

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

Course Title: Physics II
Time: 1 hour

Credit Hour: 03

Course Code: PHY 103
Full Marks: 60

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

1. a. State and explain Gauss's law. [05]
- b. Find out the electric field of an infinite long straight charged wire. [15]

OR

2. a. Find out the capacitance of a parallel plate capacitor with a dielectric medium and state the effect of dielectric. [15]
- b. An infinite line charge produces a field of $9 \times 10^4 \text{ NC}^{-1}$ at a distance of 0.02 m. Calculate the linear charge density ($\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$). [05]
3. a. Calculate the magnetic induction due to infinitely long straight conductor carrying current. [15]
- b. A long straight wire carrying current produces a magnetic induction of $4 \times 10^{-6} \text{ T}$ at a point, 0.15 m away from the wire. Calculate the current through the wire ($\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$). [05]
4. Write short note on solenoid. Calculate the magnetic induction due to a long solenoid carrying current. [5+15]

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Mid Semester Examination Fall 2023
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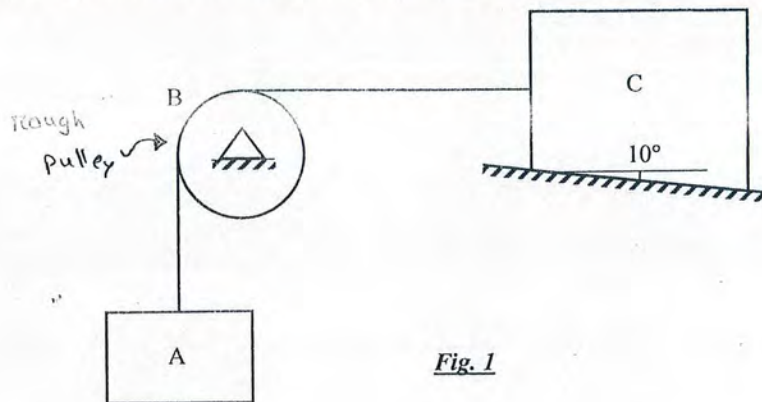
Course Title: Engineering Mechanics II
 Time: 1 hour

Credit Hours: 3.0

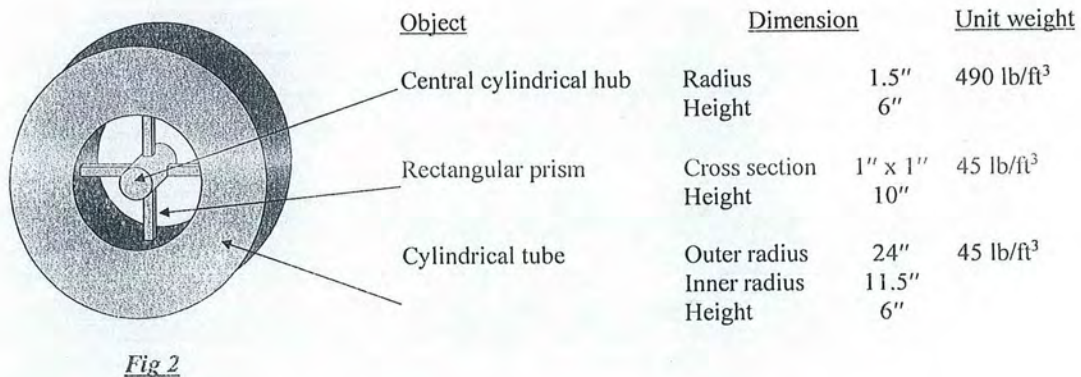
Course Code: CE 103
 Full Marks: 30

ANSWER ALL THE QUESTIONS

1. A system is shown in **Fig. 1** where C weighs 100 lb. Co-efficient of static friction for all contact surfaces is 0.25. Calculate the weight of A that cause it to impend downward. [10]



2. Calculate moment of inertia of the wheel shown in **Fig. 2** with respect to its instantaneous center. [12]



3. (a) If a turbine slows to 250 rpm from 1300 rpm during 7200 revolutions, determine the corresponding average acceleration in rad. per sec². [3]
- (b) A car moves along a road such that its velocity (in fps) is described by the following equations:

$$v = \begin{cases} 6t, & \text{if } t \leq 10 \text{ sec,} \\ 160 - t^2, & \text{if } t > 10 \text{ sec} \end{cases}$$

Draw the acceleration profile and calculate the distance traversed between $t = 5$ sec and $t = 12$ sec.

[5]

University of Asia Pacific
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Program: B.Sc. in Civil Engineering

Course Title: Chemistry
Time: 1 Hour

Credit Hour: 3.0

Course Code: CHEM 111
Full Marks: 60

There are **FOUR** questions. Answer any **THREE** including **Q-1** and **Q-2**. Figures in the right margin indicate marks.

1. a. Show that when the electron of a Hydrogen atom jumps from n_2 (a higher energy level) to n_1 (a lower energy level), the wave number ($\frac{1}{\lambda}$) associated with the radiated energy is given by $\frac{1}{\lambda} = R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$, where R_H = Rydberg constant. [12]
b. Find the wavelength of the second line of the Balmer series for the electron in a Hydrogen atom. [8]
2. a. State Raoult's law. What are the criteria for an ideal solution? [4+8]
b. 5.30 g Na_2CO_3 was dissolved in water to prepare 250 mL of solution. Calculate the molarity of the solution. [8]
3. a. Write down the key features of Valence Shell Electron Pair Repulsion (VSEPR) theory. [12]
b. Draw the structures of SF_6 and IF_7 and mention their molecular geometries. [8]

OR

4. a. Write down the key features of Molecular Orbital Theory (MOT). [12]
b. Draw the molecular orbital diagram for a Nitrogen molecule (N_2), write down the molecular orbital electronic configuration and find the bond order. [8]

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

Course Title: Surveying
Time: 1 hour

Credit Hour: 4.00

Course Code: CE 105
Full Marks: 90

[There are Total Six (06) Questions. Answer All Questions]

1. a) Explain Graphical Method with figure. [5]
b) Differentiate between open traverse and close traverse. [5]
c) Differentiate between chain survey and traverse survey. [3]
d) Explain the importance of GPS. [5]

2. A survey line ABC cuts the banks of a river at B and C, and to determine the distance BC, a line BE 65 m long was set out roughly parallel to the river. A point D was then found in CE produced and middle point F of DB determined. EF was then produced to G, making FG equal to EF, and DG produced to cut the survey line in H. GH and HB were found to be 45 and 85 meters long respectively. Determine the distance from B to C. [15]

3. A closed traverse was conducted round an obstacle and the following observations were made. Calculate the length and bearing of line BC. [15]

Line	Length (m)	Bearing
AB	208	103°04'
BC	?	?
CD	267	195° 30'
DE	453	38° 20'
EB	534	309° 50'

4. The following Fore Bearings (F.B.) and Back Bearings (B.B.) were taken while traversing with a compass: [10+5]

Line	F.B.	B.B.
PQ	131°31'	311°45'
QR	290°16'	110°02'
RS	301°47'	121°47'
ST	58°13'	238°39'
TE	28°32'	208°06'

Figure out the stations affected by local attraction. Also, calculate the corrected bearings of the given lines assuming the magnetic declination at that place as 1°05'E.

5. The following consecutive readings were taken with a level and 4 m leveling staff on a continuously sloping ground at a common interval of 24 meters: 0.453, 1.206, 2.037, 2.926, 3.866, 0.789, 1.704, 2.943, 3.792. The reduced level of the first point was 312.08 m. Calculate the reduced level of the points by the **Rise and Fall method** and the gradient of the line by joining the first and the last points. [15]
6. Draw contour lines of 10 m, 28 m, 29 m, 30 m and 31 m. Also, demonstrate your understanding on the contour shape. [Grids are given on **Page no.2**] [12]

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

[Instruction for Question No.6: Draw the grid (given in the question paper) on your answer script and answer Question No. 6]

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

Course Title: Mathematics-II

Time: 1.00 Hour

Credit Hour: 3.00

Course Code: MTH 103

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) Find the area of a triangle with vertices at $(3, -1, 2)$, $(1, -1, -3)$, and $(4, -3, 1)$. 07
b) Find the directional derivative of the function $\phi = 2xy + xy^2$ in the direction of $\hat{i} + 2\hat{j} + 2\hat{k}$ at $(1, -1, 2)$. 07
c) Prove that the vector $\vec{A} = 3y^4z^2\hat{i} + 4x^3z^2\hat{j} - 3x^2y^2\hat{k}$ is solenoidal. 06
2. a) Evaluate $\int_C xdx + ydy$ over the ellipse $4x^2 + y^2 = 4$. 10
b) Evaluate $\iint_S \vec{F} \cdot \hat{n} ds$ if $\vec{F} = (x + y^2)\hat{i} - 2x\hat{j} + 2yz\hat{k}$ and S is the surface of the plane $2x + y + 2z = 6$ in the first octant. 10
3. a) State Stoke's Theorem. Verify Gauss divergence theorem for $\vec{F} = 4x\hat{i} - 2y^2\hat{j} + z^2\hat{k}$ taken over the region bounded by the cylinder $x^2 + y^2 = 4$ and the plane $z = 0$, and $z = 3$. 20

OR

4. a) Evaluate $\int_C (y - \sin x)dx + \cos x dy$ using Green's theorem where C is the triangle with vertices $(0, 0)$, $(\frac{\pi}{2}, 0)$, $(\frac{\pi}{2}, 1)$. 12
b) Find constants a, b, c so that $\vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ is irrotational and find its scalar potential. 08

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

Course Title: English 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) I shouldn't have done it.
- b) Did she perform her duty properly?
- c) The tiger was chasing the deer.
- d) Have you written the report yet?
- e) Your order has been sent by us.

2. Complete the following using proper conditionals:

5×1 = 5

- a) If I had reached there early, ...
- b) I would be able to finish the task early, ...
- c) I could have missed the bus, ...
- d) Had I saved more time, ...
- e) What would've happened, ...

3. Suppose *UAP Language Club* recently arranged a language competition commemorating the International Mother Language Day. Now, write a 350 word report describing the event in detail.

10×1=10

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2023
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. People warned us not to go out alone.
- b. The computer will be repaired by the technician tomorrow.
- c. My sister gave me this bracelet on my birthday.
- d. Our project is being reviewed by Professor John now.
- e. The company has already offered me a job.

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 that I could have left on the evening flight,

3. Suppose you are a reporter for the quarterly newsletter of University of Asia Pacific. You are assigned to cover the "Amor Ekushe Book Fair-2024" held at the Bangla Academy Premises. Now, write a report on it, including key highlights, notable attractions and the significance of the book fair, with a focus on its impact on students.

10×1=10