

11

University of Asia Pacific
Department of Civil Engineering
Final Examination, Spring - 2019
Program: B.Sc. in Civil Engineering
Year: 1st Semester: 1st

Course Code: HSS101 Course Title: English Language I (Oral and Written English)

Credit: 3.00

Time: 3.00 Hour

Full Marks: 50

Instructions:

*Marks are indicated in the right margin.

*Answer all the questions

1. Complete the following passage by inserting the missing *a, an, the* or *x* (for no article) where necessary: 5x1 = 5

a) ___ master engineer who came to be known as “the magician of iron,” Alexandre-Gustave Eiffel’s reputation was ultimately crowned b) _____ by the marvelous, latticed Parisian tower that bears his name. But the 300-meter-high sensation has dwarfed c) _____ catalog of sensational projects by the Dijon-born visionary. Among his many great constructions, one project rivaled the Eiffel Tower in terms of fame and glory: designing the interior frame for d) _____ Statue of Liberty. Eiffel took the design—by sculptor Frédéric Auguste Bartholdi—and made it a reality, creating an internal framework around which the massive statue could be sculpted. It was Eiffel who conceived of the two spiral staircases inside e) _____ statue.

2. Choose the correct homophone from the options below: 4x1 = 4

- a) I _____ (*sent, scent, cent*) a letter to my aunt in Chicago.
- b) Nobody _____ (*knows, nose*) what she might do next!
- c) He needs to take a _____ (*break, brake*) from this tiresome exercise!
- d) Let’s grab a _____ (*bite/byte*) to eat in town after work, shall we?

3. Fill in the blanks using appropriate preposition from the box below. 10x.5 = 5

Humanity has always engineered the environment a) _____ us. From the earliest days of wetland drainage and the need b) _____ acquire fresh water, to keep it flowing and keep it clean enough to drink, building cesspits to take away our waste and to stop pollution of vital waterways, we have always strived to maximize our sanitation and living conditions c) _____ order to expand and survive. Sanitation is a large part d) _____ our civil evolution; without it, we would succumb more often e) _____ water-borne disease and illness - raising our mortality rates and lowering our quality of life. Therefore, we've always needed to find bigger and better ways f) _____ taking away our sewage, cleaning our water and harnessing natural or

artificial water supplies for our health and environment. Since the industrial revolution g) _____ the 19th century we have needed to prevent businesses and individuals from polluting the environment h) _____ harmful substances. The modern environmental engineer is dedicated to keeping our air and water clean i) _____ pollutants and promoting good health and these days, protection against radioactive and toxic materials too; they also study the potential effects of climate change and other environmental factors j) _____ the infrastructure .

4. Suppose you have just completed your graduation with a degree of BSc. in 4
Civil Engineering from the University of Asia Pacific. Now you are looking for a position of a Structural Design Engineer in an Engineering company. After a thorough research, you have found out that Advanced Development Technologies Ltd (Address: Gulshan North Ave, Dhaka 1212) would be a good place to start off your career as an Engineer.

Now write a letter inquiring about the job position to S.M. Reza Hossain, the Operative Director and Hiring Manager of Advanced Development Technologies Ltd expressing your utmost willingness and eligibility to do the job.

Alamy
Greenfield

5. Fill in the blanks by adding prefixes, suffixes or both to the root words in the brackets. 6x1 = 6

Long before the days of women's liberation, Lillian Moller Gilbreth (1878-1972), a (a) _____ (distinguish) industrial psychologist, engineer, and mother of 12, was the (b) _____ (origin) superwoman. Born in 1878 in Oakland, CA, to parents of German descent, Lillie, as she was named at birth, grew up in a well-to-do, Victorian-style family. A shy girl, she came into her own (c) _____ (academic) in high school and persuaded her father to let her attend college. When as a female she was allowed to speak at her University of California commencement, it was the first of many "firsts." She went on to obtain a master's and a doctorate degree in psychology. With a keen (d) _____ (sight) into human behavior and strong empathy for individuals, she, together with her husband, Frank Gilbreth, studied scientific management principles and pioneered many (e) _____ (industry) management techniques. Lillian became the first female professor in the engineering school at Purdue University, the first woman elected to the National Academy of Engineering, the second woman to join the American Society of Mechanical Engineers (after Kate Gleeson) and the list continues. Until 2005, she was the only woman awarded the (f) _____ (prestige) Hoover Award, jointly bestowed by five leading engineering organizations recognizing "great, unselfish, non-technical services by engineers to humanity."

6. Use capital letters and punctuation marks as needed in the following passage. 5

the channel tunnel is a 50.45-kilometre (31.35 mi) rail tunnel linking Folkestone, Kent in England, with Coquelles, Pas-de-Calais, near Calais in northern France, beneath the English Channel at the Strait of dover

7. Complete the following story using your own words and imagination. Give a suitable title to it.

4

So a couple years back, Rinky moved out of Sylhet and came to Dhaka to pursue her higher studies. She was very excited about it but she definitely had anxiety about being so far from friends and family. She managed to get a seat in a hostel of single room but her anxiety was coming out with sudden nightmares and night terrors. She would wake up violently sitting up in a cold sweat and gasping. On one particular night.....

8. Change the following sentences as directed in the brackets.

3x1 = 3

- a) She is never late (Affirmative)
- b) Audree tells her stories very cleverly. (Exclamatory)
- c) You should not pass the door. (Imperative)

anxiety
loneliness
terrors

9. Fill in the following blanks using synonyms and antonyms of the words as directed in the brackets.

4x1 = 4

Fandom is an a) ^{unique} ordinary (antonym) thing. Often times, the people who claim to love something more than anyone else are the (b) precise (synonym) same folks who can't help but nitpick and dwell on the most (c) ^{smallest} minor (synonym) of things. For these fans, (d) ^{boiling} cheering (antonym) is something of a badge of honor, and it's a dynamic thing we see time and time again across sports, the tech realm, and of course, TV.

child

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

10

- a) Is big salary more important than job satisfaction?
- b) Does technology make us alone?

useful

sh

University of Asia Pacific
Department of Civil Engineering
Final Examination, Spring- 2019
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 infrasonic and ultrasonic wave of sound. Prove that the total energy of a vibrating particle is equal to $2\pi^2 ma^2 n^2$. [15]
- (b) When a simple harmonic wave is propagated through a medium, the displacement of a particle in cm at any instant of time is given by $y=10 \sin \frac{2\pi}{100}(36000t-20)$. Calculate the amplitude of the vibrating particle, wave velocity, wave length, frequency and time period. [10]
2. (a) 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. Draw and explain sound distribution system and write down requisites for good acoustics in an auditorium. [15]
- (b) An ultrasonic beam is used to determine the thickness of a steel plate. It was noticed that the difference in two adjacent harmonic frequencies is 50 kilo hertz. The velocity of sound in steel is 5000 m/sec. Calculate thickness of the steel plate. [10]
4. (a) Define Cantilever. Prove that depression $y = \frac{Wl^3}{3YI_g}$ at the free end of the cantilever, where the terms have their usual meanings. [15]
- (b) A uniform rod of length 1 m is clamped horizontally at one end. A weight of 0.1kg is attached at the free end. Calculate the depression at the midpoint of the rod. The diameter of the rod is 0.02 m. ($Y=10^{10}$ n/m²) [10]

Turn over

5. (a) Define thermal 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. Calculate the time it will 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) State and explain Carnot's cycle and find out the efficiency of Carnot's reversible engine. [15]
- (b) A Carnot's engine is operated between two reservoirs at temperature of 450 K and 350 K. If the engine receives 1000 calories of heat from the source in each cycle, calculate the amount of heat rejected to the sink in each cycle. Calculate the efficiency of the engine and the work done by the engine in each cycle. (1 calorie = 4.2 joules) [10]
7. (a) Explain 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) State and explain the Bernoulli's theorem and prove that $\frac{v^2}{2} + gh + \frac{p}{\rho} = \text{Constant}$, where the terms have their meanings. [15]
- (b) Two equal drops of water (surface tension T), each of radius r, are falling through air (viscosity η) with a steady velocity v. If the two drops coalesce to form a bigger drop, (i) compute the energy released and (ii) find the new velocity of fall. [10]

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination, Spring-2019
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) Investigate continuity and differentiability for $f(x) = |x|$ at $x = 0$. 25

2. (a) State Euler's theorem on homogeneous function for 3 variables. If 15
 $u = \log \frac{x^3 + y^3}{x^2 + y^2}$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 1$

- (b) If $f = x^2 y + y^2 z + z^2 x$, then show that $f_x + f_y + f_z = (x + y + z)^2$. 10

3. (a) Find $\lim_{x \rightarrow 0} \frac{x - \sin^{-1} x}{\sin^3 x}$ 06

- (b) Find the maximum, minimum values of the function 13
 $f(x) = 5x^6 - 18x^5 + 15x^4 - 10$.

- (c) If $y = \sin(\sin x)$, then show that $y_2 + y_1 \tan x + y \cos^2 x = 0$ 06

4. (a) Expand the function $(x + h)^m$ in power of h with remainders R_n in Lagrange's 12
and Cauchy's form.

- (b) Verify Rolle's Theorem for the function $f(x) = x^2$ over $[-1, 1]$. 13

5. Evaluate the following integrals:

25

i) $\int x \sin x \, dx$ ii) $\int e^x \cos x \, dx$ iii) $\int e^{\tan x} \sec^2 x \, dx$

iv) $\int \frac{a \cot x + b \tan^2 x - c \sin^2 x}{\sin x} \, dx$ v) $\int \frac{x^2}{\sqrt{1-x^6}} \, dx$

6. (a) Evaluate the following integrals: $\int \frac{x}{(x-1)(x^2+4)} \, dx$

15

(b) If R is a region bounded by $x = 1, x = 3, y = 2, y = 4$ then evaluate $\iint (2x + 6x^2 y) \, dy \, dx$.

10

7. (a) Evaluate $\iiint xy^2 z \, dv$ defined by inequalities $-1 \leq x \leq 1, 1 \leq y \leq 3, 0 \leq z \leq 1$.

12

(b) Evaluate the improper integral $\int_0^{\infty} x e^{-x^2} \, dx$.

13

8. (a) Solve using gamma beta function

18

i) $\int_0^{\infty} e^{-y^2} y^5 \, dy$

ii) $\int_0^{\pi/2} \sin^5 \theta \cos^6 \theta \, d\theta$

(b) Evaluate $\int_0^1 y^2 (1-y)^{3/2} \, dy$

07

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2019
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

1. Fig.1 shows a system of forces acting on a structure (shown by lines). Calculate the magnitude, direction and location of resultant of the forces.
2. Compute product of inertia P_{xy} , minimum moment of inertia I_{min} and maximum moment of inertia I_{max} about centroidal axes of the shaded area shown in Fig.2
 [Given: centroid of the area is $(x = 3.04', y = 6.11')$ and Moment of inertia about centroidal axes are $I_x = 570.63 \text{ ft}^4$ and $I_y = 208.94 \text{ ft}^4$]

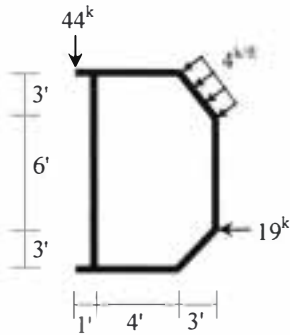


Fig.1

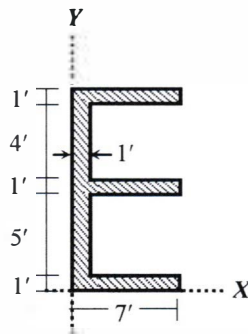


Fig.2

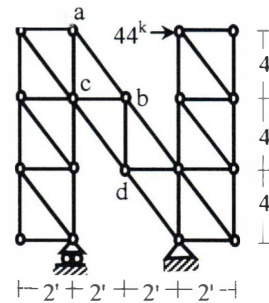


Fig.3

3. In the truss loaded as shown in Fig.3, (i) identify zero force members, (ii) Calculate reactions at supports and (iii) forces in member ab , bc and cd .
4. Locate the centroid of the composite line with respect to given co-ordinate system shown in Fig.4.

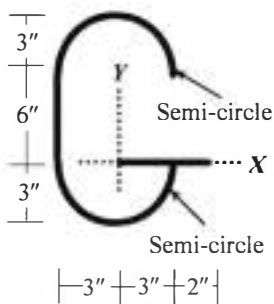


Fig.4

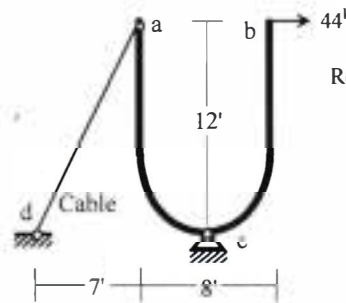


Fig.5

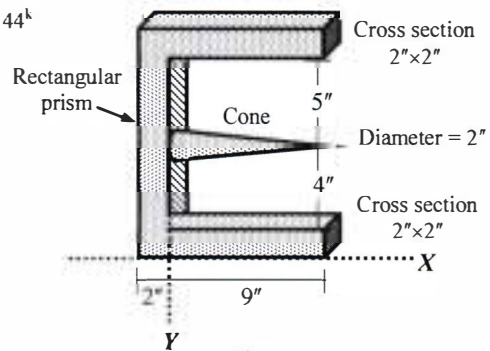


Fig.6

5. For the frame acb loaded as shown in Fig.5, calculate the (i) Reactions of supports c and d and (ii) Draw the free-body diagram of member abc .
6. Locate the centroid of the composite volume with respect to given co-ordinate system shown in Fig.6.

7. Compute moment of inertia (I_x , I_y and J) of the shaded area with respect to given co-ordinate system shown in Fig.7.
8. Locate the centroid of the composite area with respect to given co-ordinate system as shown in Fig.8.

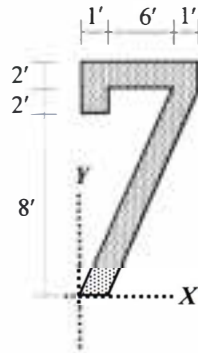


Fig.7

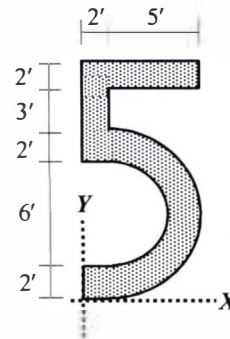


Fig.8

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.

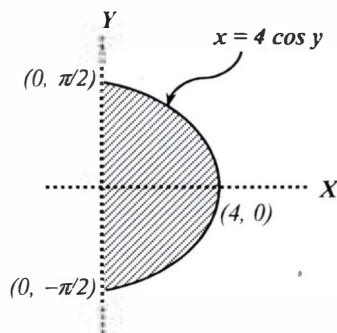


Fig.9

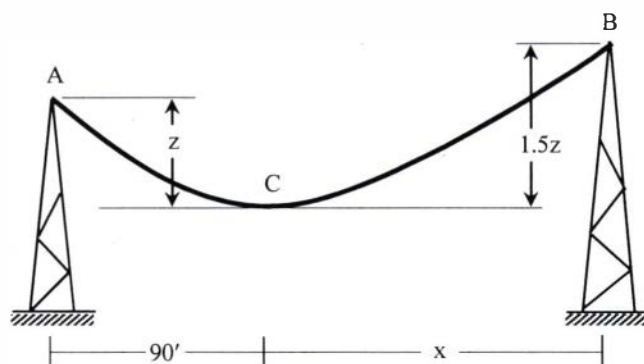


Fig.10

10. The cable ABC shown in Fig.10 weighs 2 lb/ft and is subjected to a horizontal tension of 200 lb. Calculate z , x and the maximum tension in the cable assuming it to be a Parabola OR Catenary.

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2019
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.

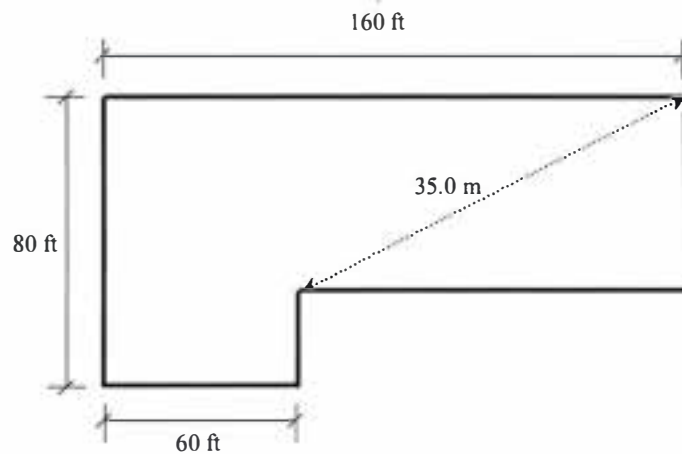
1. (a) Define *Environmental ethics*. Why it is important to study environmental ethics? [4+3]
 (b) Discuss the reasons of: i) Industrial pollution ii) Marine pollution. [4+4]
2. (a) Enlist the environmental issues in the capital city of Bangladesh. [3]
 (b) What is AQI? Write down examples of primary and secondary air pollutants. [4+2]
 (c) Explain the term *Biodiversity*. Why it is necessary to protect biodiversity? [4+2]
3. Write short notes on: i) SMOG ii) Ecosystem iii) Acid rain iv) Flood management [4*5=20]
 v) Trans-boundary pollution.

PART II

Answer all the questions.

4. A two-storied residential building is to be constructed. Estimate the total construction cost as per the following particulars and specifications of the building. Use PWD schedule and other relevant information provided in the attached appendix. 16

	Particulars	Specification
01	Land Size	Determine from plot layout as shown in the next page
02	Building type	Residential (Economy)
03	Allowable Bearing Capacity (q_a)	2.5 ksf
04	Floor Level	Two
05	Plinth Area	62 % of Land Size
06	Construction Material	23 MPa, RCC Structure 1:1.5:3 (Stone Chips)
07	Ground Floor	Car Parking
08	Roof top RCC water tank including beams and supports etc	1400 Gallons
09	Structure type	RCC Frame Structure
10	Underground water reservoir, distribution line, water pump, pump house, WASA charge	4000 gallons
11	Boundary wall	RCC frame
12	Incidental Cost	Consider 9% for this building



PLOT LAYOUT

5. (a) Using a diagrammatic expression mention some features of scientists, engineers, society and technology. 7
- (b) Define civil engineering according to ASCE. What are the major branches of civil engineering? 2+2
- (c) Give the details of the codes with their related fields: (i) BNBC (ii) ASCE. 2
- (d) What are the major factors of choice of building materials? 2
- (e) Define plane and geodetic surveying. Classify surveying based on instruments used. 3+2
- (f) Briefly discuss civil engineering as a career. 4

6. (a) A brick does not have standard dimensions. The longest dimension is missing. Other two dimensions are 7.4 cm and 4.75 in. The unit weight of the brick material (γ_{bm}) is 19 kN/m^3 . Calculate the missing dimension of the brick, in inch, if its weight is about 4.5 kg. 5.5
- (b) For the brick as mentioned above (in question no. 6(a)), calculate the pressures on the surface in (i) psf, (ii) Pa (N/m^2) and (iii) kg/cm^2 , according to its position as shown below. 4.5

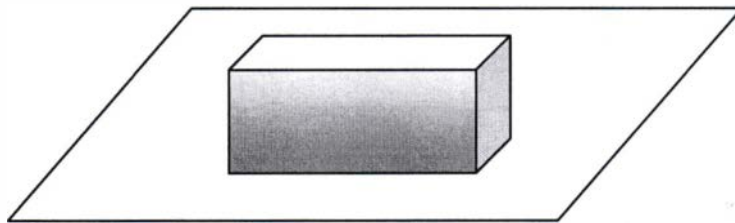


Figure: A brick resting on a plane surface