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University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2018
Program: B.Sc. in Civil Engineering

Course Title: English Language I (Oral and Written English)

Course Code: HSS101

Time: 3.00 Hour

Full Marks: 50

Instructions:

*Marks are indicated in the right margin.

*Answer all the questions

1. Transform the following sentences accordingly (without changing meaning) 5x2 = 10

- a) It takes a great deal of bravery to stand up to our enemies (Interrogative)
- b) This is happening inside your head. (Negative)
- c) She tells her stories very cleverly. (Exclamatory)
- d) You should not pass the door. (Imperative)
- e) It is not useful to meet revenge with revenge (Affirmative)

2. Complete the following sentences using appropriate prepositions 10x1 = 10
from the clues below:

to	over	across	in	on	out
of	between	of	at	For	with

For the global community to effectively grapple (a) _____ climate change, it is important to identify ways (b) _____ reduce carbon emissions from commercial buildings. According to the U.S. Green Building Council, if half of all buildings were built with 50 percent more energy efficiency, it would save (c) _____ 6 million metric tons of carbon dioxide per year over the life of the building, which typically lasts 50 to 100 years. That's the equivalent (d) _____ taking over a million cars off the road each year. Not all commercial buildings use energy (e) _____ the same rate or in the same ways. The mercantile and service industry (which includes dry cleaners, gas stations, car dealerships, malls, and big box stores) uses about 15 percent of all the energy consumed (f) _____ commercial buildings. Office space (for banks as well as professional and government offices) accounts (g) _____ the next-largest rate of energy consumption. Along with education, healthcare, and lodging, these categories account for about 50 percent of all energy use (h) _____ commercial buildings. Despite these differences, there are many ways to reduce the collective carbon footprint of all commercial buildings, no matter

their purpose. The USGBC has developed a set (i) _____ standards to help the building*planners develop more sustainable buildings. Building projects that conform closely to these standards receive ratings based (j) _____ a variety of metrics, including their energy use, water consumption, and impact on air quality. The points in each category are then tallied to award the building a final rating of either certified (the lowest rating), silver, gold, or platinum (the highest rating).

3. Read the following passage and write down the *synonyms* and *antonyms* of the words as directed. 10x1 = 10

Civil engineering is not all about fancy buildings; it is about (a) **neglecting (antonym)** vital infrastructure. When people think of (b) **infamous (antonym)** civil engineers from the past, they think of Isambard Kingdom Brunel and Joseph Bazalgette, the great engineer of the Victorian age who (c) **rescued (synonym)** London from cholera by constructing new sewers. Today, civil engineering is often (d) **associated with (synonym)** the world's most jaw-dropping structures, such as Sydney Opera House, the Shard and China's Jiaozhou Bay Bridge. But civil engineering is also about maintaining and adapting the infrastructure that people (e) **depend on (synonym)** every day - roads, railways and bridges, energy and water supply, waste networks, and flood defenses. Civil engineers have to keep this infrastructure running effectively and adapt it to meet challenges, such as population growth, climate change, and (f) **artificial (antonym)** disasters. They must also (g) **discover (synonym)** ways to deliver the infrastructure needed when there is (h) **much (antonym)** money to pay for it. Put simply, civil engineers have to (i) **come up with (synonym)** solutions to complex problems and implement them; they (j) **metaphorically (antonym)** shape the world people live in.

4. Read the beginning of the story below and add some more lines in your own words to complete it. Give a suitable title to the story. 5

Mother told Rupa never to go in the basement, but Rupa always wanted to see what was making that noise. It kind of sounded like a puppy, and Rupa wanted to see the puppy. One day, Rupa made up her mind and went in front of the basement door. Mustering all her strength, she opened the door, however

.....

5. Use capitals and punctuation marks where necessary in the following text. 5

alexandre gustave eiffel was a french civil engineer. A graduate of École Centrale Paris he made his name building various bridges for the french railway network, most famously the garabit viaduct. He is best known for the world-famous eiffel tower, built for the 1889 Universal Exposition in Paris, and his contribution to building the Statue of Liberty in New York after his retirement from engineering. Eiffel focused on research into meteorology and aerodynamics making significant contributions in both fields

6. Prepare an *outline* and write a *paragraph* in not more than 150 words on any one of the following. 10

- a) University Friends vs School Friends.
- b) Reasons for Using Social Media.

University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall- 2018
Program: B. Sc in Civil Engineering

Course Title: Physics
Time: 3.00 Hours

Course Code: PHY-101

Credit: 3.00
Full Mark: 150

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

1. (a) Define Doppler effect of sound. Find out the apparent pitch of sound, when the source moves toward and away from the stationary observer. [15]
- (b) Two trains travelling in opposite directions at 100 km/hour each, cross each other while one of them is whistling. If the frequency of the note is 800 Hz, find the apparent pitch as heard by an observer in the other train: (a) before the trains cross each other (b) after the trains have crossed each other. Velocity of sound in air =340 m/s. [10]
2. (a) Define infrasonic and ultrasonic wave of sound. Explain Lissajous' figures. Prove that $y = A \sin (\omega t + \phi)$ from the composition of two simple motions in a straight line. [15]
- (b) Two simple harmonic motions acting simultaneously on a particle are given by the equations $y_1 = \sin (\omega t + \pi/3)$ and $y_2 = 3 \sin \omega t$. Find the equation of the resultant vibration. [10]
3. (a) Define acoustics and reverberation of sound. Draw and explain sound distribution system and write down requisites for good acoustics in an auditorium. [20]
- (b) A quartz crystal of thickness 0.001 m is vibrating at resonance. Calculate the fundamental frequency. Given Y for quartz = 7.9×10^{10} newtons/m² and ρ for quartz =2650 kg/m³. [5]
4. (a) Write down three postulates of the kinetic theory of gases. Prove that $C = \sqrt{\frac{3P}{\rho}}$, where the terms have their usual meanings. [15]
- (b) At what Celsius temperature will oxygen molecules have the same root mean square velocity as that of hydrogen molecules at -100°C? [10]

Turn over

5. (a) Define equilibrium state and Zeroth law of thermodynamics. State and explain Newton's law of cooling. [15]
- (b) A liquid takes 4 minutes to cool from 70°C to 50°C . How much time will it take to cool from 50°C to 40°C ? The temperature of the surrounding is 25°C . Newton's law of cooling is applicable throughout the process. [10]
6. (a) Define first and second law of thermodynamics. Distinguish between Carnot's engine and refrigerator and also prove that efficiency of refrigerator is more than hundred percent. [15]
- (b) A Carnot's refrigerator takes heat from water at 0°C and discards it to a room at 27°C . 1 kg of water at 0°C is to be changed into ice at 0°C . How many calories of heat are discarded to the room? What is the work done by the refrigerator in this process? What is the coefficient of performance of the machine? [10]
7. (a) Write down how you can produce Newton's rings using a monochromatic light. Prove that $r^2 = (2n-1)\lambda R/2$ for Newton's bright ring, where the terms have their usual meanings. [15]
- (b) In a Newton's rings experiment the diameter of the 15th ring was found to be 0.590 cm and that of the 5th ring was 0.336 cm. If the radius of the plano-convex lens is 100 cm, calculate the wave length of light used. [10]
8. (a) Define diffraction and polarization of light. Distinguish between Fresnel and Fraunhofer diffraction. [20]
- (b) If the plane of vibration of the incident beam makes an angle of 30° with the optic axis, compare the intensities of extraordinary and ordinary light. [05]

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

Course Title: Mathematics-I
 Time: 3.00 Hour.

Course Code: MTH 101
 Full Marks: 150

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

1. (a) Find $\lim_{x \rightarrow 3} f(x)$, if it exists. Where $f(x) = \begin{cases} x - 1, & x \leq 3 \\ 3x - 7, & x > 3 \end{cases}$ 08

(b) Define Limit, Continuity and Differentiability of a function. Examine 17
 Differentiability of $f(x)$ at $x = 1$, where $f(x) = \begin{cases} x^2 + 1, & x \leq 1 \\ 2x, & x > 1 \end{cases}$

2. (a) State Euler's theorem on homogeneous function. If $u = \tan^{-1} \frac{x^2 + y^2}{x + y}$, prove 10
 that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \sin 2u.$$

(b) Evaluate: (i) $\lim_{x \rightarrow 0} \frac{x - \sin^{-1} x}{\sin^3 x}$ (ii) $\lim_{x \rightarrow 0} (\sin x)^x$ 15

3. (a) State Leibnitz's Theorem. If $y = \tan^{-1} x$, then show that 12

$$(1 + x^2)y_{n+2} + 2(n+1)xy_{n+1} + (n^2 + n)y_n = 0$$

(b) Find the maximum, minimum values of the function 13

$$f(x) = 2x^3 - 6x^2 - 18x + 7.$$

4. (a) Expand the function $\ln(1 + x)$ in power of x with remainders R_n in Lagrange's 15
 and Cauchy's form.

(b) State Mean value Theorem. Verify Mean Value Theorem for the function 10

$$f(x) = x^3 + 1 \text{ over } [1, 2].$$

5. Evaluate the following integrals:

(i) $\int e^x \sin x dx$ (ii) $\int_1^2 \frac{(1+\log x)}{x} dx$ (iii) $\int \frac{\sin x + \operatorname{cosec} x}{5 \tan x} dx$

25

(iv) $\int_0^1 x e^{-3x} dx$ (v) $\int_0^{\pi/2} \cos^4 x dx$

6. (a) Evaluate the following integrals: $\int \frac{x^2 + x - 1}{x^3 + x^2 - 6x} dx$

18

(b) Establish a formula of reduction for $\int \sin^n x dx$ and $\int \sin^7 x dx$

07

7. (a) Define improper integrals with properties.

18

(b) Evaluate the improper integral $\int_0^{\infty} \frac{x dx}{x^4 + 1}$

07

8. (a) Define Gamma and Beta functions. Show that

20

i) $\Gamma(n+1) = n\Gamma(n) = n!$

ii) $\int_0^{\pi/2} \sin^4 \theta \cos^6 \theta d\theta = \frac{3\pi}{512}$

(b) Evaluate $\int_0^{\infty} e^{-y^2} y^3 dy$

05

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B.Sc. Engineering (Civil)

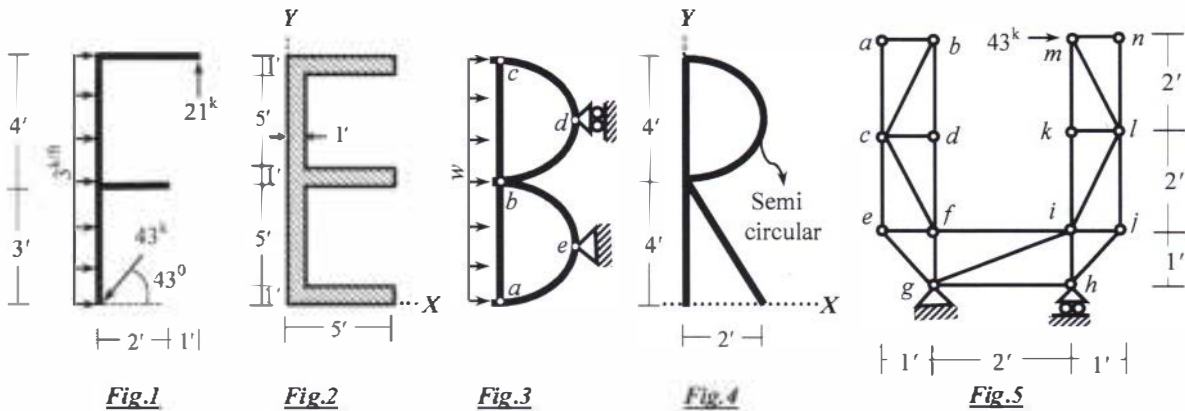
Course Title: Engineering Mechanics I
 Time: 3 hours

Credit Hours: 3.0

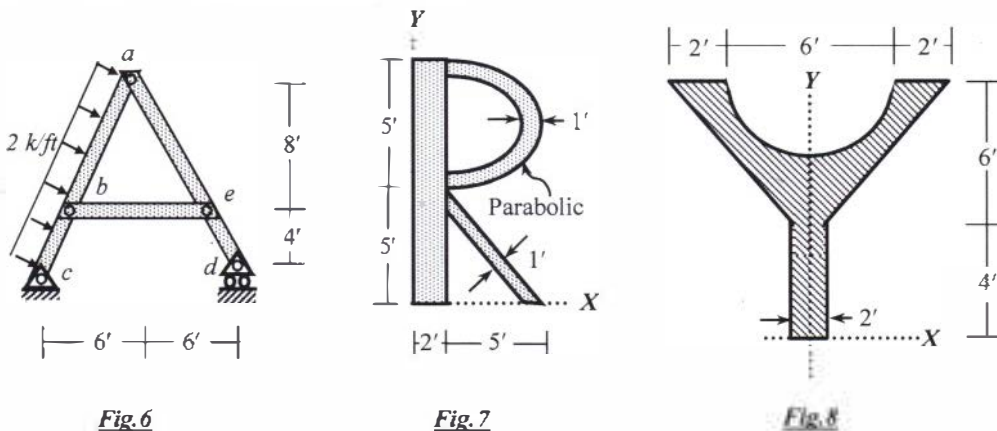
Course Code: CE 101
 Full Marks: 100 (= 10 × 10)

ANSWER ALL THE QUESTIONS

- Fig.1 shows a system of forces acting on a structure (shown by bold lines). Calculate the magnitude, direction and location of resultant of the forces.
- Compute product of inertia P_{xy} , minimum moment of inertia I_{min} and maximum moment of inertia I_{max} of the shaded area shown in Fig.2.
- In the structure shown in Fig.3 draw the free-body diagram of (i) Member abc and aeb (ii) Support d and e .



- Calculate centroid of the composite line shown in Fig.4 with respect to given co-ordinate system.
- In the truss loaded as shown in Fig.5, (i) identify zero force members, (ii) Calculate reactions at supports and (iii) forces in member il, jl and ik .



- For the frame $abcde$ loaded as shown in Fig.6, calculate the (i) reactions of supports c and d and (ii) draw the free-body diagram of member abc with joint forces.
- Calculate centroid of the composite area shown in Fig.7 with respect to given co-ordinate system.
- Compute moment of inertia (I_x, I_y and J) of the shaded area with respect to given co-ordinate system shown in Fig.8.

9. Compute moment of inertia of the shaded area with respect to given co-ordinate system by integration method shown in Fig.9.

Or

Locate the centroid of the shaded area with respect to given co-ordinate system by integration method shown in Fig.9.

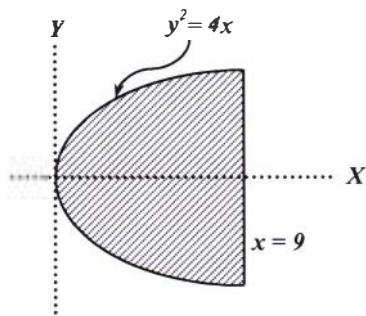


Fig.9

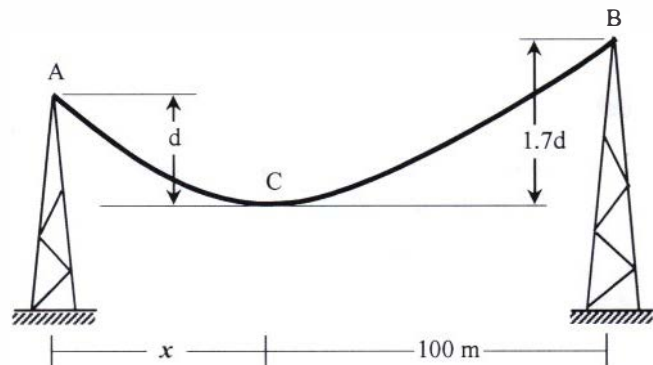


Fig.10

10. The cable ABC shown in Fig.10 weighs 2 kg/m and is subjected to a horizontal tension of 500 kg. Calculate d , x and the maximum tension in the cable assuming it to be a (i) parabola or (ii) catenary.

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B. Sc. Engineering (Civil)

Course Title: Introduction to Civil and Environmental Engineering
Time- 2 hours

Course Code: CE 107
Full marks: 100

PART I

Answer all the questions.

1. (a) Explain the role of environmental engineers in our society. 2
- (b) Discuss the possible reasons of 5+5
(i) Industrial pollution, (ii) Soil pollution.
- (c) With a figure show the circulation of water in nature. 5+3
'Water pollution is all about quantity' — justify this statement.
2. (a) Explain the term 'Bio diversity'. 2+1
Why is it necessary to protect Bio diversity?
- (b) Compare between the following: 3×4=12
(i) Biotic component and Abiotic component of environment
(ii) Natural eutrophication and Cultural eutrophication
(iii) Renewable energy and Nonrenewable energy
(iv) Primary air pollutant and Secondary air pollutant.
3. (a) Define flood. What are the possible impacts of flood? 1+2+3
Explain how flood can be managed to reduce its impacts.
- (b) Write short notes on: 3×3=9
(i) Ecosystem, (ii) Global warming, (iii) Air quality index.

PART II

Answer all the questions.

4. (a) Write short notes on your understanding regarding science, engineering and 9+3=12
technology. Describe your role as a civil engineer within these contexts.
- (b) Classify building according to type of occupancy. What are the major factors for 2+1=3
choice of materials?
5. (a) What are the major sub-disciplines of civil engineering? What are the major foci of 1+2=3
any civil engineering project?
- (b) Define plane and geodetic surveying. 2
- (c) Calculate (showing unit detail) the weight of a brick (W_b) in lb and kg, if its size is 5
about 24.13 cm x 4.5 in x 69.85 mm. Consider unit weight of brick material, $\gamma_{bm} = 125 \text{ lb/ft}^3$.

- (d) For the brick as mentioned in Question no. 5(c), calculate the pressures on the contact surfaces in psi (lb/in²) as shown in figure I. 5

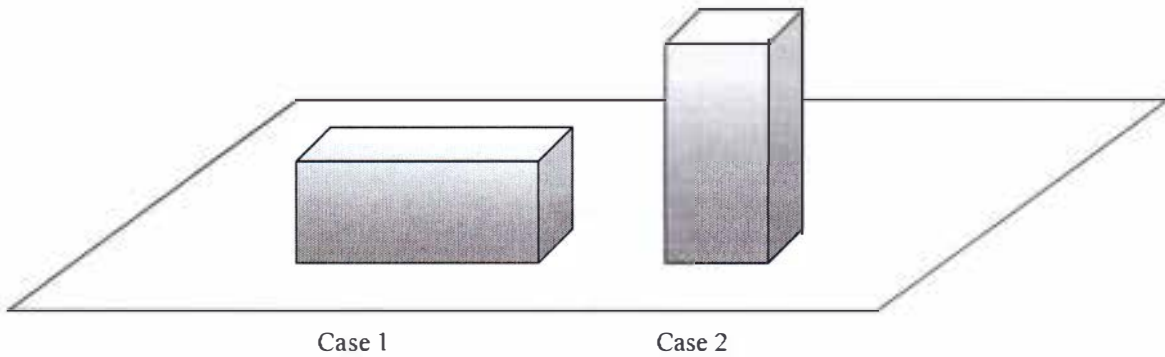
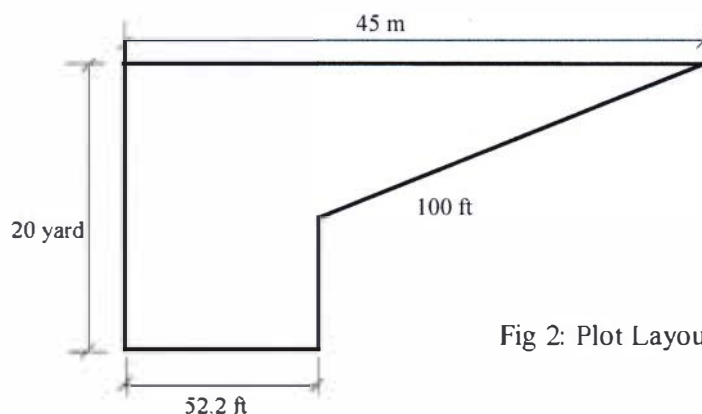


Fig 1: Bricks resting on a plane surface

6. A three-storied residential building is to be constructed. Estimate the construction cost of foundation, superstructure and boundary wall as per the following particulars and specifications of the building. Use PWD schedule and other relevant information provided in the attached appendix. 20

Sl	Particulars	Specification
01	Land Size	Determine from plot layout as shown in figure 2
02	Building type	Residential (Standard)
03	Allowable Bearing Capacity (q_a)	4.0 ksf
04	Plinth Area	55 % of Land Size
05	Construction Material	$f'_c=20$ MPa, Mix Ratio= 1:2.4 (Brick Chips)
06	Ground Floor	Car Parking
07	Roof top RCC water tank including beams and supports etc	1500 Gallons
08	Structure type	RCC Frame Structure
09	Underground water reservoir, distribution line, water pump, pump house, WASA	4500 gallons
10	Boundary wall	RCC frame
11	Incidental Cost	Consider 8%



**APPENDIX
PWD SCHEDULE**

1. Foundation Cost upto PL (per m² of Plingth Area)

Storey	q _a = 2 ksf	q _a = 2.50 ksf	q _a = 3.0 ksf	q _a = 3.5 ksf	q _a = 4.0 ksf	q _a = 4.5 ksf	q _a = 5.0 ksf
1	3982	3875	3811	3769	3740	3718	3702
2	4684	4381	4199	4080	3997	3936	3830
3	5591	5036	4702	4482	4329	4217	4133
4	6566	5811	5296	4958	4723	4551	4421
5	8001	6774	6035	5550	5212	4965	4778
6	9495	7851	6862	6213	5759	5429	5178
7	10961	8908	7673	6862	6296	5883	5571
8		10043	8544	7560	6873	6371	5992

2. Superstructure Cost (per m² of Plingth Area)

Building Category													
		Non-Residential (fc=19-21 MPa, Brick Chips)			Residential (fc=19-21 MPa, Brick Chips)			Non-Residential (fc=22-25 MPa, Stone Chips)			Residential (fc=22-25 MPa, Stone Chips)		
Level	Floor	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior
0	GF Park	5449	5812	6538	5634	6010	6761	5922	6317	7107	6124	6532	7349
0A	Habitation	8545	9601	12674	8837	9929	13106	9020	10135	13378	9631	10792	14274
1	1 st Floor	8242	9360	12224	8523	9576	12640	8699	9776	12903	9289	10409	13767
2	2nd Floor	8365	9399	12407	8651	9720	12830	8830	9921	13096	9568	10565	14180
3	3 rd Floor	8491	9540	12593	8780	9866	13023	8962	10070	13293	9855	10723	14606
4	4 th Floor	8618	9683	12782	8912	10014	13218	9097	10221	13492	10151	10884	15044

SOME ADDITIONAL COSTS

3. Boundary Wall: Tk.3500/m
4. External Water Supply: Tk.60.00/gallon
5. Gas Connection:
 - GF: Tk.260/sqm
 - Other floors: Tk.100/sqm
6. Internal Electrification:
 - (i) Residential Building
 - Economy: Tk.1030 /sqm
 - Standard: Tk.1290 /sqm
 - Superior: Tk.1550 /sqm
 - (ii) Non-Residential Building:
 - Economy: Tk.775 /sqm
 - Standard: Tk.970 /sqm
 - Superior: Tk.1160/sqm
7. Internal Sanitary and Water Supply:
 - (i) Residential Building
 - Economy: Tk. 475 /sqm
 - Standard: Tk.715 /sqm
 - Superior: Tk. 1070 /sqm
 - (ii) Non-Residential Building
 - Economy: Tk.360 /sqm
 - Standard: Tk.540 /sqm
 - Superior: Tk.800 /sqm
8. Floor Finish Work: Tk.1000.00/ sqm
9. Rooftop RCC water Tank: Tk.85.00/gallon