Course Title: English I	Course Code: HSS 101	Credit: 3.00
Time: 3 hours		Full Marks: 50

Instructions:
*Marks are indicated in the right margin.
*Answer all the questions

1. **Complete the following sentences using proper conditionals:**   1×15=15

   a) UAP will remain closed tomorrow if … … …
   b) … … … if I aced the SAT.
   c) HSS 101 would be more fun if … … …
   d) If it had not rained early in the morning, … … …
   e) If I were you, … … …
   f) If I hadn't gotten into UAP,
   g) Had you been my friend, … … …
   h) You'd understand the joke if … … …
   i) If animals could talk, … … …
   j) I could get more sleep if … … …
   k) What would have happened if … … …?
   l) If I were to tell you the story, … … …
   m) If he is an actor, … … …
   n) He would know me if … … …
   o) If I was there, … … …

2. **Combine/join the individual sentences into one sentence:**   1×15=15

   a) Ms. Adrina was our Latin teacher. She was a birdlike woman.
   b) I lost my watch. It was a costly gift from my father.
   c) Marzan described the fact. She did not fear anyone at all.
   d) I completed my project. I sat for watching the TV after dinner as a treat.
   e) She heard the news of her husband's passing. She fainted.
   f) The hunter told us about a wild boar. He met it on a road.
   g) It must be done. Whatever may be the cost.

h) The bus was crowded. That was usual.
i) Chris was present. Jada also was present. Will was absent from the school.
j) She is greedy. She is honest about her ways.
k) Life is short. Art is what remains.
l) A book can be a lot of fun to read. A book can be boring.
m) I think you were right. You were a little rude.
n) Hannah is attending Duke University. It was her first choice.
o) The rain will not stop. The sky is clear.

3. **Use suitable pronouns to complete the sentences:**   1×10=10

a) Have you seen the books? I have not seen … … …
b) I always lose my keys. Where are … … …?
c) Please listen to … … … when I'm talking to you.
d) I have a new job, but I do not like … … … at all.
e) I have found her bag but I haven't found … … …
f) This is my house, where is … … …?
g) Is this Emily's room? – Yes, it's … … ….
h) I lost my pen in the library. Can I have one of … … …?
i) Stop! – These sweets are all … … …
j) Did you forget to do your homework yesterday? – No I didn't. I did … … … homework.

4. **Write a paragraph on either topic:**   10×1= 10

a) Should students learn a second language?

   Or

b) The good life.

University of Asia Pacific
Department of Basic Sciences and Humanities
Final Examination, Fall - 2021
## Program: B. Sc Engineering (Civil)

Course Title: Physics   Course Code: PHY-101   Credit: 3.00
Time: 3.00 Hours   Full Mark: 150

[N.B-_There are **EIGHT (08)** questions. Answer **SIX (06)** including question no. 1, 6, 7 and 8. The figures in the right margin indicate marks. All questions are marked out of 25.]

1. (a) State and explain the laws: Zeroth law of thermodynamics, First law of thermodynamics, Second law of thermodynamics.   [15]

   (b) When a system is taken from the state A to state B along the path ACB, 80 joules of heat flows into the system and the system does 30 joules of work (fig. below).   [10]
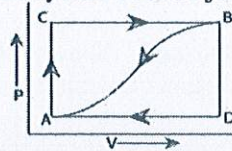
   (i) How much heat flows into the system along the path ADB, if the work done is 10 joules?
   (ii) The system is returned from the state B to the state A along the curved path. The work done on the system is 20 joules. Does the system absorb or liberate heat and how much?
   (iii) If $U_A = 0$ and $U_D = 40$ joules, find the heat absorbed in the process AD and DB.

2. (a) What is isothermal process? Prove that work done during an isothermal process is $W = RT \times 2.3026 \times \log_{10} \frac{P_1}{P_2}$.   [15]

   (b) A quantity of dry air at 27° C is compressed suddenly to 1/3 of its volume. Find the change in temperature. γ is 1.4.   [10]

OR

3. (a) Derive that the efficiency of the Carnot's heat engine in terms of temperature is given by the relation   [15]

$$\eta = 1 - \frac{T_2}{T_1}$$

   Where T_1 and T_2 are the temperatures of source and sink respectively.

   (b) A Carnot's engine whose temperature of the source is 400 K takes 200 calories of heat at this temperature and rejects 150 calories of heat to the sink. What is the temperature of the sink? Also calculate the efficiency of the engine.   [10]

Turn over

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 2 m and diameter 10^{-3} m is stretched by 12×10^{-4} m by a load 10 kg. Calculate the Young's modulus of the wire. [10]

OR

5. (a) Prove that in case of longitudinal strain, the work done per unit volume is equal to $\frac{1}{2} \times$ Stress $\times$ Strain. [15]

(b) Calculate the work done in stretching a uniform metal wire of area of cross section 10^{-6} m^2 and length 3 m through 8×10^{-3} m. Given $Y = 2 \times 10^{11}$ N/m^2. [10]

6. (a) Derive the Bernoulli's equation for steady, nonviscous, incompressible flow. [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]

7. (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 body of mass 5 kg at rest explodes into three pieces. Two pieces, each of mass 1 kg fly off perpendicular to each other with a speed of 100 m/s. Calculate the velocity of the third piece. Also calculate the ratio of the kinetic energy of third piece and one of the small pieces. [10]

8. (a) What is moment of inertia? Find out the moment of inertia of a ring which rotates about an axis passing through its centre and perpendicular to its plane. [15]

(b) A thin metal ring of mass 100 grams and radius 10 cm is making 120 rpm about an axis passing through its centre and perpendicular to its plane. Calculate its kinetic energy. [10]

Course Title: Mathematics I   Course Code: MTH 101
Credit: 3.00   Time: 3.00 Hours   Full Marks: 150

There are **Eight (8)** questions. Answer any **Six (6)**. All questions are of equal values, indicated in the right margin.

1. Integrate by parts: 25

   (i) $\int \dfrac{x}{\sec x + 1}\, dx$ (ii) $\int x^2 \sin^2 x\, dx$ (iii) $\int \sin^{-1} x\, dx$

2. Integrate by partial fraction: 25

   (i) $\int \dfrac{2x^2 - 1}{(x+1)^2(x-2)}\, dx$ (ii) $\int \dfrac{4x + 3}{x(2x+3)(2x+1)}\, dx$

3. Evaluate the followings: 25

   (i) $\int \sin^2\theta\,\cos^3\theta\, d\theta$ (ii) $\int \dfrac{e^x}{1 + e^x}\, dx$ (iii) $\int \dfrac{x^{\frac{1}{4}}}{x^{\frac{1}{2}}}\, dx$

4. (a) Find the maximum and minimum values of $f(x) = 2x^3 - 9x^2 + 12x - 3$.   15

   (b) What is the value of $\displaystyle\lim_{x\to 1} \dfrac{1 - x^2}{1 - \ln x}$?   10

5. Evaluate the followings: 25

   (i) $\int \dfrac{\cos(\ln x)}{x}\, dx$ (ii) $\int \sin^7 x\, dx$ (iii) $\int (\ln x)^2\, dx$

6. Integrate by method of substitution: 25

   (i) $\int \dfrac{\sin 2x}{a \sin^2 x + b \cos^2 x}\, dx$ (ii) $\int \dfrac{\cos 2x}{(\sin x + \cos x)}\, dx$

7. Find the value using L'Hospital's rule: 25

   (i) $\displaystyle\lim_{x\to 0} \dfrac{2\sin x - \sin 2x}{xx - \sin x}$ (ii) $\displaystyle\lim_{x\to 0} \dfrac{e^x + e^{-x} - 2\cos x}{x \sin x}$

8. (a) Integrate by method of substitution: 20

   (i) $\int \dfrac{\sin x}{\sin(x - a)}\, dx$ (ii) $\int \sqrt{\sin x}\,\cos^3 x\, dx$

   (b) What is the value of $\displaystyle\lim_{x\to 1} \dfrac{e^x - 1}{x^2 + x}$?   5

Course Title: Engineering Mechanics I   Credit Hours: 3.0   Course Code: CE 101

Time: 3 hours   Full Marks: 100 (= 10 × 10)

ANSWER ALL THE QUESTIONS

1. For the structure *abcde* loaded as shown in *Fig.1*, calculate the
   (i) Reactions of supports *b* and *c*; (ii) Shear force and bending moment at midpoint of *bc*.
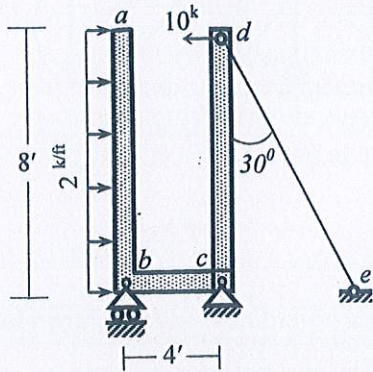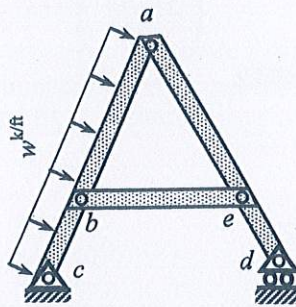   Note that there are two frame members (member *abc* and member *cd*).
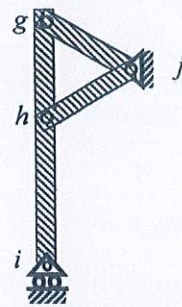

Fig.1   Fig.2(a)   Fig.2(b)

2. In the structures shown in *Fig. 2* draw the free-body diagram of
   (a) Member *abc*, support *c* and support *d* [*Fig. 2(a)*]
   (b) Member *ghi*, support *j* [*Fig. 2(b)*]

3. Compute moment of inertia **OR** locate the centroid of the shaded area (shown in *Fig. 3*) with respect to given co-ordinate system by integration method.
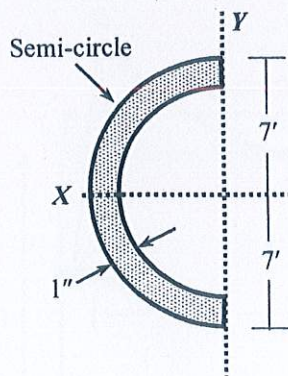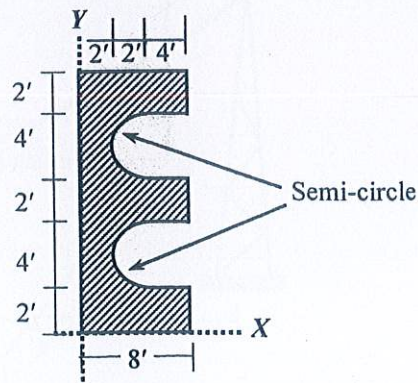

Fig.3   Fig.4

4. Locate the centroid of the composite area shown in *Fig. 4*

5. Locate the centroid of the composite weight shown in *Fig.5*
[Given: Thickness of the object = 2 inch; Unit weight of concrete, γ_{con} = 150 lb/ft³;
Unit weight of steel, γ_{st} = 490 lb/ft³; Unit weight of aluminium, γ_{al} = 150 lb/ft³].

6. Compute product of inertia P_{xy}, minimum moment of inertia I_{min} and maximum centroidal moment of inertia I_{max} of the shaded area shown in *Fig 6.*
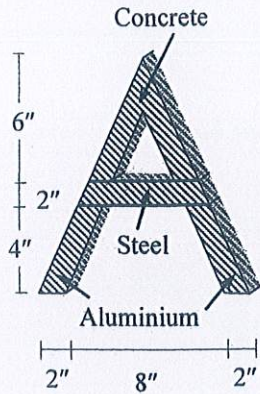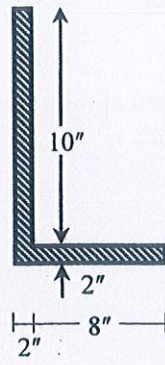
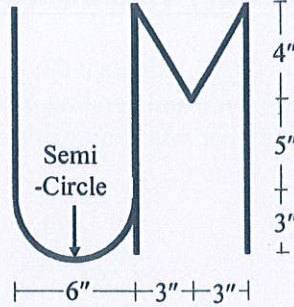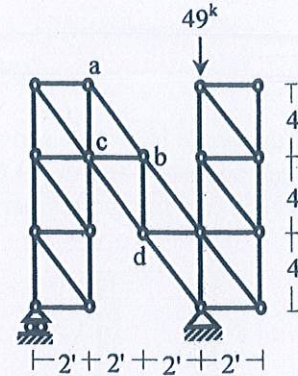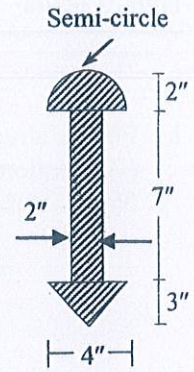| Fig. 5	Fig. 6	Fig. 7	Fig. 8	Fig.9

7. Locate the centroid of the composite lines with respect to given co-ordinate system shown in *Fig.7.*

8. In the truss loaded as shown in *Fig.8*,
   (i) Identify zero force members
   (ii) Calculate reactions at supports,
   (iii) Calculate forces in member *ab*, *cb* and *cd*.

9. Compute moment of inertia I_x, I_y and J of the shaded area shown in *Fig.9* with respect to centroidal axis.

10. The cable ABC shown in *Fig.10* weighs *w* lb/ft and is subjected to a horizontal tension of 450 lb.
    Calculate *x, y* and the maximum tension in the cable assuming it to be parabola *OR* catenary

Fig.10

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2021
Program: B.Sc. Engineering (Civil)
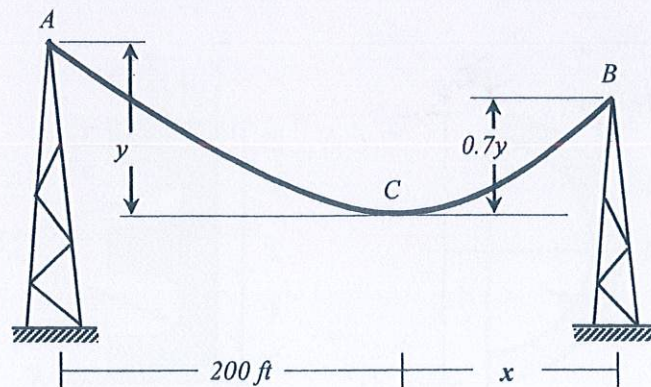
Course Title: Introduction to Civil and Environmental Engineering   Course Code: CE 107
Time: 2 Hours   Credit Hours: 2.00   Full Marks: 100

Part A

Answer all the questions.

1.   A five-storied residential building is to be constructed. Estimate the construction cost   [16]
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 annexure.

Serial	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)	3.5 ksf
4	Floor Level	Five
5	Plinth Area	60% of land size
6	Construction Material	23 MPa, RCC Structure 1: 1.5 : 3 (Stone Chips)
7	Ground Floor	Habitation
8	Rooftop RCC water tank	1500 Gallons
9	Structure type	RCC Frame Structure
10	Underground water reservoir	3500 Gallons
11	Boundary wall	RCC Frame
12	Incidental Cost	8% for this building

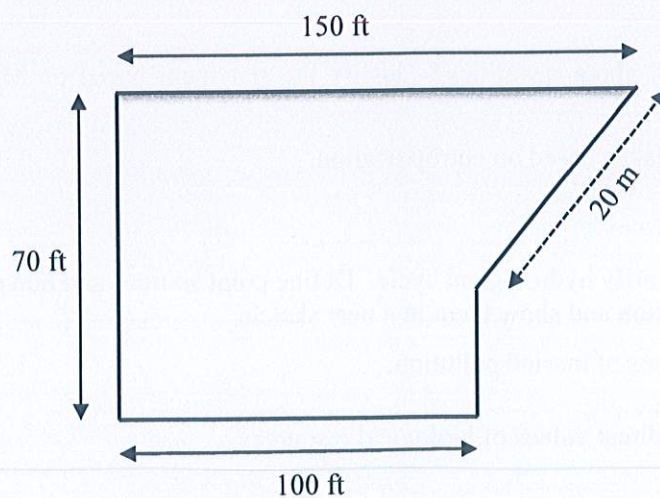*Figure 1*

2. (a) Define plane and geodetic surveying. [4+4]

   (b) In your own word, describe some field test methods for cement. [6]

   (c) The size of a brick is 25 cm x 4.75 in x 7.5 cm. The unit weight of the brick (γ_{bm}) is 120 lb/ft^3. For the positions of the brick shown in **Figure 2**, calculate the pressures on the contact surfaces in psf (lb/ft^2). [8]

Case 1   Case 2
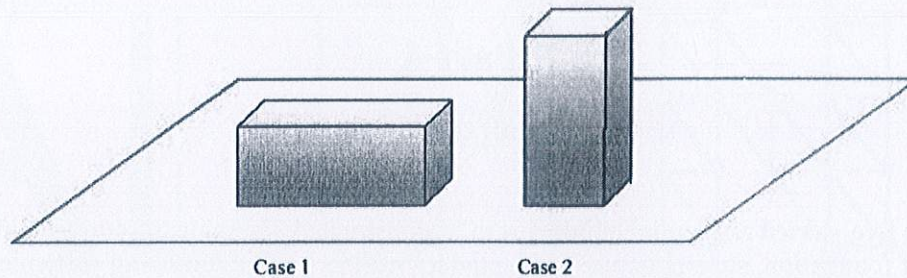
Figure 2

3. (a) Explain the major factors that need to be considered while selecting building materials. [6]

   (b) Give the names in detail of the following codes with their related fields.
   (i) ACI, (ii) ASTM and (iii) AASHTO [3]

   (c) State different types of loads to be considered in design. [3]

Part B

Answer all the questions.

4. (a) "Water pollution is all about quantities."- Justify the statement based on Marine pollution. [4]

   (b) Define AQI. Classify lakes based on eutrophication. [4+4]

5. (a) With a neat sketch, identify hydrological cycle. Define point sources and non point sources of water pollution and show them in a neat sketch. [8+6]

   (b) Identify the major causes of marine pollution. [4]

   (c) Briefly describe the indirect values of biological resources [6]

6.   Kamlakanda of Netrokona is flooded every year due to onrush of water from upper catchments in the Gunai river. To prepare a floodplain zone Flood frequencey of nearby areas has been recorded.

Location	Distance from Gunai River	Flood frequency
Kamlakanda	0 km	frequently flooded
Bisauti	5 km	once in 2 years
Rangsi	12 km	once in 25 years
Bakatola	19 km	once in 25 years
Gilagora	24 km	once in 100 years

(a)   Enlist the activities that should be followed at Kamlakanda upozilla to manage the floods (Flood management activities) and also enlist the flood management strategies [6]

(b)   Create a floodplain zoning for areas around the Gunai river and show it in a neat sketch. [8]

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)

Level	Floor	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)		
		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
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

SOME ADDITIONAL COST

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