

University of Asia Pacific
Department of Civil Engineering
Semester Final Examination, Spring 2022
Program: B.Sc in Civil Engineering
Year: 1st Semester: 1st

Course Code: HSS 101

Course Title: English I

Credit Hr: 3.00

Time: 3 hours

Full Marks: 50

Instructions:

**Marks are indicated in the right margin.*

** Answer all the questions.*

1. Fill in the blanks using correct pronouns and possessives.

10 x .5 = 5

- a) So I told Kamal that ___ won't be able to participate in this year's Yule Ball.
- b) The ball rolled on, knocking everything on ___ path.
- c) The godfather is a great movie, ___ highly recommend it.
- d) ___ smile was infectious, it was impossible not to smile back.
- e) Choosing Civil Engineering was a life changing decision for _____.
- f) I swear ___ keep hearing violins.
- g) He's holding the keys; the car clearly belongs to _____.
- h) As for Sneha, becoming an astronaut was a big dream of _____.
- i) The football team did _____ best, _____ should be commended for it.

2. Join the sentences into one as instructed.

10 x 1 = 10

- a) You've been ruining the fun. You need to leave. (Complex)
- b) Structural integrity is a high priority for us. There is no way this error came from us. (Compound)
- c) Help them pick their outfits for the night. They clearly need your help, Akash. (Complex)
- d) I wish we could slow down time. I don't want this to end. (Compound)
- e) Star Cements is a well-known brand. They source their ingredients both nationally and internationally. (Complex)
- f) Raja was super happy now. He didn't know how long it would last though. (Compound)
- g) The candle was flickering. It will go out anytime soon. (Simple)
- h) You missed out on the Shironamhin concert, man. It was a once in a lifetime opportunity. (Complex)
- i) I don't know which streaming service I should go for. It feels unnecessary when I can easily torrent. (Compound)
- j) Prices are rising everywhere. It's scary to think how I can continue supporting my family. (Complex)

3. Pick the correct option.

10 x .5= 5

- a) I could not sit (idle/idol) knowing my childhood (idle/idol) was coming to my town.
- b) It is hard to (find/fined) any motivation when it feels like the (gate/gait) of opportunities has closed on you.
- c) I would rather (die/dye) my hair neon green than wear that ugly 12 (carat/carrot) ring.
- d) Man, I am (beat/beet), I did not think he would go for the (bolder/boulder) option.
- e) Pump the (brakes/breaks) Ellen! You cannot be so (callous/callus) about this!

4. Complete the sentences using correct conditional.

10 x 1= 10

- a) You cannot go to the convention unless _____.
- b) If I hadn't chosen this path, _____.
- c) _____ I would color the jeep blue.
- d) If I woke up at 6am, _____.
- e) When the two ends of the magnets touch, _____.
- f) If I were the little kid in this scenario, _____.
- g) Had Messi been there, _____.
- h) _____ it wouldn't have been impossible to win the title.
- i) If you turn to your left, _____.
- j) If getting a driving license will make it easier to commute, _____.

5. Choose the correct modal for the given sentences.

5 x 1= 5

Would	Can't	Must	Should	Might	Will
-------	-------	------	--------	-------	------

- a) It _____ have been our dog barking last night, she was sleeping right next to us.
- b) Stop wasting your time, you _____ be done with your tasks already.
- c) Since his pocket is empty, he _____ have spent all his money already.
- d) Rani _____ rather not be in Istanbul, but since her husband has been appointed there, she has no other choice.
- e) It's strange Kabir hasn't said anything about moving anymore, he _____ have changed his mind.

6. Rewrite the following excerpt using correct punctuation (7) and capitalization (3). 10 x .5= 5

the first day I stepped foot into this campus, the anticipation was palpable. Try as I deny, I couldnt help but feel something momentous was happening I wanted to play it cool but i could see it on the faces around me too we were on the cusp of a new beginning. You could hear it in the meek Hi! and the nervous laughter, you could hear it in the guitar twangs, in the pitter patter of feet shuffling. Who knows what was coming how will our lives shape up to be 5 years from now? What memories will we be making

7. Write a paragraph of 200-250 words on any one.

1 x 10= 10

- a) What made you choose to be a civil engineer?
- b) Should students be allowed to use computers for research when taking tests?

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Spring - 2022
Program: B. Sc. Engineering (Civil)

Course Title: Physics
Time: 3.00 Hours

Course Code: PHY-101

Credit: 3.00
Full Mark: 150

[N.B-There are **EIGHT (08)** questions. Answer **SIX (06)** including question no. **1**. The figures in the right margin indicate marks. All questions are marked out of 25.]

1. (a) Derive the Bernoulli's equation for steady, nonviscous, incompressible flow of fluid. [15]
- (b) A Pitot tube is fixed on the wing of an aeroplane to measure the speed of it. The tube contains a liquid of density 400 kg/m^3 . The difference in level between the two limbs is 1 m. Density of air = 1.293 kg/m^3 . Calculate the speed of the aeroplane. [10]

2. (a) Write short notes: (i) Brewster's law, (ii) Quarter wave plate, (iii) Half wave plate. [15]
- (b) Plane polarized light passes through a calcite plate with its optic axis parallel to the faces. Calculate the least thickness of the plate for which the emergent beam will be circularly polarized. [10]

3. (a) Prove that the equation for the intensity at a point on the screen in Young's experiment can be written as [15]

$$I = 4a^2 \cos^2 \frac{\delta}{2}$$

Where a and δ are the wave amplitude and the phase difference between the two waves reaching the point considered. Using this equation find out the conditions under which bright and dark fringes are observed in interference pattern.

- (b) In Young's double slit experiment the separation of the slit is 3.8 mm and the fringe spacing is 0.31 mm at a distance of 2 metre from the slits. Calculate the wavelength of light. [10]
4. (a) Explain the term Poisson's ratio. Derive that the maximum possible value of Poisson's ratio is $\frac{1}{2}$. [15]
- (b) A wire of length 1 m and diameter 10^{-3} m is stretched by 6×10^{-4} m by a load 10 kg. Calculate the Young's modulus of the wire. [10]
5. (a) Prove that in case of longitudinal strain, the work done per unit volume is equal to $\frac{1}{2} \times \text{Stress} \times \text{Strain}$. [15]
- (b) The Young's modulus of a metal is $2 \times 10^{11} \text{ N/m}^2$ and its breaking stress is $1.078 \times 10^9 \text{ N/m}^2$. Calculate the maximum amount of energy per unit volume which can be stored in the metal when stretched. [10]

Turn over

6. (a) What is projectile motion? Derive the general equation for the motion of a projectile and show that the trajectory of it is parabolic. [15]
- (b) A neutron moving with a velocity of 2×10^6 m/s collides with a deuteron at rest. After collision, the combined mass moves with a certain velocity. Calculate the velocity, if the mass of neutron is 1.67×10^{-27} kg and the mass of the deuteron is 3.34×10^{-27} kg. [10]
7. (a) Consider a particle of mass m rotating about an axis. Find out the kinetic energy of rotation, angular momentum and torque of the particle. [15]
- (b) A 2 kg mass is whirled in a circle at the end of a string of 0.2 m long, the other end of which is held in the hand. If the mass makes 50 revolutions per second, what is its angular momentum? If the number of revolution decreases by one in 20 s, calculate the mean value of the torque on the system. [10]
8. (a) What is moment of inertia? Find out the moment of inertia of a uniform rod which rotates about an axis passing through its centre. Draw necessary figures. [15]
- (b) A thin metal ring of mass 400 grams and radius 5 cm is making 120 rpm about an axis passing through its centre and perpendicular to its plane. Calculate its kinetic energy. [10]

University of Asia Pacific
Department of Basic Sciences & Humanities
Semester Final Examination, Spring-2022
Program: B.Sc. in Civil Engineering
1st Year / 1st Semester

Course Title: Mathematics I
 Time: 3.00 Hours

Course Code: MTH 101

Credit: 3.00
 Full Marks: 150

There are **Eight** Questions. Answer any **Six** questions including questions **1 to 4**. Figures in the right margin indicate marks.

1. (a) Evaluate the following limits using L' Hospital's Rule. 10
 - i) $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} + 2\sin x - 4x}{x^5}$
 - ii) $\lim_{x \rightarrow 0} x^{3x}$

- (b) Verify Mean Value theorem are for the function 15
 $f(x) = (x - 1)(x - 2)(x - 3)$ in the interval $(0, 4)$.

2. Solve the following integrals.
 - i) $\int \frac{\cos 2x - \cos 2a}{\cos x + \cos a} dx$ 5
 - ii) $\int \cos^4 x dx$ 10
 - iii) $\int \tan^3 2x \sec 2x dx$ 5
 - iv) $\int \frac{\sin^4 x}{\cos^8 x} dx$ 5

3. (a) If $u = \sqrt{x^2 + y^2}$, then prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{u}$. 15

- (b) State Euler's theorem. Then show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 3u$ for the function 10
 $u = x^3 + y^3 + z^3$.

4. (a) Solve the followings using integration by parts. 15
 - i) $\int 1. \ln(x + \sqrt{x^2 + a^2}) dx$
 - ii) $\int (\ln x)^2 dx$

- (b) Solve $\int \frac{x}{(x-1)^2(x+2)} dx$ using partial fraction method. 10

5. (a) Find maximum and minimum value for the function $f(x) = x^3 - 3x^2 + 3x + 1$. 15

- (b) Show that $f(x) = x^3 - 6x^2 + 24x + 4$ has neither a maximum nor a minimum. 10

6. (a) Solve the following definite integrals. 15
- i) $\int_0^2 \frac{1}{e^x + e^{-x}} dx$
- ii) $\int_1^{e^3} \frac{(1 + \log x)}{x} dx$
- (b) Find the Maclaurin's polynomial $P_n(x)$ for $\frac{1}{1-x}$. 10
7. (a) Prove that $\int_0^\infty e^{-t^2} dt = \frac{\sqrt{\pi}}{2}$. 15
- (b) Evaluate $\int_0^\infty e^{-y^3} y^5 dy$ using Gamma function. 10
8. (a) Express the integral $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$ in terms of Beta function. 15
- (b) Show that $\int_0^{\frac{\pi}{2}} \sin^4 \theta \cos^6 \theta d\theta = \frac{3\pi}{512}$. 10

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2022
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. Compute the product of inertia P_{xy} , the minimum moment of inertia I_{min} , and the maximum moment of inertia I_{max} about the centroidal axes of the shaded area shown in Fig.1.

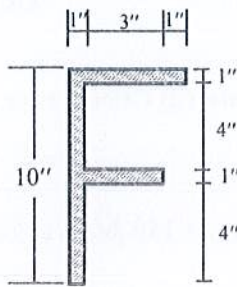


Fig.1

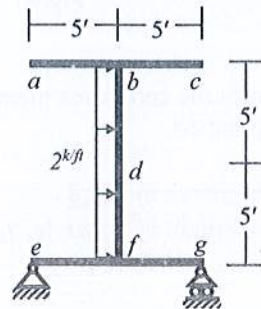


Fig.2

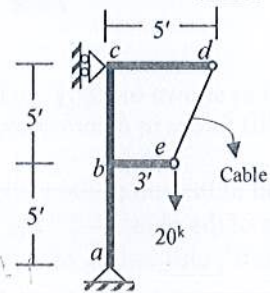


Fig.3

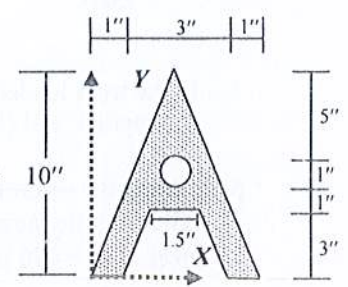


Fig.4

2. For $abcdefg$ loaded as shown in Fig.2, calculate the (i) reactions of supports e and g and (ii) shear force and bending moment at d (mid-point of member bf).
3. In the structure shown in Fig.3, draw the free-body diagram of member abc , cd , be , cable de ; supports at a and c [Consider all the members are weightless].
4. Locate the centroid of the shaded area shown in Fig.4 with respect to the given coordinate system.
5. Compute the moment of inertia (I_x , I_y , and J) of the shaded area shown in Fig.5 with respect to the given coordinate system.

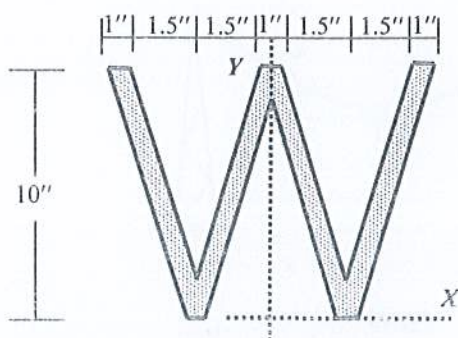


Fig.5

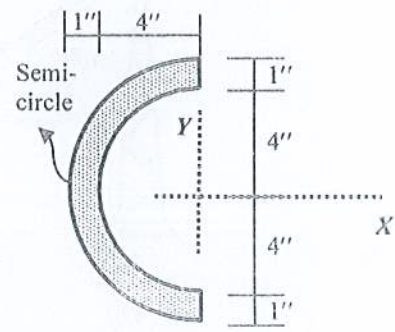


Fig.6

6. Compute by integration method the moment of inertia (I_x and I_y) of the shaded area shown in Fig.6 with respect to the given coordinate system.

Or

Locate the centroid of the shaded area shown in Fig.6 with respect to the given coordinate system by integration method.

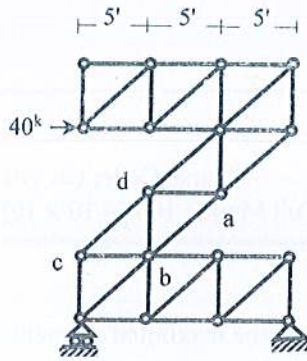


Fig.7

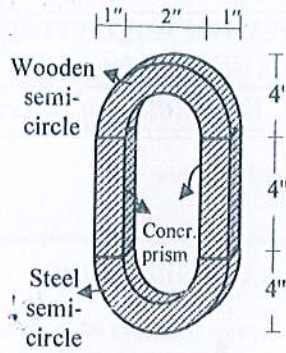


Fig.8

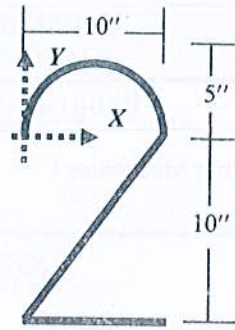


Fig.9

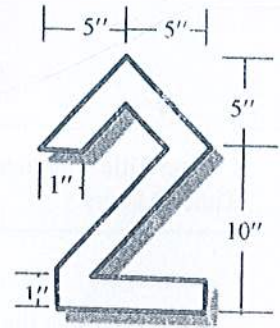


Fig.10

7. In the truss loaded as shown in Fig.7, (i) identify the zero force members, (ii) Calculate the reactions at supports, and (iii) forces in member *ab*, *bd*, and *cd*.
8. Locate the centroid of the composite weight as shown in Fig.8
[Given: Thickness of the object = 2"; the 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, $\gamma_{\text{wood}} = 50 \text{ lb/ft}^3$].
9. Locate the centroid of the composite line shown in Fig.9 with respect to the given coordinate system.

Or,

Locate the centroid of the composite volume of the object shown in Fig.10. [Given: Thickness of the objects = 2"]

10. The cable QTR shown in Fig.11 weighs 0.5 lb/ft and is subjected to a horizontal tension of 760 lb. Calculate *d*, *x*, and the maximum tension in the cable assuming it to be a
(i) parabola, or (ii) catenary.

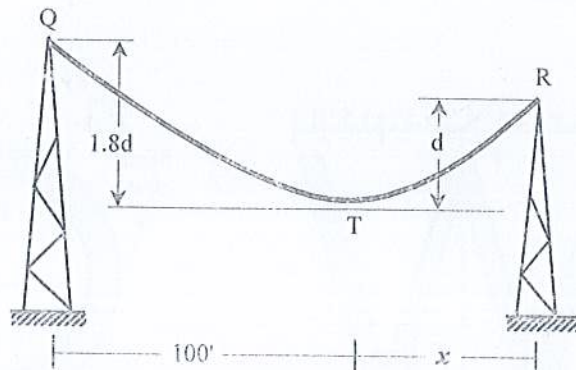


Fig.11

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2022
Program: B.Sc. Engineering (Civil)

Course Title: Introduction to Civil and Environmental Engineering
Time: 2 Hours

Credit Hours: 2.00

Course Code: CE 107
Full Marks: 100

**(Answer all the questions. Figures
in the right margin indicate marks)**

1. a) Define biodiversity hotspot. Explain why we need to protect biodiversity. [3+3]
b) Discuss the types of biodiversity and identify the direct benefits of biodiversity. [4+5]
2. a) Just a few days ago, UAP area was surrounded by stagnant water with almost entire city flooded. Which type of flood do you believe it was? Investigate the management approach against this flood. [10]
b) Explain what factors make Bangladesh more vulnerable during flood. [5]
3. a) Define ecology and ecosystem. Describe the purposes of studying ecology. [4+6]
b) Explain ecosystem hierarchy in brief. [5]
4. a) Discuss the purpose of soil test and site classification. [6]
b) Demonstrate the components of soil test and discuss them in brief. [10]
5. a) Classify field survey based on the instruments used and discuss any two of them. [3+4]
b) Differentiate between national highway and regional highway. [4]
c) Discuss on different types of loads that can act on a structure. [8]
6. A five-storied residential building is to be constructed. Estimate the total construction cost as per the PWD schedule. The particulars of the building are as follows: [20]

Serial No	Particulars	Specification
1	Land Size	Determine from plot layout as shown in Figure 1
2	Building type	Residential (Economy)
3	Allowable Bearing Capacity (q_a)	4 ksf
4	Floor Level	Five
5	Plinth Area	70 % of land size
6	Construction Material	24 MPa, RCC Structure 1: 1.5 : 3 (Stone Chips)
7	Ground Floor	Car Parking
8	Rooftop RCC water tank	1500 Gallon
9	Structure type	RCC Frame Structure
10	Underground water reservoir	4000 Gallon
11	Boundary wall	RCC Frame
12	Contingency Cost	Consider 10 % for this building

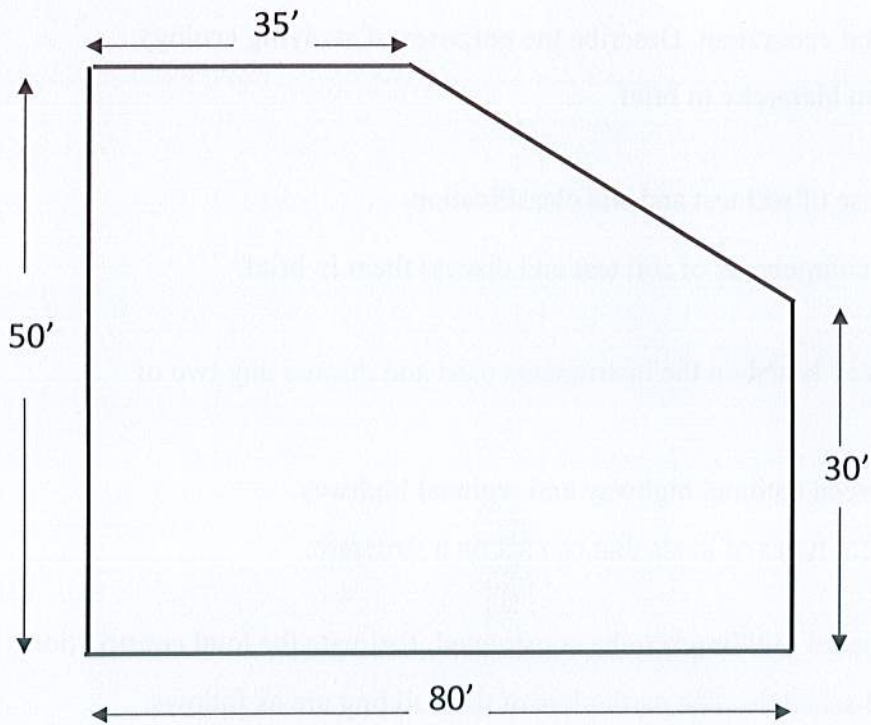


Figure 1

Annexure: PWD SCHEDULE

1. Foundation Cost upto PL (per m² of Plinth 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
9		11252	9471	8302	7487	6891	6441
10		12529	10451	9088	8136	7441	6915

2. Superstructure Cost (per m² of Plinth 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	2 nd 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
5	5 th Floor	8748	9829	12974	9046	10154	13416	9233	10374	13694	10455	11046	15495
6	6 th Floor	8835	9927	13104	9136	10265	13550	9326	10478	13831	11030	11158	15960

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. Roof top RCC water Tank: Tk.85.00/gallon