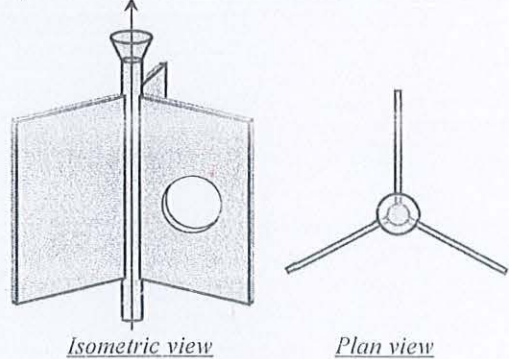| Object	Cross-section	Height	Unit Weight
Frustum	Top radius: 3" Bottom radius: 2"	4"	200 lb/ft³
Cylinder	Radius: 2"	4'	100 lb/ft³
Rectangular prism	3' × 2'	1"	100 lb/ft³
Cylindrical hole	Radius: 4"	1"	-

Isometric view   *Plan view*

Figure 2

Calculate the Moment of inertia and radius of gyration of the composite object with respect to the given axis shown in *Figure 2*. [12]

3. a. Calculate the stopping distance for an automobile going at a constant initial speed of 80 km/h and a human reaction time of 0.42 second for acceleration a= -3 ms⁻². If human reaction time is 1 second, what can be the maximum initial speed for the calculated stopping distance? [4]

   b. The position of a particle is given by $s = (3t^2 - 8t + 6)$ in meters where t is in seconds. Calculate the time when velocity of the particle is 10 ms⁻¹ starting from rest at t = 0. [4]

Course Title: English Composition and Communication   Course Code: HSS 103   Credit: 3.00

Time: 1.00 Hour   Full Marks: 20

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1. The following is a paragraph containing 10 grammatical errors (3 article-related errors, 4 preposition-related errors, and 3 pronoun-related errors). **Rewrite the text correctly and underline your changes.**   0.5x10 = 5

Sayeed is an civil engineer, who plays a crucial role on designing and constructing infrastructure projects such as bridges, buildings, and roads. He holds a MSc in civil engineering from UAP. Him works with architects and contractors to ensure that plans are executed accurately and within budget. Their need a strong understanding at math and physics to solve complex problems. Sayeed also collaborates with clients to understand her needs and specifications. In Friday, he is supposed to start an utility-based project. However, he has informed the clients that he cannot work in the weekend.

2. Rewrite the following paragraph in the past tense.   0.5x10 = 5

The sun shines brightly in the clear blue sky, casting a warm and inviting glow over the bustling city below. People hurry along the sidewalks, their footsteps echoing amidst the distant hum of traffic. Birds chirp merrily from the branches of trees, adding a cheerful melody to the urban symphony. The aroma of freshly brewed coffee wafts out of a quaint café, enticing passersby with its rich and tantalizing scent. A street performer captivates a small crowd with mesmerizing dance moves, their energy infectious and captivating. In a nearby park, children giggle and play on the playground, their laughter echoing through the air. A couple sits on a bench, lost in animated conversation and occasional bursts of laughter. The skyscrapers stand tall and imposing, a testament to the city's ambitious spirit and modernity. Bicyclists whiz by, taking advantage of the dedicated lanes that wind through the city streets. Overall, the city pulses with life and activity, each moment adding to the vibrant tapestry of the present.

3. Sumaita Arefeen of 49/a Lalmatia, Dhaka, bought a color TV set from Haier Electronics, Roopnagar two months ago. She finds that the set is not up to the mark; its sound is not clear and the picture changes to black and white every now and then. The trouble started about 15 days ago. **Now, write a letter to the dealer complaining about the TV set and requesting them to send their engineer to repair it or replace it with a new one if the defect cannot be fixed.**

10x1 = 10

GOOD LUCK!

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

Course Title: Surveying
Time: 1 hour

Credit Hour: 3.00

Course Code: CE 105
Full Marks: 60

[There are Total Six (6) Questions. Answer All Questions]

1. Explain Graphical Method with figure. [05]

2. A closed traverse was conducted round an obstacle and the following observations were made. Calculate the missing values. [10]

Line	Length (m)	Bearing
AB	?	230° 10′
BC	?	155° 40′
CD	423	94° 30′
DE	301	37° 20′
EA	534	308° 50′

3. The following are bearings taken on a closed compass traverse: [10]

Line	FB	BB
AB	131°45′	321°45′
BC	290°16′	33°26′
CD	301°47′	103°19′
DE	58°13′	288°0′
EA	28°32′	237°25′

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

4. The following consecutive readings were taken with a level and 7 m leveling staff on a continuously sloping ground at a common interval of 25 meters: 2.453, 3.206, 4.037, 4.926, 5.866, 6.789, 2.704, 4.328, 5.943, 6.792. The reduced level of the first point was 312.08 m. Calculate the reduced level of the point by the **rise and fall method** and the gradient of the line by joining the first and the last points. [15]

5. Draw contour lines of 10 m, 20 m, and 30 m. Also, demonstrate your understanding on the contour shape. [Grids are given on *Page no.2*] [10]

6. Suppose a client wants a hexagonal-shaped residential building to be built in his 1000 square ft. area. The survey map of the area is given to you. You have to set up it as per the survey map in the field where a rail line already runs through the area. Figure out the steps you need to follow for setting up the map in the field. Identify the problems you face during the whole process (if any). [10]

31		32		36		33
30		8		9		35
37		7		10		34
32		31		35		38

[Instruction for Question No.5: Draw the grid (given in the question paper) on your answer script and answer Question No. 5]

University of Asia Pacific

Department of Basic Sciences and Humanities

Mid-Semester Examination Spring-2023

Program: B.Sc. in CE

Course Title: Chemistry   Course No.: CHEM 111   Credit: 3.00

Time: 1.00 Hour   Full Marks: 60

There are **four** questions. Answer **three** questions including **Q-3** and **Q-4**. All questions are of equal value. Figures in the right margin indicate marks.

1. a. Give an account of Bohr's theory of atomic structure and draw all of the spectral lines found in the atomic spectra of hydrogen atoms.   **10**

   b. A line at 434 nm in the Balmer series of spectrum corresponds to a transition of an electron from the nth to the 2nd Bohr orbit. Find the value of n.   **10**

OR

2. a. State Heisenberg's uncertainty principle. Does this principle go against Bohr's theory? –Explain.   **10**

   b. Write down the significance of four quantum numbers.   **10**

3. a. Define ionization energy. The ionization energy of nitrogen is higher than that of oxygen. –Explain.   **10**

   b. Define atomic radius. Explain the trends of atomic size if you move from Li to Ne in a period.   **10**

4. a. Define lattice energy. Explain how the Born-Haber cycle can determine the lattice energy of an ionic compound such as LiF.   **12**

   b. Draw Lewis dot structures of the following ions/compounds and use the VSEPR model to predict their geometry.   **08**

   (i) SF_4 (ii) H_3O^+

University of Asia Pacific
Department of Basic Sciences and Humanities
Mid-term Examination Spring-2023
Program: B.Sc. Engineering (Civil)

Course Title: Mathematics-II   Course Code: MTH 103
Time: 1.00 Hour   Credit Hour: 3.00   Full Marks: 60

There are four (4) questions. Answer three (3) questions including Q1 and Q2. Figures given in the right margin indicate the marks of the respective questions.

1. a) Define Direction cosine. Find the ratio in which XY plane divides the line joining (2, 1, -3) and (1, 3, 2). Also find the coordinates of that point. **10**

   b) Write the relation between direction cosine and direction ratio. Find the angle between lines AB and BC. Where A(-11, 8, 4), B(-1, -7, -1) and C(9, -2, 4). **10**

2. a) Find the two tangent planes to the sphere $x^2 + y^2 + z^2 - 4x + 2y - 6z + 5 = 0$ which are parallel to the plane $2x + y = 0$. **10**

   b) Identify the name of the equation $9x^2 + 4y^2 + 4z^2 + 4x + y + 10z + 1 = 0$. Also find the center and length of semi major axes. **10**

3. a) Find the equation of plane which is passing through (2, 1, 3), (-1, -2, 4), (4, 2, 1). Also find the perpendicular distance from the point (1, 1, -1) to this plane. **10**

   b) Find the equation of plane which is passing through (1, 1, 2) and perpendicular to two planes $2x - 2y - 4z - 6 = 0, 3x + y + 6z - 4 = 0$. **10**

OR

4. a) Find the equation of plane which is parallel to the plane $4x - 4y + 2z - 3 = 0$ and a distance 4 unit from the point (4, 1, -2). **10**

   b) Write down the condition of perpendicularity and parallelism of two planes. Find the equation of plane which is passing through the middle point of the joining points (2, -3, 1) and (4, 5, -3) and is parallel to the line joining the points. **10**