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**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination, Spring- 2019**  
**Program: B.Sc. in Civil Engineering**  
**1<sup>st</sup> Year 2<sup>nd</sup> Semester**

Course Title: English Language II

Course Code: HSS-103

Credit: 3.00

Time: 3.00 hours

Full marks: 50

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**Instructions:**

\*Marks are indicated in the right margin.

\*Answer all the questions.

**Read the passage and answer questions 1 & 2:**

**The history of Coca-Cola**

The Coca-Cola company started 110 years ago as a small, insignificant one man business. Since then, it has grown into one of the largest companies in the world. Coca-Cola was invented by Dr. John Pemberton, an Atlanta pharmacist. He concocted the formula in a three legged brass kettle in his backyard on May 08, 1886 by mixing lime, cinnamon, coca leaves, and the seeds of a Brazilian shrub.

Coca-Cola was named by Frank Robinson, one of Pemberton's close friends. Robinson also designed the famous Coca-Cola logo. Later, Dr. John Pemberton sold the Coca-Cola company to Asa Candler for \$2,300.

On January 31, 1893, the famous Coca-Cola formula was patented. In 1915 the Root Glass Company made the contour bottle for the Coca-Cola company. Candler advertised Coca-Cola in newspapers and billboards. Coca-Cola was sold after the prohibition era to Earnest Woodruff for 25 million dollars. He gave Coca-Cola to his son, Robert Woodruff who would be president of the company for six decades. Woodruff introduced the six bottle carton in 1923. He also made Coca-Cola available through vending machines in 1929. The Coca-Cola contour bottle was patented in 1977. The two litter bottle was introduced in 1978. The same year, the company introduced plastic bottles.

During the First World War, American soldiers in Europe began asking for Coca-Cola, so the Coca-Cola company began to export to Europe. It was so popular with soldiers that they then had to start bottling the drink in Europe. Today, Coca-Cola is made in countries all over the world, including Russia and China; it is the world's most popular drink.

As for the famous formula, it is probably the world's most valuable secret! The exact ingredients for making Coca-Cola are only known to a handful of people. And as for the "coca" that was in the original drink, that was eliminated in 1903. It was a drug, and too dangerous. Today's Coca-Cola contains caffeine, but not cocaine!

**1. Answer the following questions briefly.**

**4×1=4**

- a. Who invented Coca-Cola? What was his job?
- b. Who did Pemberton sell the Coca-Cola company to?
- c. Who made Coca-Cola available through vending machines and when?
- d. When did the Coca-Cola company begin to export Coca-Cola to Europe?

*Please turn over*

2. Match the words in Column A with their definitions in Column B.

8×0.5=4

Column A	Column B
i) Concoct	a) an official right to be the only person to make, use or sell a product or an invention
ii) Cinnamon	b) one of the things from which something is made
iii) Logo	c) the inner bark of a South East Asian tree, used in cooking as a spice, especially to give flavour to sweet foods
iv) Patent	d) a drug found in coffee and tea that makes you feel more active
v) Vending Machine	e) a printed design or symbol that a company or an organization uses as its special sign
vi) Ingredient	f) to make something, especially food or drink, by mixing different things
vii) Eliminate	g) to remove or get rid of something/somebody
viii) Caffeine	h) a machine from which you can buy foods, drinks, etc. by putting coins into it

3. Rewrite the sentences by correcting the errors. DO NOT change the tense of the sentences. 10×0.5=5

- His interest in Economics and Physics are praiseworthy.
- You, Raju and I had cheated in the exam.
- This gift is your.
- Its my pleasure to meet you.
- He was one of the best student in our class.
- Ten thousand dollars are a really big amount.
- We really look forward to get your support.
- The murderer will be hung till death.
- We have to rise our voice against corruption.
- While in school, he used to stealing pens.

4. Fill in the blanks with the appropriate words.

10×0.5=5

- The \_\_\_\_\_ (spectators/audience) clapped their hands from the stadium gallery.
- By pouring a glass of water on the interviewer, my friend just made a \_\_\_\_\_ (mistake/blunder) in the interview board.
- Although the movie did not make much money, it got a/an \_\_\_\_\_ (award/reward).
- Still he did not \_\_\_\_\_ (acknowledge/admit) his fault.
- Embracing each other on Eid day is a \_\_\_\_\_ (custom/habit) of the Muslims.
- Arrogance is a \_\_\_\_\_ (crime/sin).
- Are you a fool? How did you buy this simple pen for 100 tk? It has been really \_\_\_\_\_ (costly/expensive).
- I requested him to lend me his book. Unfortunately he \_\_\_\_\_ (denied/refused).
- The ship \_\_\_\_\_ (drowned/sank) just because of the ice berg.
- Don't let him go. Hand him over to the police. He is a \_\_\_\_\_ (famous/notorious) thief.

5. Choose the correct proverbs from the box to fill in the blanks.

10×0.5=5

miss the boat	a blessing in disguise	once in a blue moon	add insult to injury	spill the beans
bolt from the blue	on cloud nine	fit as a fiddle	play devil's advocate	break the ice

- My grandfather is 90 years old, but he is as \_\_\_\_\_.
  - The road accident is a \_\_\_\_\_ for her.
  - Someone at a meeting may \_\_\_\_\_ the role of \_\_\_\_\_ to try and find out what your plan is if things go wrong.
  - Do not tell this secret to Ahmed, he will \_\_\_\_\_.
  - My car broke down in the middle of nowhere, then, to \_\_\_\_\_, it started to rain.
  - He was \_\_\_\_\_ after winning the marathon.
  - Earthquakes hit \_\_\_\_\_ in this part of the earth.
  - He had to \_\_\_\_\_ before she would really engage in a conversation.
  - The apparent misfortune may turn out to be \_\_\_\_\_ and the seeming stroke of luck the very stuff of tragedy.
  - He \_\_\_\_\_ when he did not apply for the job in time.
6. Suppose you are a fresh graduate from the Department of Civil Engineering. There is a vacancy announcement from a reputed university for the post of a Lecturer. Now write a cover letter with your Curriculum Vitae (CV) for the post. 1×8=8

	<b>University of Asia Pacific</b> 74/A, Green Road, Dhaka-1205 Website: www.uap-bd.edu	<b>UAP</b>
<b>FACULTY SEARCH</b>		
Applications are invited for the following position-		
<b>Lecturer, Department of Civil Engineering</b>		
<b>Qualifications:</b> 1 <sup>st</sup> class in Bachelor and Masters degree in Civil Engineering (CGPA 3.5 out of 4.0)		
<b>Experience Requirement:</b> N/A		
<b>How to Apply:</b> Please send your application and C.V. to the Registrar, University of Asia Pacific, 74/A, Green Road, Dhaka-1205 with copies of all relevant certificates and two copies of recent passport size photograph by 31 August 2019.		
		<b>Registrar</b>

7. Write a report on the Fresher's Reception program held at the Department of Civil Engineering, University of Asia Pacific on May 26, 2019.

1×7=7

8. Write an essay on any one of the following:

1×12=12

- Advantages and Disadvantages of Ride-Sharing Services
- Negative Effects of being Addicted to Social Media.

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination, Spring 2019**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Chemistry

Course Code: CHEM 111

Time: 3 Hours

Full Marks: 150

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Write your answers neatly and cleanly. Good Luck!

**Section: A**

There are **FOUR** questions in this section. Answer any **THREE**. [25×3 = 75]

1. (a) What is meant by the term entropy? How is entropy related to reaction spontaneity? [10]  
(b) Describe the effect of temperature on reaction enthalpies using the Kirchhoff's law. [9]  
(c) Explain the meaning of intensive and extensive properties. Give two examples of each of them. [6]
2. (a) Explain the dynamic nature of chemical equilibria. [8]  
(b) State the Law of Mass Action. How would you apply this law to determine the equilibrium constant of a reversible reaction? [10]  
(c) What is Le Châtelier's Principle? Using this principle describe the effect of the addition of helium gas and the change of pressure on the following chemical equilibrium:  
$$\text{H}_2 + \text{I}_2 \rightleftharpoons 2\text{HI}$$
 [7]
3. (a) Which of the following would be likely to have a very large rate constant? Which would have a very small rate constant? (a) Dynamite exploding  
(b) Iron rusting (c) Paper burning [6]  
(b) Distinguish between order and molecularity of a chemical reaction. [10]  
(c) Briefly describe the factors that control chemical reactivity. [9]
4. (a) Define the following terms:  
(i) Elementary reaction (ii) Pseudo-first order reaction (iii) Turnover number [9]  
(b) Derive the integrated rate law equation of a second order reaction. How is half-life related to the second order reaction kinetics? [11]  
(c) The half-life ( $t_{1/2}$ ) of a first-order reaction is 0.950 s. What is the rate constant? [5]

**Section: B**

There are **FOUR** questions in this section. Answer any **THREE**. [25×3 = 75]

5. (a) State Henry's law. Explain the limitations of Henry's law. [6]  
(b) Describe the energy changes in solution making processes. [14]  
(c) A patient has a cholesterol count of 206 mg/dL. What is the molarity of cholesterol in this patient's blood if the molecular mass of cholesterol is 386.64 g/mol? (1 L = 10 dL) [5]
6. (a) Define the following terms: (i) Ideal solution (ii) Azeotropic mixtures [10]  
(b) State and explain Raoult's Law. Explain how the lowering of vapor pressure of a solvent can be employed to determine the molecular weight of the dissolved substance. [10]  
(c) Calculate the osmotic pressure of a 0.075 M solution of aspartic acid at 18.5° C. [5]
7. (a) Why is water considered as a universal solvent? [6]  
(b) Explain the properties that allow water to rise on its own up through a thin column. How do the thermal properties of water regulate the rate at which air temperature changes throughout the world? [14]  
(c) A swimming pool has a volume of one million liters. How many grams of HCl would need to be added to that swimming pool to bring the pH down from 7 to 4? (Assume the volume of the HCl is negligible) [5]
8. (a) What are the environmental pollutants? Predict and identify the pollutants that are directly affecting the air quality of Dhaka city. [7]  
(b) How is the emission of effluents from different industries of DEPZ area contributing to the heavy and toxic metals pollution in nearby water body, soil, and plants? [8]  
(c) Describe two major global environmental problems that are affecting us more or less in recent years. [10]

**University of Asia Pacific**  
**Department of Basic Sciences & Humanities**  
**Final Examination, Spring 2019**  
**Program: B. Sc in Civil Engineering**

Course Title: Mathematics-II  
 Time: 3.00 Hour

Course Code: MTH 103  
 Full Marks: 150

There are **Eight** questions. Answer any **Six**. All questions are of equal value. Figures in the right margin indicate marks.

1. (a) Prove that  $21x^2 - 21y^2 + 40xy + 44x + 122y - 17 = 0$  represents a pair of straight lines. Find the point of intersection and the angle between them. 9
- (b) Reduce the equation of the conic  $x^2 - 4xy + y^2 + 8x + 2y - 5 = 0$  to its standard form. 12
- (c) Find the center of the conic  $14x^2 - 4xy + 11y^2 - 44x - 58y + 71 = 0$ . 4
  
2. (a) Define direction cosines and direction ratios of a line. 6
- (b) 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
- (c) Show that equation of the plane through the point  $(-1, 3, 2)$  and perpendicular to the planes  $x + 2y + 2z = 5$  and  $3x + 3y + 2z = 8$  is  $2x - 4y + 3z = -8$ . 10
  
3. (a) Find the equation of the plane through the points  $(2, 3, 1)$ ,  $(1, 1, 3)$  and  $(2, 2, 3)$ . 7
- (b) Find the equation of the plane through the points  $(-1, 1, 1)$  and  $(1, -1, 1)$  and perpendicular to the plane  $x + 2y + 2z = 5$ . 8
- (c) Find the direction cosines of two lines are connected by the relations  $l + m + n = 0$  and  $2lm + 2ln - mn = 0$ . 10
  
4. (a) 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  $(-1, 2, 2)$ . 12
- (b) Show that the lines  $\frac{x-5}{4} = \frac{y-7}{4} = \frac{z+3}{-5}$  and  $\frac{x-8}{7} = \frac{y-4}{1} = \frac{z-5}{3}$  are coplanar. Find their intersection point and the equation of the plane in which they lie. 13
  
5. (a) Define triple product. Find the volume of the tetrahedron having vertices  $(-j-k)$ ,  $(4i+5j+qk)$ ,  $(3i+9j+4k)$  and  $4(-i+j+k)$ . Also find the value of  $q$  for which these four points are coplanar. 15
- (b) If four points whose position vectors are  $\mathbf{a}$ ,  $\mathbf{b}$ ,  $\mathbf{c}$ ,  $\mathbf{d}$  are coplanar, then show that  $[\mathbf{a} \ \mathbf{b} \ \mathbf{c}] = [\mathbf{a} \ \mathbf{d} \ \mathbf{b}] + [\mathbf{a} \ \mathbf{d} \ \mathbf{c}] + [\mathbf{d} \ \mathbf{b} \ \mathbf{c}]$ . 10



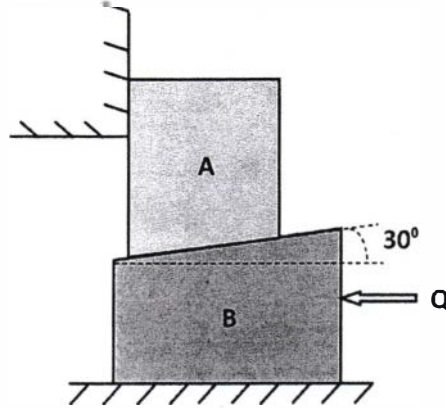
6. (a) Define Gradient. Find  $\nabla\phi$  if (a)  $\phi = \ln|\vec{r}|$ . 15  
 (b)  $\phi = 1/r$
- (b) Define Divergence and Curl. Suppose  $\mathbf{v} = \boldsymbol{\omega} \times \mathbf{r}$ . Prove  $\boldsymbol{\omega} = \frac{1}{2} \text{curl } \mathbf{v}$  where  $\boldsymbol{\omega}$  is a constant vector. 10
7. (a) If a force  $\vec{F} = 2x^2y\hat{i} + 3xy\hat{j}$  displaces a particle in the xy-plane from (0, 0) to (1, 4) along a curve  $y = 4x^2$ . Find the work done. 10
- (b) If  $\vec{F} = 2z\hat{i} - x\hat{j} + y\hat{k}$ , evaluate  $\iiint_V \vec{F} \cdot d\mathbf{v}$  where,  $V$  is the region bounded by the surface  $x = 0, y = 0, x = 2, y = 4, z = x^2$  and  $z = 2$ . 15
8. (a) State and prove Green's theorem on a plane. 10
- (b) Verify Green's theorem in the plane for  $\oint_C (xy + y^2)dx + x^2dy$ , where  $C$  is the closed curve of the region bounded by  $y = x$  and  $y = x^2$ . 15

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Spring 2019**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Engineering Mechanics II  
Time: 3.0 hours

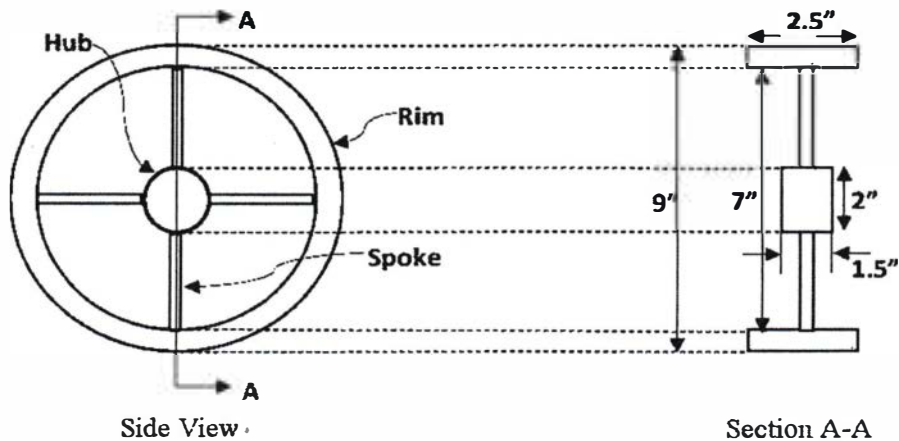
Course Code: CE 103  
Full Marks: 100 (10×10)

1. A body A (Weight = 5000 lb) rests on a weightless body B as shown in **Figure 1**. If the coefficient of static friction for all slipping surfaces is  $f = 1/3$ , calculate the value of  $Q$  that causes impending motion of B towards right.



**Figure 1**

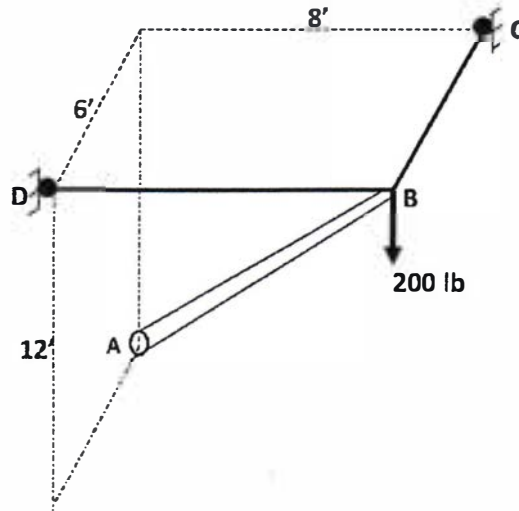
2. A flywheel consists of a rim, a solid central hub and four spokes as shown in **Figure 2**. Determine the mass moment of inertia of the flywheel about the axis of rotation.  
Given: The material weighs 450 lb/cft.  
The spokes are 0.5 inch in diameter and may be treated as slender bars.



**Figure 2**

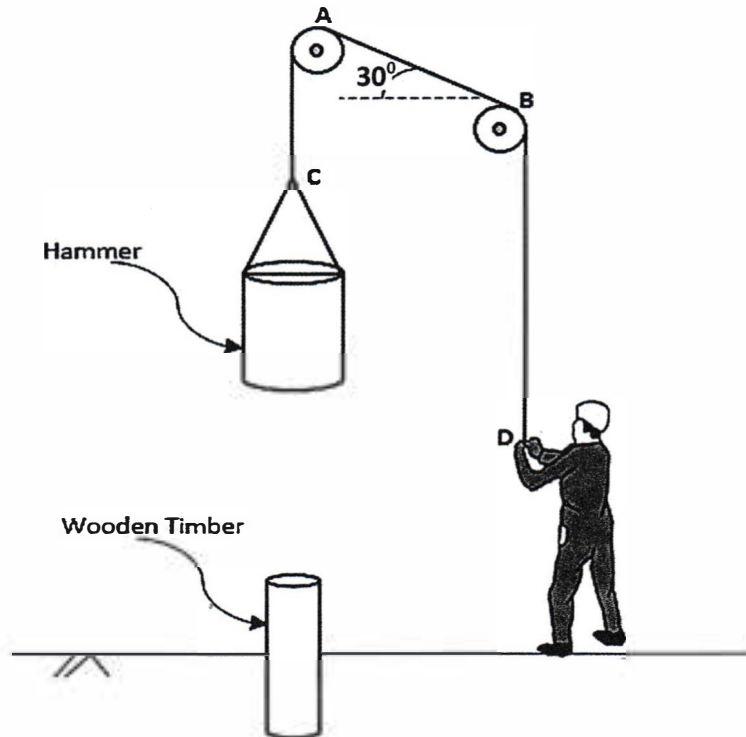


3. A mast AB, supported by a spherical socket at A and two horizontal guy wires BC and BD, carries a vertical load of 200 lb at B as shown in **Figure 3**. The wires BC and BD intersect at right angle at B. Determine the force in the mast AB and tensions in the cables.



**Figure 3**

4. A wooden timber is being driven into the ground with a hammer falling from a height as shown in **Figure 4**. The hammer weighs 140 lb and impends upward when the worker holds the cable at one end with a pull force of 400 lb. If the coefficient of static friction of pulley A is  $f_A = 0.35$ , determine  
 (a) The coefficient of static friction of pulley B ( $f_B$ )  
 (b) The tension in cable AB.

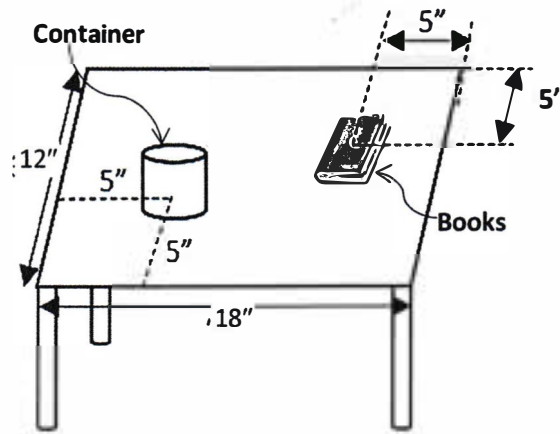


**Figure 4**

5. The timber shown in **Figure 4** is being driven by impact load from the hammer  $F_{\text{hammer}} = 180 \sin(2t)$  and resisted by the ground friction force  $F_{\text{friction}} = 110 \cos(2t)$ , where  $t$  is time in seconds. Use the Impulse-Momentum principle to derive the equation for driven velocity of the timber. Given: Timber weight is 110 lb.

6. A table with one broken leg is supporting a container (weighing 50 lbs) and several books (each weighing 4 lbs) as shown in **Figure 5**.

Determine the maximum number of books that can be stacked on the table at the impending state of overturning. Also determine support reactions at this state. Consider the table top weighs 5 lb/sft.

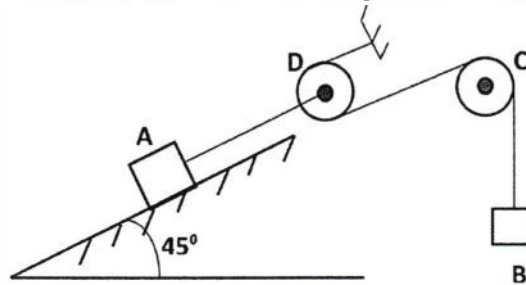


**Figure 5**

7. A system is shown in **Figure 6** where object A weighs 1000 lb and the pulleys are frictionless and weightless. Also, coefficient of static friction for the inclined plane is  $f = 1/3$ .

If A moves 60' from rest up the incline in 12 seconds, determine the weight of body B.

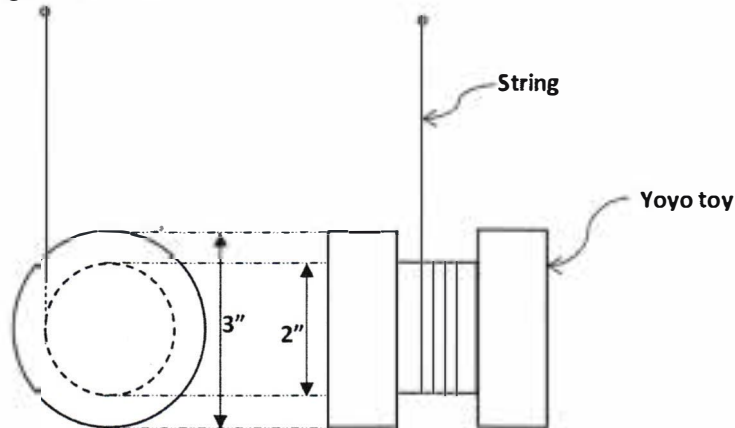
Also, determine the forces on the cables attached to A and B [Use Work-Energy principle].



**Figure 6**

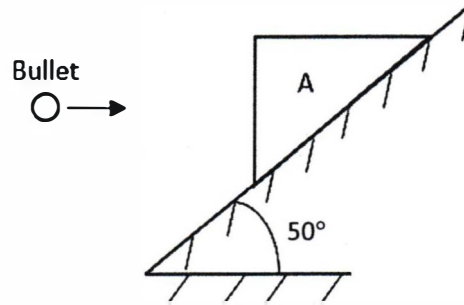
8. A yoyo toy consists of a grooved cylinder and a string wrapped around its mid section, as shown in **Figure 7**. When released from rest, it took full five revolutions to reach its full length.

Consider, radius of gyration of the toy about its rotational axis,  $k = 12$  inch to determine the speed of its CG when its full length was reached.



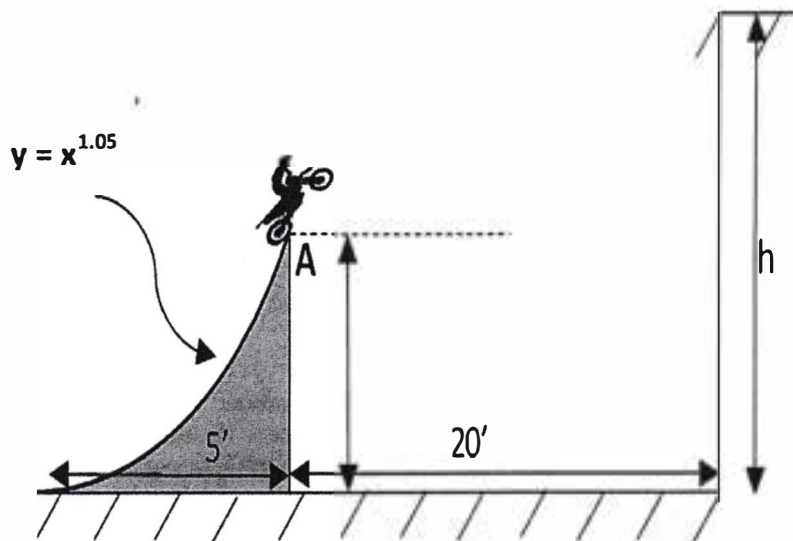
**Figure 7**

9. **Figure 8** shows block A (weight 25 lb) at rest on the  $50^\circ$  inclined plane, when it is hit by a 0.25 lb bullet travelling at 150 ft/s. When the bullet is embedded in the block, determine the distance the block will slide up along the plane before momentarily stopping. Given: Coefficient of static friction of the inclined surface,  $f = 0.20$ .



**Figure 8**

10. **Figure 9** shows a stunt rider passing point A at a speed of 110 fps. Calculate the maximum value height  $h$  if he is to jump over the 20 ft ditch [Consider the stunt rider as a point and neglect air resistance].



**Figure 9**

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Final Examination Spring 2019**  
**Program: B. Sc. Engineering (Civil)**

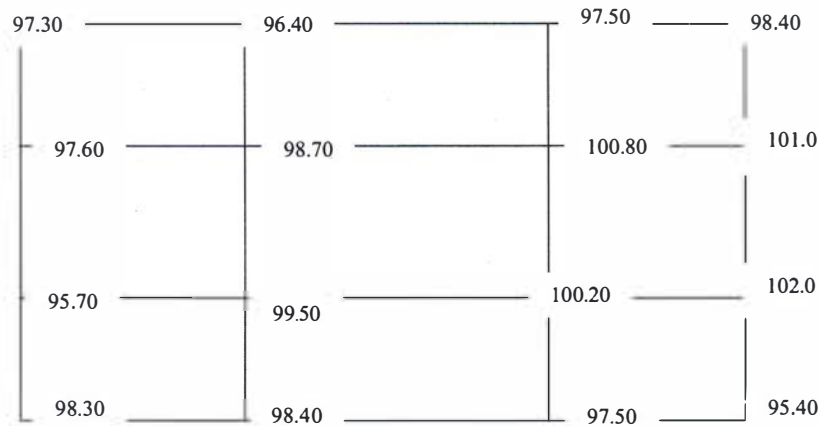
Course Title: Surveying  
 Time: 3 (Three) hours

Course Code: CE 105  
 Full Marks: 120

[Assume Reasonable Values for Any Missing Data]

**PART – A** (Answer all questions)

- Q.1. **Draw tentative contour lines** for 98 m and 100 m in the following grid (calculation not required). (5)



- Q.2. a. A transition curve is required for a circular curve of 400 m radius, the gauge being 1.5m (10) between rail centre and maximum super elevation restricted to 12 cm. The transition is to be designed for a velocity such that no lateral pressure is imposed on the rails and the rate of radial acceleration is  $30 \text{ cm/sec}^3$ . **Calculate the required length of transition curve and design speed.**
- Q.2.b. Two tangents intersect at chainage 59+60, the deflection angle being  $50^{\circ}30'$ . (10) **Calculate the necessary data** for setting out a curve of 15 chains radius to connect the two tangents if it is intended to set out the curve by offset from chords. Take peg interval equal to 100 links, length of the chain being equal to 20 metres (100 links).
- Q.3. a. A railway embankment 400m long is 12 m wide at the formation level and has side slope 2 (10) to 1. The ground levels at every 100m along the centre line are as under:

Distance	0	100	200	300	400
R.L.	204.8	206.2	207.5	207.2	208.3

The formation at 0 chainage is 207.00 and the embankment has a rising gradient of 1 in 100. The ground is level across the centre line. **Calculate the volume of earthwork.**

- Q.3.b. The following gives the values of the offsets in feet taken from a chain line to an irregular boundary: (5)

Distance	0	50	100	150	200	250	300	350	400
Offset	10.6	15.4	20.2	18.7	16.4	20.8	22.4	19.3	17.6

Calculate the area in square feet included between the chain line, the irregular boundary and the first and the last offset by - i) Simpson's Rule and ii) Trapezoidal Rule.

- Q.4. A closed traverse was conducted round an obstacle and following observation were made. (10)

Work out the missing quantities:

Side	Length (m)	Azimuth
AB	500	98°30'
BC	620	30°20'
CD	468	298°30'
DE	?	230°0'
EA	?	150°10'

- Q.5. The following bearings were observed in running a closed traverse: (10)

Line	F.B.	B.B.
AB	75°5'	254°20'
BC	115°20'	296°35'
CD	165°35'	345°35'
DE	224°50'	44°5'
EA	304°50'	125°5'

At what station do you suspect the local attraction? Determine the correct magnetic bearings. If declination was 5°10' E, what are the true bearings?

**PART – B** (Answer all questions)

- Q.6. The following observations were made in a tacheometric survey. (10)

Instrument Station	Height of axis (m)	Staff station	Vertical angle	Hair readings (m)	Remark
A	1.345	BM	-5°30'	0.905,1.455,2.005	RL of BM= 450.500 m
A	1.345	B	+8°0'	0.755,1.655,2.555	
B	1.550	C	+10°0'	1.500,2.250,3.000	

Calculate the RLs of A, B and C and the horizontal distances AB and BC. The multiplying constant is 100.

- Q.7. The distance between two stations was found to be 1200 m when chained with a 20 m chain. The same distance when measured with a 30 m chain was 1195 m. If the 20 m chain was 0.04 m too long, what was the error in 30 m chain? (2.5)

- Q.8.a. Differentiate between remote sensing and GIS. (2.5)
- Q.8.b. Write down the objectives and components of GIS. (5)
- Q.8.c. Describe the procedure of chaining along sloping ground with neat sketches. (5)
- Q.8.d. Explain: i. Celestial Sphere, ii. Zenith and Nadir (5)
- Q.9.a. On a flat plain, where it is quite easy to carry the instruments and place them, which method of survey would you prefer and why? (5)
- Q.9.b. On a hilly terrain, which is quite impossible to reach while carrying instruments, which method of survey would you prefer and why? (5)
- Q.9.c. Compare between 'Aerial Photogrammetry' and 'Terrestrial Photogrammetry'. (5)
- Q.9.d. Write five Applications of Photogrammetry. (5)
- Q.10. Fill up the following blanks using **rise and fall method**. (10)

Point	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
1	3.125					?	BM
2	?		?	1.325		125.005	TP
3		2.320			0.055		
4		?				125.350	
5	?		2.655				TP
6	1.620		3.205		2.165		TP
7		3.625					
8			?			122.590	TBM