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University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall - 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

Efficient insulation a) _____ material is becoming increasingly important throughout b) _____ construction industry. Heat transmission through walls tends to be passed directly through the building envelope, be it masonry, block or stud frame, to the internal fascia such as drywall. This process is known as "thermal bridging". Aerogel, a technology developed by NASA for cryogenic insulation, is considered one of c) _____ most effective thermal insulation materials and US spin-off Thermablok has adapted it using a proprietary aerogel in d) _____ fibre-glass matrix. This can be used to insulate studs, which can reportedly increase overall wall R-value (an industry measure of thermal resistance) by more than e) _____ 40 per cent.

2. Choose the correct homophone from the options below:

4x1 = 4

- a) I always ask for an _____ (*isle/aisle*) seat when I fly.
- b) The list has been _____ (*pared/ paired*) down from 9 counties to 4.
- c) We all need to ensure that the _____ (*waist/waste*) materials are disposed of responsibly.
- d) Once on the slab, his boots failed to _____ (*bite/byte*).

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

2x1 = 2

- a) As soon as Sadia entered the room, Rafid and Shotez shut down the laptop. (Negative)
- b) You should turn off your cell phone. (Imperative)

4. Fill in the blanks using appropriate preposition from the following box.

4x1 = 4

from	in	at
of	by	to

The CN Tower is Canada's most recognizable and celebrated icon. It is located (a) _____ downtown Toronto, Canada and is considered (b) _____ be the tallest freestanding structure in the world. Its name "CN" is

originally referred to Canadian National, the railway company that built the tower. It measures in (c) _____ a height of 1,815 ft. and is used as a communications tower and an observation desk. There's a restaurant at a height (d) _____ 346 meters known as 360 restaurant since it completes a full rotation every 72 minutes.

5. Fill in the blanks by adding prefixes, suffixes or both to the root words in the brackets. 4x1 = 4

The responsibilities of engineers and architects often overlap. Both professions are integral to the design and (a) _____ (construct) of structures, such as buildings and bridges. Architects design the space to meet client needs, as well as the aesthetic appearance of the inside and exterior of the (b) _____ (build). The engineers' main responsibility is to (c) _____ (sure) the design is safe and meets all appropriate building codes. Engineers concern themselves with making buildings safe and functional by selecting (d) _____ (structure) materials, determining the structural members of the design, and specifying the electrical, heating, ventilation, air conditioning and plumbing systems. One way that engineers and architects communicate their ideas to each another is through blueprints, or technical drawings.

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

the Sydney Harbour Bridge is a heritage-listed steel through arch bridge across Sydney Harbour that carries rail, vehicular, bicycle, and pedestrian traffic between the Sydney Central Business District (CBD) and the North Shore. The view of the bridge, the harbour, and the nearby Sydney Opera House is widely regarded as an iconic image of Sydney, and of Australia itself. the bridge is nicknamed "The Coathanger" because of its arch-based design

**7. Complete the following story using your own words and imagination. 5
Give a suitable title to it.**

"It's a new recipe, dearie," Sanjida chirped as her younger daughter, Bithi entered the kitchen. "I've made this pie especially for you", said Sanjida. "But where's Father and Audree?" Bithi got puzzled. "It's such a beautiful day. They had to leave," Sanjida added. Looking at the open window Bithi noticed in the bright sunlight that there was a bird-shaped fracture in

8. Fill in the following blanks using synonyms and antonyms of the words as directed in the brackets. 3x 1 = 3

Structural Engineers a) **face (synonym)** _____ the challenge of designing structures that b) **oppose (antonym)** _____ their own weight and the loads they carry, and that c) **withstand (synonym)** _____ extreme forces from wind, earthquakes, bombings, temperature and others. Bridges, buildings, amusement park rides and many other kinds of projects are included within this field of study.

9. Answer to any one of the following questions.

10

a) *Do you think our government should spend more money on railways rather than roads?* State your opinion in one paragraph only and give a suitable title to it. A brainstorming segment has to be shown as well.

b) *Do you think that green engineering should be promoted to improve sustainability and reduce the carbon footprint in manufacturing?* State your opinion in one paragraph only and give a suitable title to it. A brainstorming segment has to be shown as well.

10. Write a cover letter (addressing the Hiring Manager of *Eminence Structures Ltd.*) in response to the following advertisement published in <https://jobs.bdjobs.com> on February 27, 2020.

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Job Position: **Site Engineer**

Vacancy: **03**

Company: *Eminence Structures Ltd*

Address: 2/A,2/20, Zoo Road, Rainkhola, Mirpur-2, Dhaka-1216

Job Responsibilities

- Ensuring erection/ construction works according to construction drawing.
- Managing with the site supervisor and laborers.
- Communicate with the representative of client assigned on site.
- Reporting status of the project on a daily basis to the Project coordinator.

Employment Status: Full-time

Educational Requirements: B.Sc. in Civil Engineering from any reputed institution.

Experience Requirements: At least 1 year, Freshers are also encouraged to apply

Additional Requirements:

- Both males and females can apply.
- The applicants should have experience in the following area(s): Factory Buildings, Pre-Engineered Steel Buildings and knowledge of civil engineering software (AutoCAD, MS Office and Excel).
- Should be dynamic & energetic.

Application Deadline: March 9, 2020.

****A cover letter and two color photographs must be enclosed with the resume. ****

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

Course Title: Introduction to Civil and Environmental Engineering
 Time: 2.0 Hours

Course Code: CE 107
 Credit Hour: 2.0
 Full Marks: 100

PART I

Answer all the questions.

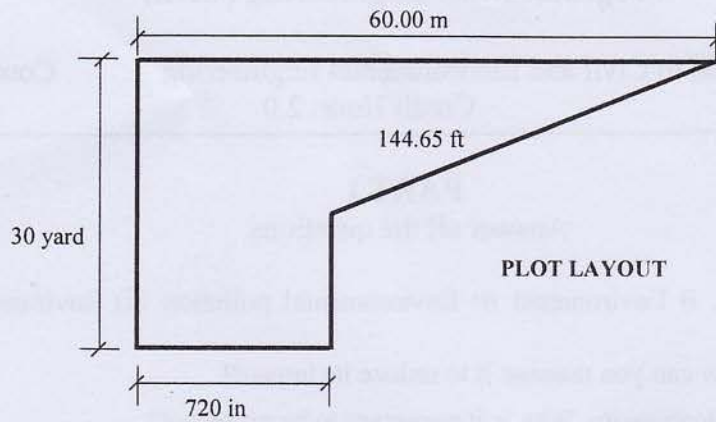
1. (a) Explain the terms: i) Environment ii) Environmental pollution iii) Environmental ethics [3*4=12]
- (b) What is flood? How can you manage it to reduce its impact? [4]
- (c) Explain the term *Biodiversity*. Why is it necessary to be protected? [4]
2. (a) Write short notes on: i) SMOG ii) Acid rain iii) Eutrophication [3*4=12]
- (b) Describe the basic characteristics of an ecosystem. [4]
- (c) What is AQI? Write down some examples of primary air pollutant and secondary air pollutant. [4]
3. (a) Draw a soil profile mentioning different horizons. [5]
- (b) Briefly discuss the relationship between human and environment. [5]

PART II

Answer all the questions.

4. A Five-storied non-residential building is to be constructed. Estimate the foundation, boundary wall and superstructure cost as per the following particulars and specifications of the building. Use PWD schedule and other relevant information provided in the attached appendix. 14

	Particulars	Specification
01	Land Size	Determine from plot layout as shown in the next page
02	Building type	Non-Residential (Economy)
03	Allowable Bearing Capacity (q_a)	3.5 ksf
04	Floor Level	Five
05	Plinth Area	61 % of Land Size
06	Construction Material	24 MPa, RCC Structure 1:1.5:3 (Stone Chips)
07	Ground Floor	Car Parking
08	Structure type	RCC Frame Structure
09	Boundary wall	RCC frame
10	Incidental Cost	Consider 9% for this building



5. (a) Mention two simple points (each) related to the understanding of science, engineering and technology. 6
 (b) Discuss, in brief, history of Civil Engineering. 6

6. (a) Classify building according to type of occupancy. 2
 (b) Give the names in details of the following codes with their related fields. 2
 (i) ASTM (ii) AREA
 (c) Define plane and geodetic surveying. 3
 (d) Classify surveying based on instruments used. 3

7. (a) Showing detail convert the unit weight of water from lb/ft^3 to kN/m^3 . 5
 (b) 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 in, if its weight is about 4.5 kg. 5
 (c) Mention (names only) few types of loads to be considered in design. 4

University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall- 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 **Six** questions including question no. 1, 2, 3 and 4. All questions are of equal value. Figures in the right margin indicate marks.

1. (a) Define Doppler effect. Find out the apparent pitch of sound, when the observer moves toward and away from the stationary source. [15]
- (b) Two trains travelling in opposite directions at 150 km/hour each, cross each other while one of them is whistling. If the frequency of the note is 900 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 = 332 m/s. [10]
2. (a) Explain Lissajous' figures. Prove that $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{2xy}{ab} \cos \alpha = \sin^2 \alpha$ from the composition of two simple vibrations of equal time periods acting at right angles to each other. [15]
- (b) Two simple harmonic motions acting simultaneously on a particle are given by the equations $y_1 = \sin(\omega t + \pi/3)$ and $y_2 = 2 \sin \omega t$. Find the equation of the resultant vibration. [10]
3. (a) Draw and explain sound distribution system in an auditorium. 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) State and explain the Bernoulli's theorem and prove that $\frac{v^2}{2} + gh + \frac{p}{\rho} = \text{Constant}$, [15]
where the terms have their meanings.
- (b) Find the limiting velocity of a rain drop. Diameter of the rain drop is 3×10^{-3} m. [10]
[Density of air relative to water = 1.3×10^{-3} , coefficient of viscosity of air = 1.81×10^{-5} S.I. units and density of water = 10^3 kg/m³]

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 surroundings is 25°C . Newton's law of cooling is applicable throughout the process. [10]

OR

6. (a) Define first 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 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]

OR

8. (a) Define interference and polarization of light. State and explain Brewster's law for a polarized light. [15]
- (b) Calculate the thickness of a half wave plate of quartz for a wave length of 5000 \AA . Here $\mu_E=1.553$ and $\mu_0=1.544$. [10]

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

Course Title: Engineering Mechanics I
 Time: 3 hours

Credit Hours: 3.0

Course Code: CE 101
 Full Marks: 150 (= 15 × 10)

ANSWER ALL THE QUESTIONS

1. Locate the centroid of the composite line with respect to given co-ordinate system shown in **Fig.1**.
2. Locate the centroid of the composite weight as shown in **Fig.2**
 [Given: Cross section of prism and semi-circular object = 1' × 1'; Unit weight of concrete, $\gamma_{\text{concrete}} = 150 \text{ lb/ft}^3$; unit weight of steel, $\gamma_{\text{steel}} = 490 \text{ lb/ft}^3$; unit weight of wood, $\gamma_{\text{wood}} = 50 \text{ lb/ft}^3$].

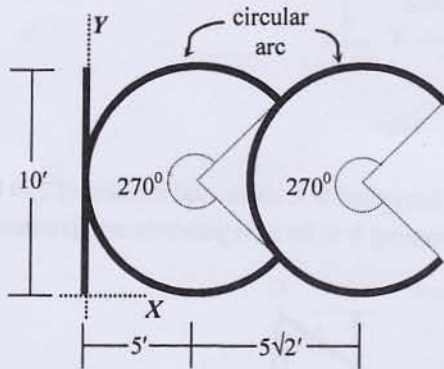


Fig.1

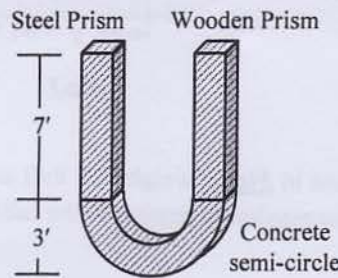


Fig.2

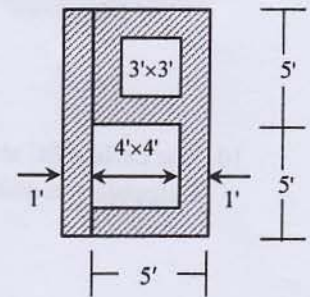


Fig.3

3. 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.3**.
4. In the truss loaded as shown in **Fig.4**, (i) identify zero force members, (ii) Calculate reactions at supports and (iii) forces in member bc , be and de .
5. Compute moment of inertia (I_x , I_y and J) of the shaded area with respect to given co-ordinate system shown in **Fig.5**.

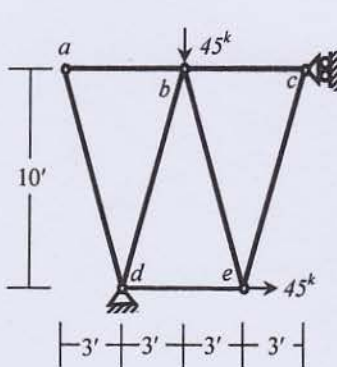


Fig.4

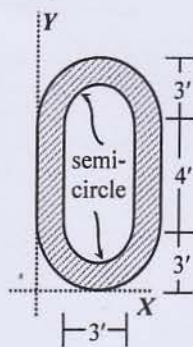


Fig.5

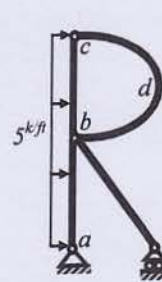


Fig.6

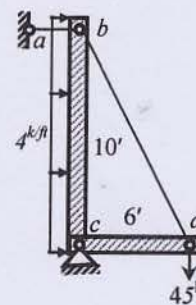


Fig.7

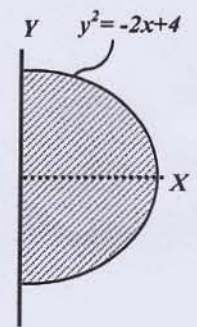


Fig.8

6. In the structure shown in **Fig.6**, draw the free-body diagram of member abc , be ; support a , e [Consider all the members are weightless]
7. For the frame $abcd$ loaded as shown in **Fig.7**, calculate the (i) reactions of supports a and c and (ii) shear force and bending moment at mid-point of member bc .

8. Locate the centroid of the shaded area with respect to given co-ordinate system by integration method shown in **Fig.8**.
9. Locate the centroid of the composite area with respect to given co-ordinate system shown in **Fig.9**.

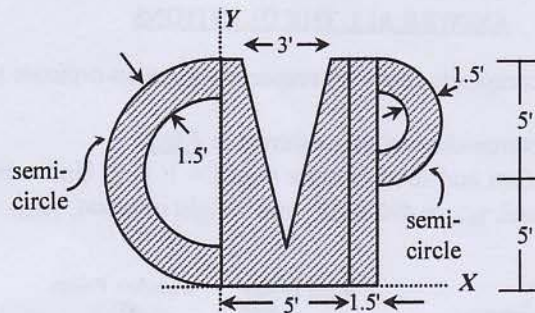


Fig.9

10. The cable ABC shown in **Fig.10** weighs 0.5 lb/ft and is subjected to a horizontal tension of 750 lb. Calculate y , x and the maximum tension in the cable assuming it to be a (i) parabola *or* (ii) catenary.

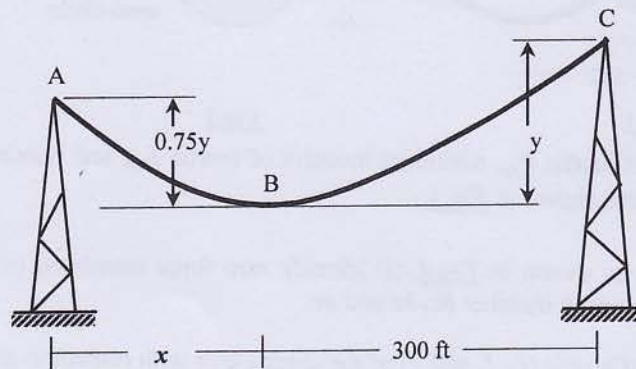


Fig.10

University of Asia Pacific
Department of Basic Sciences & Humanities
Final Examination, Fall -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 including 1, 2,3 and 4. All questions are of equal values, indicated in the right margin.

1. Investigate continuity and differentiability for $f(x) = \begin{cases} x^2 + x + 1, & 0 \leq x \leq 1 \\ 2x + 1, & 1 \leq x \leq 2 \end{cases}$ at $x = 1$. 25

2. (a) State Euler's theorem on homogeneous function for 3 variables. If $u = x^3 + y^3 + z^3$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 3u$. 10

- (b) Show that $f_{xy} = f_{yx}$ for $f(x, y) = (x^2 + y^2 + z^2)^{1/2}$. 7

- (c) If $u = x + y + z$, $v = x + 2y + 3z$, $w = 2x + 3y + 5z$, then find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$. 8

3. (a) If $(1+x)y = \ln(1+x)$, then by Leibnitz's theorem show that $(1+x)^2 y_{n+2} + (2n+3)(1+x)y_{n+1} + (n+1)^2 y_n = 0$. 12

- (b) Find the maximum, minimum values of the function $f(x) = 2x^3 - 6x^2 - 18x + 7$. 13

4. (a) Expand the function $\cos x$ in power of x with remainders R_n in Lagrange's and Cauchy's form. 12

- (b) Verify Mean value Theorem for the function $f(x) = (x-1)(x-2)(x-3)$ over $[0, 6]$. 13

5. Evaluate the following integrals:

25

$$i) \int \frac{2x \sin^{-1} x^2}{\sqrt{1-x^4}} dx \quad ii) \int (\log \sqrt{x})^2 dx \quad iii) \int_0^1 \frac{dx}{e^x + e^{-x}} \quad iv) \int_1^{e^2} \frac{dx}{x(1+\log x)^2} \quad v) \int x \cos x dx$$

OR

6. (a) Evaluate the following integrals: $\int \frac{x dx}{x^2 - 12x + 35}$ 12

(b) State and prove Walli's formula. 13

7. (a) Evaluate $\iiint_V 6xy^2z^3 dv$ defined by inequalities $-2 \leq x \leq 1, 1 \leq y \leq 5, 0 \leq z \leq 5$. 12

(b) If R is a region bounded by $x = 2, x = 6, y = 3, y = 8$ then evaluate $\iint_R (yx + 12xy^2) dy dx$. 13

OR

8. (a) Using gamma beta function show that $\int_0^{\pi/2} \sin^4 \theta \cdot \cos^6 \theta d\theta = \frac{3\pi}{512}$ 10

(b) Evaluate the improper integral $\int_0^{\infty} \frac{x dx}{x^4 + 1}$ 15