

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2018**  
**Program: B.Sc Engineering (Civil)**

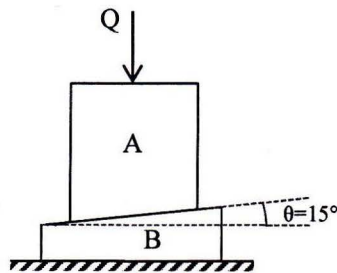
Course Title: Engineering Mechanics II  
 Time: 1 hr

Course Code: CE 103  
 Full Marks: 30

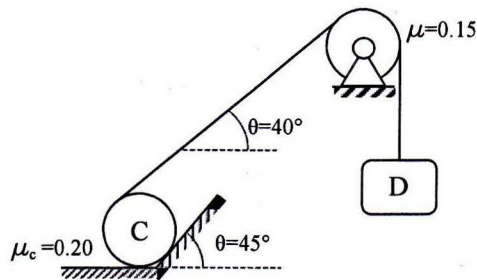
[Answer any 3 (Three) out of 4 (Four) Questions]

1. Block A and B are resting on ground as shown in **Figure 1** below. Q is a gradually increasing force applied on block A. Identify frictional forces on all surfaces and calculate Q which causes either of the blocks to slip.

Given: Co-efficient of static friction between blocks = 0.25; co-efficient of static friction between block B and surface = 0.20; weight of A and B respectively 50 lbs and 30 lbs.



**Figure 1**



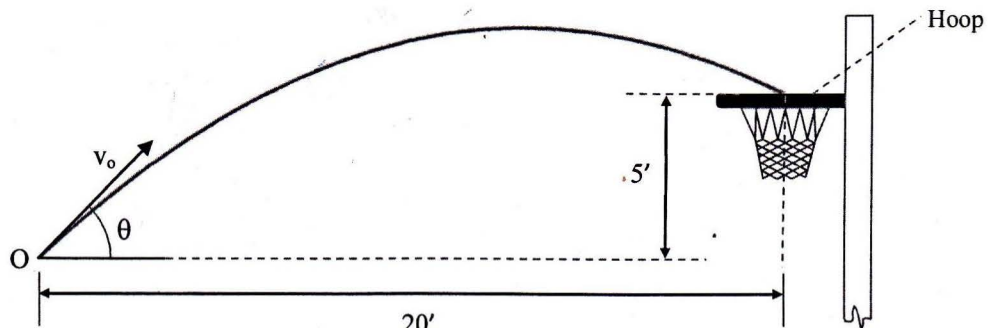
**Figure 2**

2. a) Cylinder C is connected to block D with a weightless cord as shown in **Figure 2**. Calculate weight of block D if the cylinder is just about to spin.

Given, Co-efficient of static friction between cord & pulley = 0.15; co-efficient of static friction between cylinder and surface = 0.20; weight of cylinder = 10 lbs; radius of cylinder = 1ft.

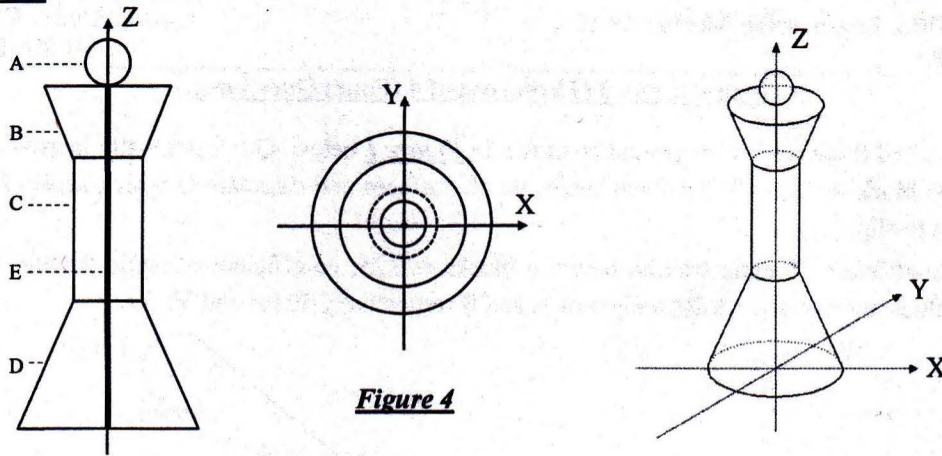
b) A particle is moving at acceleration  $a = 5t^2 + 12t$  from rest, where 't' is in seconds and 'a' is in  $\text{ms}^{-2}$ . Calculate its displacement after 10 seconds.

3. In a basketball match, a player shoots for the hoop from 20 feet horizontal distance, with an initial velocity  $v_0$  as shown in **Figure 3**. Calculate magnitude and direction of  $v_0$  such that the ball reaches hoop in 1.5 sec. Given, the hoop is 5 feet higher than throwing location O.



**Figure 3**

4. Calculate mass moments of inertia for the composite object with respect to given Z axis as shown in **Figure 4**.



**Figure 4**

Objects		Radius (cm)	Height (cm)	Density (g/cm <sup>3</sup> )
A	Solid sphere	0.75	-	0.60
B	Frustum	2.00 (top) 1.15 (bottom)	1.2	0.60
C	Cylinder	1.15	2.4	0.60
D	Frustum	1.15 (top) 2.70 (bottom)	2.1	0.60
E	Slender rod	0.05	6.0	7.85

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2018**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Surveying  
Time: 1 hour

Course Code: CE 105  
Full Marks: 30

[Assume Reasonable Values for Any Missing Data]

**PART – A**

There are **SIX** questions in this section. Answer any **FIVE**.

**5 x (2) =10**

1. Write down the components of an idealized remote sensing system.
2. Compare between 'Plane Surveying' and 'Geodetic Surveying'.
3. How can you detect local attraction at a particular place?
4. Define: i. Turning point and ii. Bench Mark
5. Why are Gamma rays and X rays not available for remote sensing? What do you understand by the term 'Active Remote Sensing'?
6. How are GIS and Remote Sensing linked?

**PART – B**

There are **THREE** questions in this section. Answer any **TWO**.

**2 x (10) = 20**

7. The following are the bearings taken on a closed traverse:

Line	F.B.	B.B.
AB	80°10'	259° 00'
BC	120° 20'	301° 50'
CD	170° 50'	350° 50'
DE	230° 10'	49° 30'
EA	310° 20'	130° 15'

Compute interior angles and correct them for observational errors.

8. The following consecutive readings were taken with a level:

0.585, 1.010, 1.735, 3.295, 3.775, 0.350, 1.300, 1.795, 2.575, 3.375, 1.735, 0.635 and 1.605

The instrument was shifted after 5th and 10th reading. The reduced level of the first point was 136.44 m. Rule out a page of a level book and enter the above readings. Calculate the reduced levels of the other points.

9. (i) The distance between two stations was measured with a 20 m chain and found to be 1500 m. The same distance when measured with a 30 m chain was found to be 1476 m. If the 20 m chain was 5 cm too short, what was the error in 30 m chain?

(ii) The table below gives the lengths and bearings of the lines of a traverse ABCDE, the length and bearing of EA have been omitted, Calculate length and bearing of line EA.

Line	Length (m)	W.C.B.
AB	102.5	261°45'
BC	108.7	9°00'
CD	92.5	282° 30'
DE	125	71° 30'
EA	?	?

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**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid term Examination Spring 2018**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Chemistry  
Time: 1 hour

Course Code: CHEM 111  
Full Marks: 60

There are *four* questions. Answer *any three* questions.

1. (a) Define ionization potential and electron affinity. How do they change in the periodic table? [4]  
(b) What is meant by isoelectronic? Which of the following species are isoelectronic? Explain the reasons for being isoelectronic. [3+3]  

$\text{Cu}^{2+}$ ,  $\text{Na}^+$ ,  $\text{Zn}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Al}^{3+}$

(c) Predict the geometry of the  $\text{H}_2\text{O}$ ,  $\text{SF}_4$ ,  $\text{IF}_5$ , and  $\text{XeF}_4$  molecules by VSEPR model. Show your work to get full credit for this question. [10]
2. (a) Draw the arrangements of the electron pairs in  $\text{NH}_3$  and  $\text{NF}_3$ . Which one of these two molecules has larger dipole moment? Explain your answer. [6]  
(b) Applying VBT explain the bonding of  $\text{NH}_3$  and  $\text{N}_2\text{F}_2$  molecules. [8]  
(c) What are  $\sigma$  bond and  $\pi$  bond? Show how the  $p$  orbitals can form both  $\sigma$  and  $\pi$  bonds. [6]
3. (a) Define orbital. What are the physical significances of  $\Psi^2$ ? [5]  
(b) Which of the following orbitals are NOT permissible? Explain.  

$3p$ ,  $2d$ ,  $1p$ ,  $3f$ ,  $2s$

[8]  
(c) Applying the Bohr model, determine the wavelength of light emitted when the electron in a hydrogen atom undergoes a transition from energy level  $n = 3$  to level  $n = 1$ ? [7]
4. (a) Estimate the vapor pressure of water at  $50^\circ\text{C}$ . Note that the normal boiling point of water is  $100^\circ\text{C}$  and that its heat of vaporization is  $40.7 \text{ kJ/mol}$ . [6]  
(b) Draw and label the phase diagram of  $\text{H}_2\text{O}$ . Calculate the degrees of freedom using the phase rule at all the regions, curves and at the triple point. [4+4]  
(c) The pH of a blood sample is measured 7.4. Calculate the concentration of  $\text{H}^+$  ion in that sample. [6]

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination, Spring 2018**  
**Program: BSc in Civil Engineering**

Course Title: English II: Language Composition Skill

Course Code: HSS-103

Time: 1 hour

Full Marks: 20

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1. Read the passage and then respond to the questions. Each question will ask you to make a logical inference based on textual details. Explain your answer by referencing the text: 3

Kyle ran into his house, slamming the door behind him. He threw his book bag on the floor and plopped onto the couch. After six hours of playing *Grand Larceny VII*, he ate some pizza and fell asleep with a slice on his stomach and his feet on his book bag. When Kyle came home from school the next day, he was noticeably distraught. He balled up his report card and placed it inside a soup can in the garbage. He then flipped the soup can upside down in the garbage can and arranged loose pieces of trash over it. As he plopped down on the couch, he let out a sigh and picked up his controller.

- a) Why was Kyle distraught? 1
- b) Why did Kyle put the report card in a soup can? 1
- c) Was Kyle's report card good or bad and why was it like that? 1

2. Choose the correct form of the verb that agrees with the subject: (7×.5=3.5)

- a) This is one of the best pictures that ..... been released this year. (**has / have**)
- b) The color of the fish and birds..... as a protection. (**serves /serve**)
- c) The coach and assistant..... us patiently. (**teach /teaches**)
- d) Bill, together with his brothers ..... the college. (**attends /attend**)
- e) Neither of these routes.....directly to the beach. (**connect / connects**)
- f) The man with all the birds----- on my street. (**live/lives**)
- g) Either Jane or Joe ..... on the games. (**was /were**)

3. Re-write the following sentences correcting the errors: (7×.5=3.5)

- a) I got here late because the traffic.
- b) •I wish I have more time to finish the proposal.
- c) If we hire more people, we wouldn't be so busy.
- d) They've been married during ten years.

- e) The TV is too loud? Okay, I turn it down.
- f) I saw the blind man crossed the busy road without any help.
- g) The robber gave the victim with a hard blow.

**4. Make the first, second or third conditional as instructed:**

**(4×0.5=2)**

- a) If Luke .....(not/send) flowers to his mother, she .....(not/be) happy. (Third conditional)
- b) If I .....(want) a new car, I .....(buy) one. (Second Conditional)
- c) If we .....(not/have) an argument, we .....(not/be) late. (Third Conditional)
- d) If I .....(not/go) to bed soon, I .....(be) tired in the morning. (First Conditional)

**5. Select the correct word for each sentence:**

**(6×0.5=3)**

- a) I refused to accept / except the performance evaluation because there was false information in it.
  - A. Accept
  - B. Except
- b) It is easy to give advice / advise, but not so easy to take it.
  - A. Advice
  - B. Advise
- c) The oil spill in the Gulf of Mexico has affected / effected the economy and the environment in negative ways.
  - A. Affected
  - B. Effected
- d) Before the bell rang, the class was already / all ready to go home.
  - A. Already
  - B. All ready
- e) The dog buried its / it's bone.
  - A. Its
  - B. It's
- f) The car passed / past the semi on the right; that was a dangerous move.
  - A. Passed
  - B. Past

**6. Write a paragraph on- 'Dhaka then and now.'**

**(05)**

**University of Asia Pacific**  
**Department of Basic Sciences & Humanities**  
**Mid Examination, Spring-2018**  
**Program: B. Sc. in Civil Engineering**

Course Title: Coordinate Geometry and Vector Analysis  
Time: 1.00 Hour

Course Code: MTH 103  
Full Marks: 60

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

1. (a) Determine the equation of the curve  $x^2 + y^2 - 8x + 14y + 5 = 0$ , when the origin is transferred to the point  $(4, -7)$ . 8
- (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  $45^\circ$ . 12
2. (a) Prove that  $3x^2 - 5y^2 - 14xy - 54x - 2y + 51 = 0$  represents a pair of straight lines. Find the point of intersection and the angle between them. 14
- (b) Find for what value of  $\lambda$  the equation  $2\lambda xy - y^2 + 4x + 2y + 8 = 0$  represents a pair of straight lines. 6
3. (a) Show that the lines whose direction cosines are proportional to  $2, 1, 1$  ;  $4, \sqrt{3} - 1, -\sqrt{3} - 1$  ;  $4, -\sqrt{3} - 1, \sqrt{3} - 1$  are inclined to one another at angle  $\frac{\pi}{3}$ . 9
- (b) Reduce the equation of the conic  $x^2 - 4xy + y^2 + 8x + 2y - 5 = 0$  to its standard form. 11
4. (a) Find the equation of the plane through the points  $(-1, 1, 1)$  and  $(1, -1, 1)$  and also perpendicular to the plane  $x + 2y + 2z = 5$ . 10
- (b) Find the equation of the straight line that intersect the lines  $4x + y - 10 = 0 = y + 2z + 6$  and  $3x - 4y + 5z + 5 = 0 = x + 2y - 4z + 7$  and passing through the point  $(-1, 2, 2)$ . 10