3-2

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

Course Title: Environmental Engineering II | Course Code: CE 333
Time: 1 hour | Full Marks: 30

There are **Three** Questions. **Answer all questions. Assume any data if required.**

1. Design: (a) rectangular sedimentation tank and (b) circular tank employing the following dataset. **[10]**

- Average flow rate, Q_{av}=20,000 m^3/d.
- Peak hourly flow rate, Q_p=40,000 m^3/d.
- Specific gravity of the particles to be removed, s=1.25.
- Diameter of the particles, d=150 μm.
- Darcy-Weisbach fraction factor, f=0.025.
- Scouring material constant, k=0.05

Use the following equations if required:

$$V_H = \left[\frac{8k(s-1)gd}{f}\right]^{1/2} \qquad \text{BOD/TSS removal} = \frac{t}{a+bt}$$

2. a. What are the benefits of improving sanitation access? **[5]**

b. What is the difference between Septic and SBS systems? **[5]**

3. a. Calculate the velocity through a rack, when approach velocity is 0.70 m/s, flow open area through clean bar rack is 0.20 m^2 and headloss across the rack is 40 mm. Also estimate the headloss, when 50% area of the flow area is blocked off due to coarse solids accumulation. **[5]**

b. Write short note on microstrainers employed for wastewater treatment. **[5]**

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2019

Course: CE 363 Course Title: Engineering Hydrology
Full Marks: 60 Time: 1 hour

Assume any reasonable value, if not given

Answer All the Questions

All students must attach the question paper with the answer script

1. Define the followings:
   Φ Index, Residence Time, Field Capacity, Vapor Pressure, Potential Evapotranspiration and Infiltration Capacity. (6*2 = 12)

2. Describe the Climate of Bangladesh. (6)

3. Fill in the boxes shown in figure-1 and also write the water budget equation for the situation mentioned in the figure. (5)

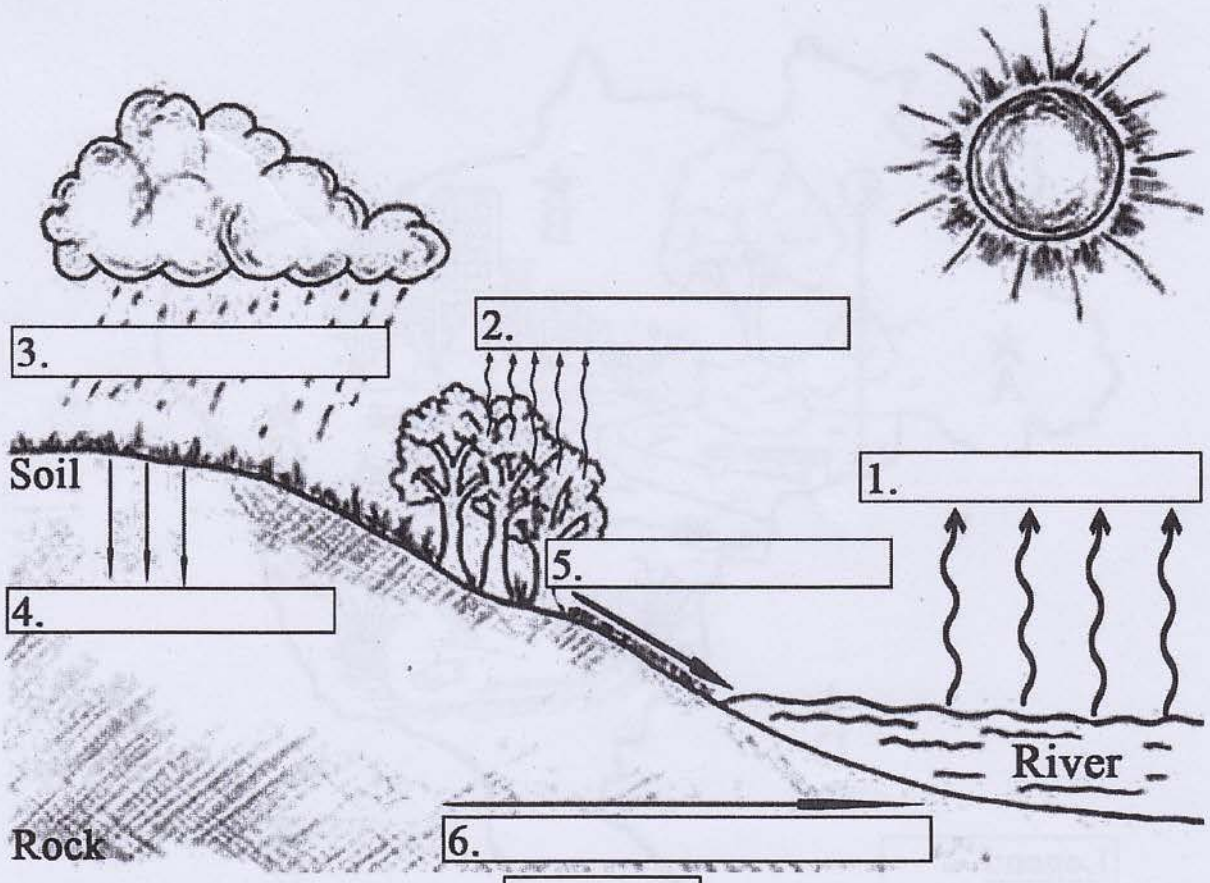

Figure-1

4. Calculate in one step, the perceptible water in a saturated air column of 3500 m high above $2m^2$ of ground surface. The surface pressure is 101.325 kPa, the surface air temperature is 30^0C and the lapse rate is 6.5^0C/Km. (15)

5. A storm with 200 mm precipitation produced a direct runoff of 120 mm. The time distribution of storm is given below. Estimate the Φ index of the storm. (7)

Time from start (hr.)	1	2	3	4	5	6	7	8
Incremental rainfall in each hour (mm)	9	26	30	8	36	32	20	7

6. Find the infiltration capacity of a catchment at 6^{th} hour of an 8-hour rainfall using Horton's equation. Initial infiltration capacity of that catchment is 6.5 cm and final steady state value is 1.4 cm. Assume value of the constant Kh as 0.33 (7)
Horton's equation: $f_{ct} = f_{cf} + (f_{co} - f_{cf})\, e^{-K_h t}$

7. Draw only the polygons using Thiessen polygon method to find the average rainfall for the catchment shown in Figure-2. (8)

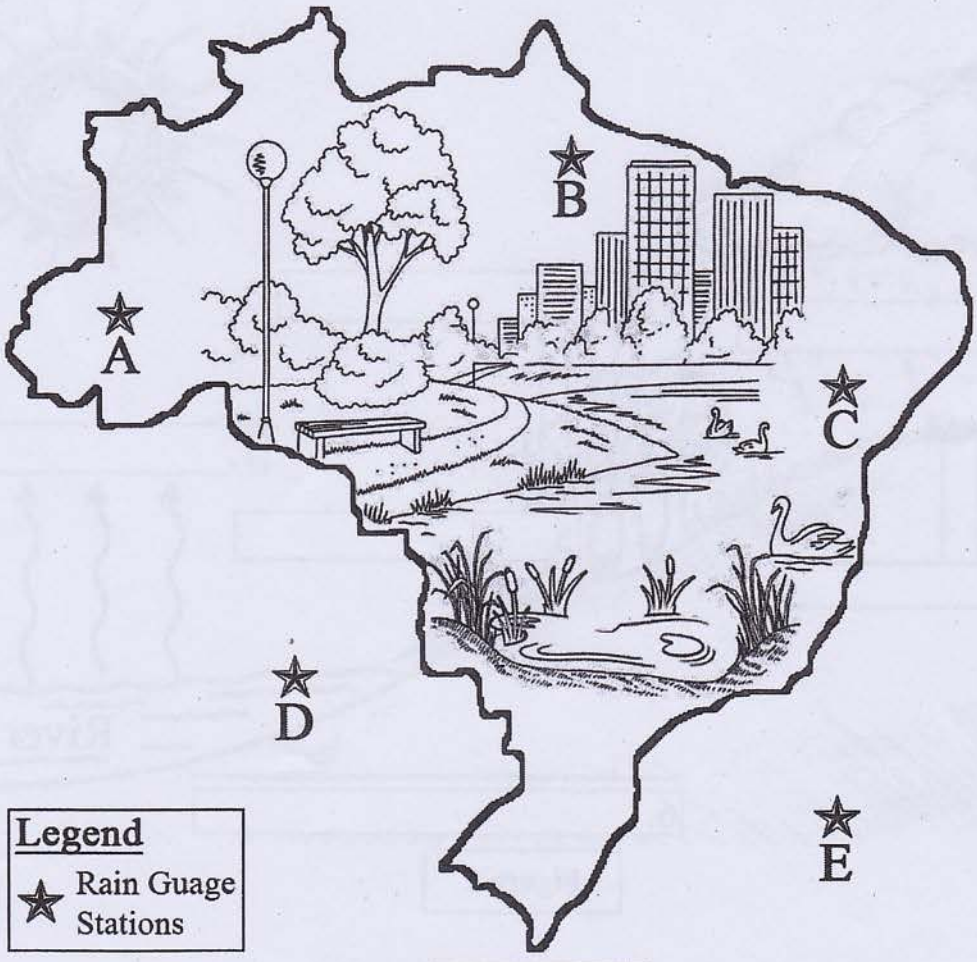

Figure-2

You may use the following equations:

$$p_2 = p_1\left(\frac{T_2}{T_1}\right)^{g/\alpha R_a}$$

$$T_2 = T_1 - \alpha(z_2 - z_1)$$

$$p = \rho_a R_a T$$

$$e = 611 \exp\left(\frac{17.27T}{237.3 + T}\right)$$

$$q_v = 0.622\frac{e}{p}$$

$$\Delta m_p = \bar{q}_v \bar{\rho}_a A \Delta z$$

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination, Fall 2019
Program: B.Sc in Civil Engineering

Course Title: Principles of Management Course Code: IMG 301 Credit: 2

Time: 1 Hour Full Marks: 20

(Answer all questions sequentially.)

1. Some laptops are needed for sales representative. How will a manager choose the laptop brand? (5)

Weighted Criteria:

Memory and storage	40
Battery life	30
Carrying weight	15
Warranty	10
Display quality	5

Possible Alternatives:

Brand	Memory and storage	Battery life	Carrying weight	Warranty	Display quality
HP	35	25	15	8	2
Acer	40	30	10	8	3
Sony	40	35	14	8	4
Lenovo	32	25	12	7	4
Toshiba	30	28	8	8.5	4
Apple	35	25	15	8	5
Asus	32	28	14	6	4.5
Samsung	35	27	11	5.5	4
Huawei	20	21	9	9	4
Dell	26	23	10	8	3

2. Briefly discuss the managerial skills with appropriate examples. (5)

3. Explain different approaches to social responsibility with examples. (5)

4. Explain Maslow's hierarchy of needs theory with examples. (5)

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2019
Program: B.Sc. in Civil Engineering

Course Code: CE 317 Time: 1 (one) Hour
Course Title: Design of Concrete Structures II Full Marks:(30+18+12)=60

Answer all the QUESTIONS
Use f_c' is 24 N/mm^2, f_y is 420 N/mm^2 and γ_c is 24 kN/m^3 for design

QUESTION 1 [30 MARKS]

The floor slab of a storage warehouse of garments building (live load 6 kN/m^2) is constructed with reinforced concrete beam (250 mm x 600 mm) supported slabs. The floor carries 2 kN/m^2 dead load due to finishes and partition wall (excluding self-weight of slab). The thickness of slab could be assumed as 150 mm. Apply concept to design the short span of side panel of slab as shown in **Figure 1**. The moment coefficients of side panel are listed in **Table 1**. [30 Marks]

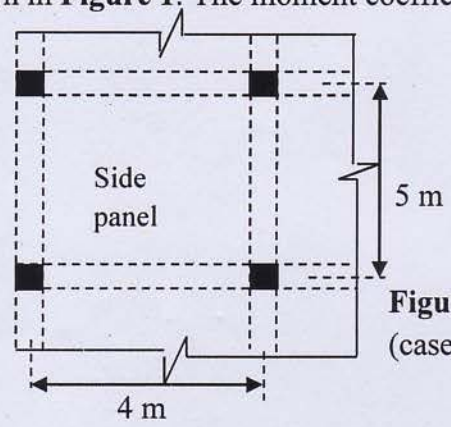

Figure 1. Side panel (case 8) of warehouse

Table 1: Moment coefficients of Interior slab

Span Ratio	Positive Moment		Negative Moment
	Live load	Dead Load	
0.8	0.044	0.032	0.055

QUESTION 2 [18 MARKS]

The interior column **"C"** (shown in Figure 2) of 8-storeyed office building (live load 2.4 kN/m^2) is required to design. The floor is constructed with flat slab and carries 2 kN/m^2 load due to random wall (without self-weight of slab). Design the ground floor column of **"C" as tie column** for **gravity load** only. Assume required data to design the column. Arbitrary area method of floor could be used to calculate the column load. As per ACI 318, the minimum thicknesses of interior and exterior slabs are $l_n/33$ and $l_n/30$ respectively to control deflection [18 marks]

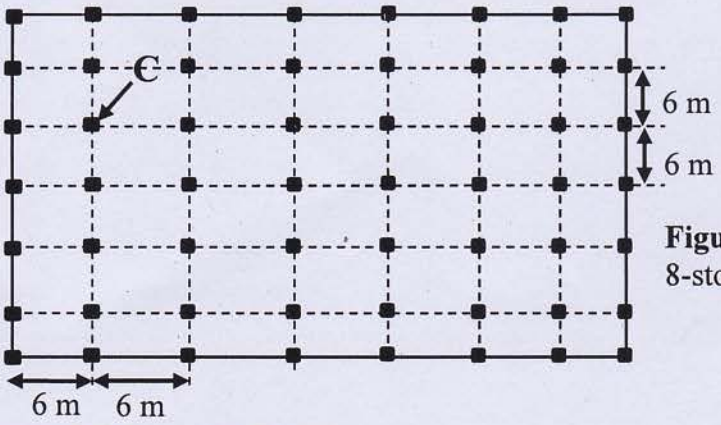

Figure 2. Floor plan of 8-storey office building

QUESTION 3 [12 MARKS]

Synthesis the optimal thickness of flat slab of the office building **of Question 2 (Figure 2),** considering all critical parameters (deflection and punching shear). The dimension of all columns could be as assumed as 500 mm x 500 mm equally spaced square column. Assume required data to obtain optimal thickness of slab. [12 marks]

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

Course Title: Transportation Engineering 1 **Course Code: CE 351**
Full Marks: 60 **Time: 1hour**

There are **Two** questions. Answer **all** of them

1. a) Differentiate between simple trip chain and complex trip chain. 8
   b) Calculate the AADT for the following data. Data collection was conducted on Wednesday in May. MEF for May is 1.395. 12

Hour	Volume
8:00-9:00 a.m.	1450
9:00-10:00 a.m.	1370
10:00-11:00 a.m.	1260
11:00-12:00 p.m.	1690
12:00-1:00 p.m.	1370
1:00-2:00 p.m.	1550

   c) Compute the time-mean speed and space-mean speed of 7 vehicles traversing a 2500 m segment of a highway presented in following table: 10

Vehicle no.	Distance (m)	Travel time (sec)
1	2500	58
2	2500	79
3	2500	86
4	2500	58
5	2500	64
6	2500	80
7	2500	62

2. a) Design a two-phase signal of a cross-junction for the data given below: 15

Amber 3 sec
Red-amber 2 sec

	N-S	E-W
Inter green	9	8
Lost time	5	4

	Approaches			
	North	South	East	West
Flow, pcu/hr	1470	1190	770	1220
Saturation flow pcu/hr	3970	3550	2350	3690

Draw the **phase diagram**.

   b) Enumerate the objectives of Origin-Destination (O-D) survey. 6
   c) Define (any **three**): 9
   (i) VMS (ii) Forced flow
   (iii) Mandatory traffic sign (iv) Park and ride

Table for Question 1 b)

Table 1 Hourly Expansion Factors for a Rural Primary Road

Hour	Vol.	HEF	Hour	Vol.	HEF
6:00-7:00 a.m.	294	42.01	6:00-7:00 p.m.	743	16.6
7:00-8:00 a.m.	426	28.99	7:00-8:00 p.m.	706	17.5
8:00-9:00 a.m.	560	22.05	8:00-9:00 p.m.	606	20.4
9:00-10:00 a.m.	657	18.8	9:00-10:00 p.m.	489	25.3
10:00-11:00 a.m.	722	17.11	10:00-11:00 p.m.	396	31.2
11:00-12:00 p.m.	667	18.52	11:00-12:00 a.m.	360	34.3
12:00-1:00 p.m.	660	18.71	12:00-1:00 a.m.	241	51.2
1:00-2:00 p.m.	739	16.71	1:00-2:00 a.m.	150	82.3
2:00-3:00 p.m.	832	14.84	2:00-3:00 a.m.	100	124
3:00-4:00 p.m.	836	14.77	3:00-4:00 a.m.	90	137
4:00-5:00 p.m.	961	12.85	4:00-5:00 a.m.	86	144
5:00-6:00 p.m.	892	13.85	5:00-6:00 a.m.	137	90.2
Total daily volume =		12350			

Table 2 Daily Expansion Factors for a Rural Primary Road

Day of Week	Volume	DEF
Sunday	7,895	9.515
Monday	10,714	7.012
Tuesday	9,722	7.727
Wednesday	11,413	6.582
Thusrday	10,714	7.012
Friday	13,125	5.724
Saturday	11,539	6.51
Total weekly volume =		75,122

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

Course Title: Structural Engineering II | Course Code: CE 313
Time: 1 hour | Credit Hour : 3.0 | Full Marks: 40

ANSWER ALL QUESTIONS. Any missing data can be assumed reasonably.

Part A

1. Use Method of Virtual Work to calculate the horizontal deflection at **C** and rotation at **B** of the plane frame shown in ***Fig. 1***
[Given: EI=Constant]. **[12]**

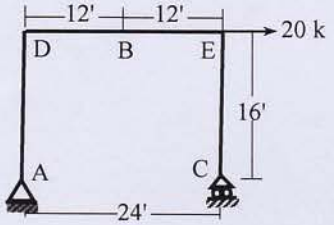

Fig.1

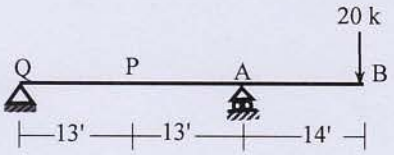

Fig.2

2. Use Method of Virtual Work to calculate vertical deflection at **P** and rotation at **Q** in the beam shown in ***Fig. 2***
[Given: EI= Constant]. **[08]**

Part B

3. Use Portal Method to draw the axial force, shear force and bending moment diagrams of the structure shown in ***Fig.3***. All columns have the same cross-sectional area. **[13]**

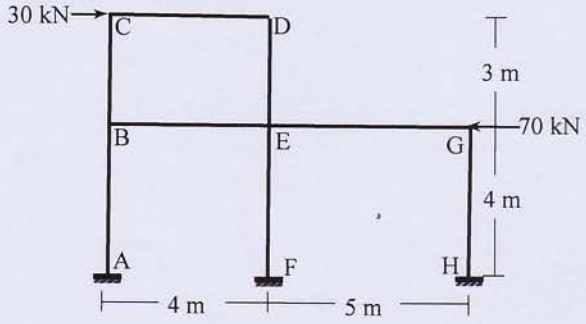

Fig.3

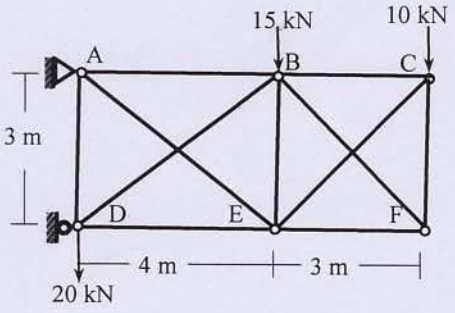

Fig.4

4. Use (i) Approximate Method 1 (tension and compression diagonals each carry half the panel shear) to calculate the member forces AE, DB and
ii) Approximate Method 2 (Diagonal members can take tension only (i.e., they cannot take any compression)) for member BF and CE of the truss shown in ***Fig.4***. **[07]**