University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2018
Program: B.Sc in Civil Engineering

Couse Title: Principles of Management
Time: 2 Hours

Course Code: IMG 301
Full Marks: 50

Answer all the questions

1. Given the following schedule for the construction of the part of an establishment:

Activity	Activity Description	Immediate Predecessors	Estimated Duration
A	Excavate	—	2 weeks
B	Lay the foundation	A	4 weeks
C	Put up the rough wall	A	10 weeks
D	Put up the roof	C	6 weeks
E	Install the exterior plumbing	A	4 weeks
F	Install the interior plumbing	C	5 weeks
G	Put up the exterior siding	D, B	7 weeks
H	Do the exterior painting	E	9 weeks
I	Do the electrical work	F, G	7 weeks
J	Put up the wallboard	I, H	8 weeks

Requirements:

a) Draw the project network. [5]
b) Find all possible paths and determine the critical path. [3]
c) Find ES time and LF time for each activity. [2]
d) Determine slacks on each activity. [5]

2. a) Explain Maslow's needs hierarchy theory with proper example. [3]
b) Illustrate the expectancy theory by explaining how efforts lead to performance expectancy, and performance expectancy leads to outcomes. What does Valence mean? [3]
c) Explain the following terms from Goal Setting Theory: goal difficulty, goal specificity, goal acceptance, and goal commitment. [4]

3. a) Define power? Explain its types with proper examples. [6.5]
b) In light with the Path Goal Theory answer the following questions by selecting appropriate leader:

Supportive, Participative, Directive, Achievement-oriented

i. If one's perceived ability is low, what type of leader can be helpful?
ii. If one's perceived ability is high, what type of leader can be helpful?
iii. People believing internal locus of control, prefer what type of leader?
iv. People believing external locus of control, prefer what type of leader?
v. If the task structure is complicated, what type of leader is helpful?
vi. If the task structure is simple, what type of leader is helpful?
vii. What type of leader prefer work group and which type don't? [3.5]

4. The following data were obtained from a study of the time required to overhaul a small power plant:

	Normal Time (Weeks)	Crash Time (Weeks)	Normal Cost ($)	Crash Cost ($)
1-2	10	7	500	800
1-3	11	8	600	750
1-4	10	9	700	1000
2-5	9	6	400	610
3-5	6	4	200	300
3-7	12	6	600	1200
4-6	7	4	200	350
5-7	9	8	600	800
6-7	9	7	500	600
7-8	7	6	400	500

Requirements:

a) Prepare network under normal time schedule and determine the project completion time. [5]
b) Prepare network under crash time schedule and determine the project completion time. [3]
c) Determine cost slope. [2]
d) Determine the least possible cost under crash time schedule. [5]

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B.Sc. in Civil Engineering

Course Title: Structural Engineering II | Course Code: CE 313
Time: 3 Hours | Full Marks: 100

QUESTION 1 [20 MARKS]

a) Differentiate between Portal and Cantilever methods to analyze indeterminate frame structure under lateral load. [4]

b) Formulate the equations to calculate deflections of beam and frame using Virtual Work Method. [4]

c) Explain the basic principle of force method to analyze indeterminate beam and frame. [4]

d) Draw the qualitative influence line of shear forces V_B(left), V_B(right), bending moment of M_f and reaction at R_C of the beam shown in **Figure1(a)**. [4]

e) Formulate the equation to calculate moment distribution factors at joint E of the structure shown in **Figure 1(b)**. [4]

Figure 1(a)

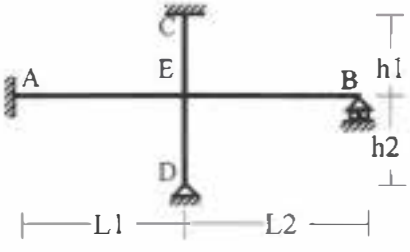


Figure 1(b)

QUESTION 2 [20 MARKS]

a) The frame shown in **Figure 2(a)** is subjected to lateral load due to wind. Analyze the frame using Portal Method to obtain bending moments and shear forces of columns. [10]

b) A frame of portal mill of industry building is subjected to 40 kN lateral load as shown in **Figure 2(b)**. Analyze the frame for bending moment of columns. [3]

c) Analyze the cantilever truss shown in **Figure 2(c)** using approximate method (tension and compression diagonals each carry half the panel shear) to obtain in AB, AD, AE, BE and BD members forces. [7]

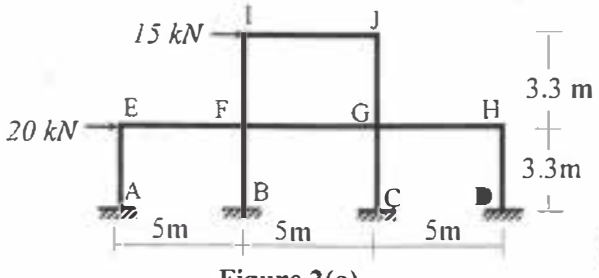


Figure 2(a)

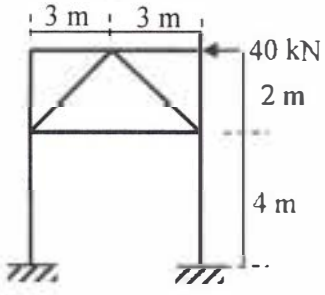


Figure 2(b)

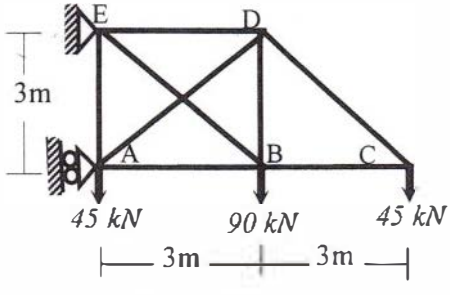


Figure 2(c)

QUESTION 3 [20 MARKS]

a) A Reinforced Concrete retaining wall is subjected to soil pressure as shown in **Figure 3(a)**. If the maximum allowable deflection of the wall is 10 mm, analyze the wall using Virtual Work Method to calculate the required thickness [Given: Width of wall is 1000 mm, Modulus of elasticity of concrete is 30,000 N/mm^2]. [10]

b) A reinforced concrete frame is subjected to gravity load shown in **Figure 3(b)**. Analyze the frame using Virtual Work Method to obtain vertical deflection at C [Given: Cross section of beam is 250 mm x 500 mm, column is 400 mm x 400 mm, modulus of elasticity of concrete is 30,000 N/mm^2]. [10]

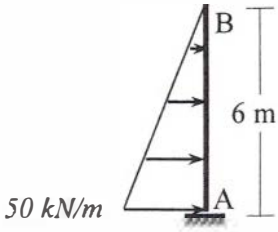


Figure 3(a)

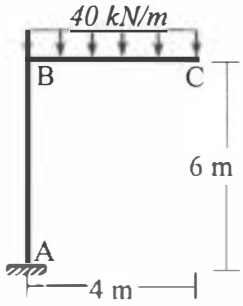


Figure 3(b)

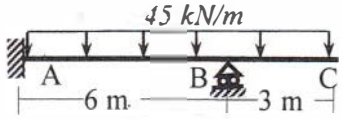


Figure 4(a)

$$For\ UDL, v_x = -\frac{w}{24EI}(x^4 - 4Lx^3 + 6L^2x^2)$$

$$For\ Point\ load, v_x = \frac{P}{6EI}(x^3 - 3Lx^2)$$

QUESTION 4 [20 MARKS]

a) Analyze the continuous beam ABC shown in **Figure 4(a)** using Force Method to obtain shear force and bending moment diagrams [EI is constant]. [10]

b) Analyze the Reinforced Concrete frame shown in **Figure 4(b)** to obtain bending moment and shear force diagrams using Moment Distribution Method [Given: EI is constant; Fixed End Moments for uniformly distributed load are wL^2/12, for concentrated load are PL/8]. [10]

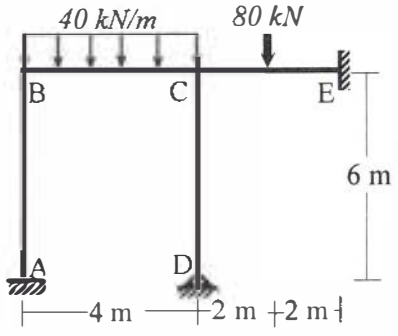


Figure 4(b)

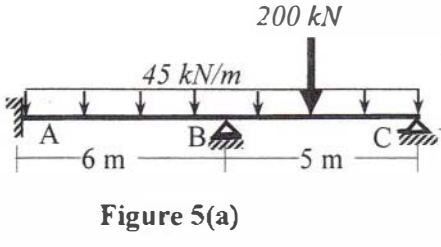


Figure 5(a)

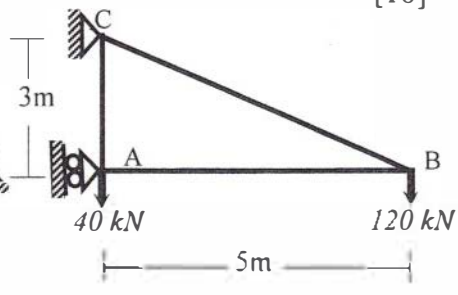


Figure 5(b)

QUESTION 5 [20 MARKS]

a) The Reinforced Concrete continuous beam ABC is subjected to loads shown in **Figure 5(a)**. The location of point load is at mid-span of beam BC. The existing structural system would show higher sagging moment (M^+) for beam BC. Propose suitable structural system to reduce sagging moment of beam BC and justify through comparative analysis of structures using Moment Distribution Method. Assume required information to analyze the structure. [10]

b) The cantilever truss ABC is subjected to loads as shown in **Figure 5(b)**. Steel (E_s 200 GPa) or aluminium (E_a 70 GPa) could be used to construct the truss. Select suitable material to reduce maximum deflection of truss. Justify your selection through comparative analysis of truss using Virtual Work Method [Given: Cross-sections of members are 1200 mm^2]. [10]

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B.Sc. in Civil Engineering

Course Title: Design of Concrete Structures II — Course Code: CE 317
Time: 3 (Three) hours — Full Marks: 100

Assume reasonable values for any missing data. Symbols used have their usual meanings.
[Use $f_c' = 30$ N/mm^2 and $f_y = 410$ N/mm^2 for all design]

QUESTION 1 [20 MARKS]

a. As per ACI-318, an average concrete stress of $0.85f_c'$ is used in stress block with a rectangle of depth $a = \beta_1 c$. The β_1 depends on the design strength of concrete. The value of β_1 for normal strength concrete ($f_c' \leq 28$ MPa) is 0.85. Formulate the design equation for flexure if the β_1 is 0.8. [5]

b. Formulate the equation to check punching shear of flat slab and state the proposed solutions for low capacity slab to satisfy the punching requirements. [5]

c. Trapezoidal type of gravity retaining wall is economical choice as compared to rectangular type, justify the statement through comparative analysis of both types. [5]

d. In terms of serviceability requirements (crack and deflection), pre-stress concrete is better than reinforced concrete, explain the statement through comparative study of both methods. [5]

QUESTION 2 [30 MARKS]

a. The floor of an 8 storeyed office building (live load 2 kN/m^2) is constructed with reinforced concrete slabs as shown in **Figure 1**. All the slabs of the floor are supported with beams (250 mm x 500 mm). The floor carries 3 kN/m^2 dead load due to finishes and partition wall (excluding self-weight of slab). **Design** short span of the slab **"panel A"** of the floor as shown in **Figure 1.** Thickness of the slab could be assumed as 150 mm. The moment coefficients are listed in **Table 1**. Assume required data to design the slab. [10]

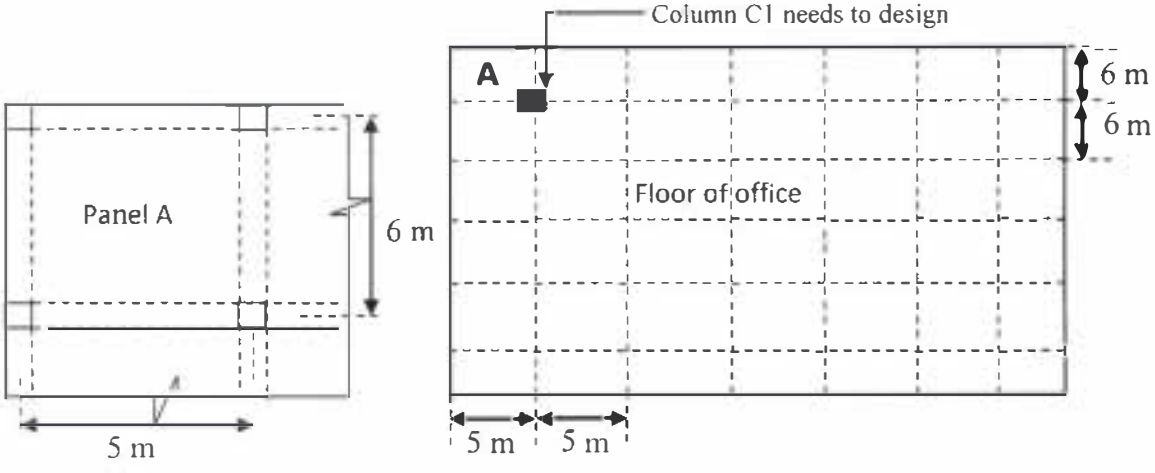


Figure 1: Layout plan of slab

b. Design the **long span column strip** of "**panel A**" of an 8 storeyed office building shown in **Figure 1**, if the slab is constructed with **flat plate** system. Assume the column size at intersection of grid line is 400 mm x 400 mm. Assume required data to design the flat slab. The moment distribution factors of end span flat slab are shown in **Table 2.** [10]

c. Design the ground floor column "**C1**" as tied column shown in **Figure 1** of the structure mentioned in **Question 2(a).** The column is subjected to gravity load along with 100 kN.m uni-axial bending moment. The design chart of **Appendix** could be used and assume required data to design the column. [10]

Table 1: Moment coefficients of corner slab (short span)

Span Ratio	Positive Moment		Negative Moment
	Live load	Dead Load	
0.85	0.043	0.036	0.066
0.8	0.048	0.039	0.071

Table 2: Distribution of total factored static moment (M_0) for flat slab of end span

Factored Moment (slab without edge beam)		
Interior Negative	Positive	Exterior Negative
0.7	0.52	0.26

QUESTION 3 [20 MARKS]

a. The interior columns (400 mm x 400 mm) as shown in **Figure 2** of 6-storeyed office building (flat slab structure) is supported by footing. The structure is constructed with flat slab and thickness of the flat slab is 250 mm. The floor height of each floor is 3.3 m. The live load of office is 2.0 kN/m^2, random wall load could be assumed as 3 kN/m^2 and bearing capacity of soil is 150 kN/m^2. Design the combined footing for long span. Assume the depth of footing is 650 mm. [10]

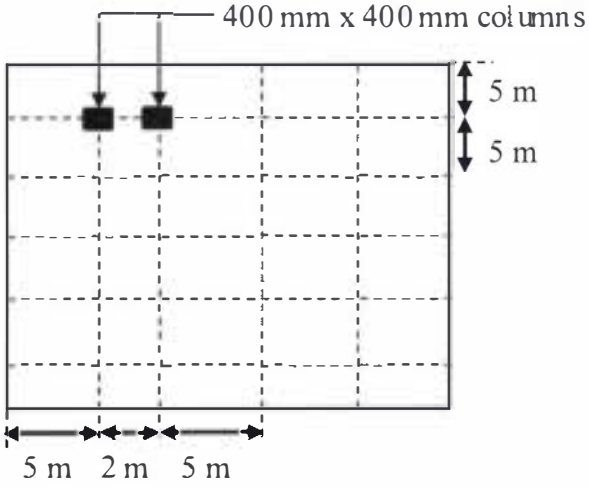


Figure 2: Layout of columns for combined footing

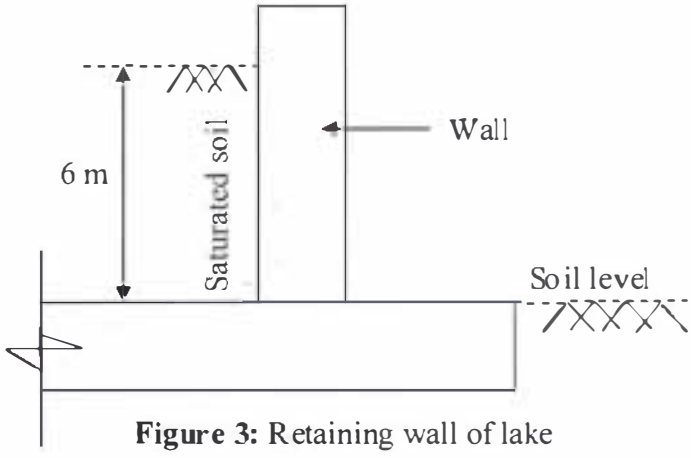


Figure 3: Retaining wall of lake

b. An artificial lake is constructed with reinforced concrete retaining wall as shown in **Figure 3**. The soil beside the wall is saturated by water. The density of soil is 1800 kg/m^3, that of water is 1000 kg/m^3 and co-efficient of active soil pressure is 0.33. Design the wall with optimal thickness for bending moment. Assume required data to design. As per ACI code, the basic span depth ratio of cantilever beam is 8. [10]

QUESTION 4 [10 MARKS]

A simply supported 8 meter span post-tensioned pre-stress concrete beam is carrying 15 kN/m live load and 25 kN/m dead load (excluding self-weight of beam). The section of the rectangular beam is 200 mm x 600 mm. A straight tendon is provided at an eccentricity of 200 mm below the centroid of the section. Analyse the section to obtain minimum pre-stressing force and calculate mid-span stresses at bottom and top of beam under working loading condition. [10]

QUESTION 5 [20 MARKS]

a. An interior column (400 mm x 400 mm) of a 9 storeyed academic building is supported by bore pile foundation. The dead and live loads of the foundation are 2400 kN and 800 kN respectively. The capacity of 500 mm diameter bore pile is 900 kN. Synthesise the depth (optimal) of pile cap considering all critical design parameters and provide an optimal design of pile cap. Assume required data to design. [10]

b. A column of reinforced concrete structure could be designed as rectangular or square sections as shown in **Figure 4**. Select the appropriate section of the column to resist higher bending moment and justify your selection through analysis of the columns. Assumed required information for analysis. [10]

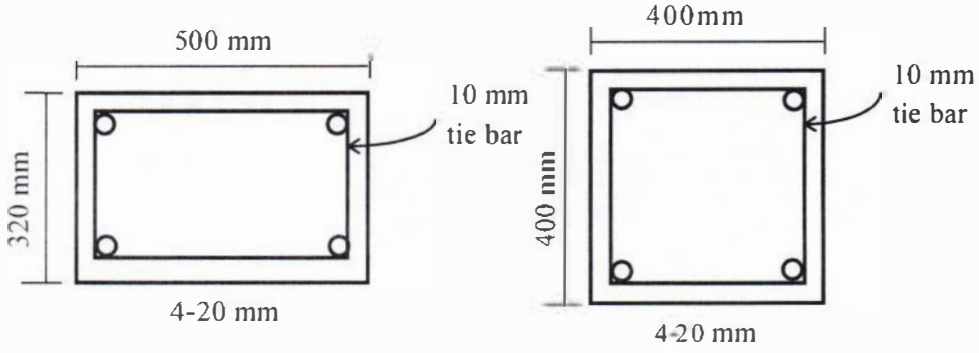


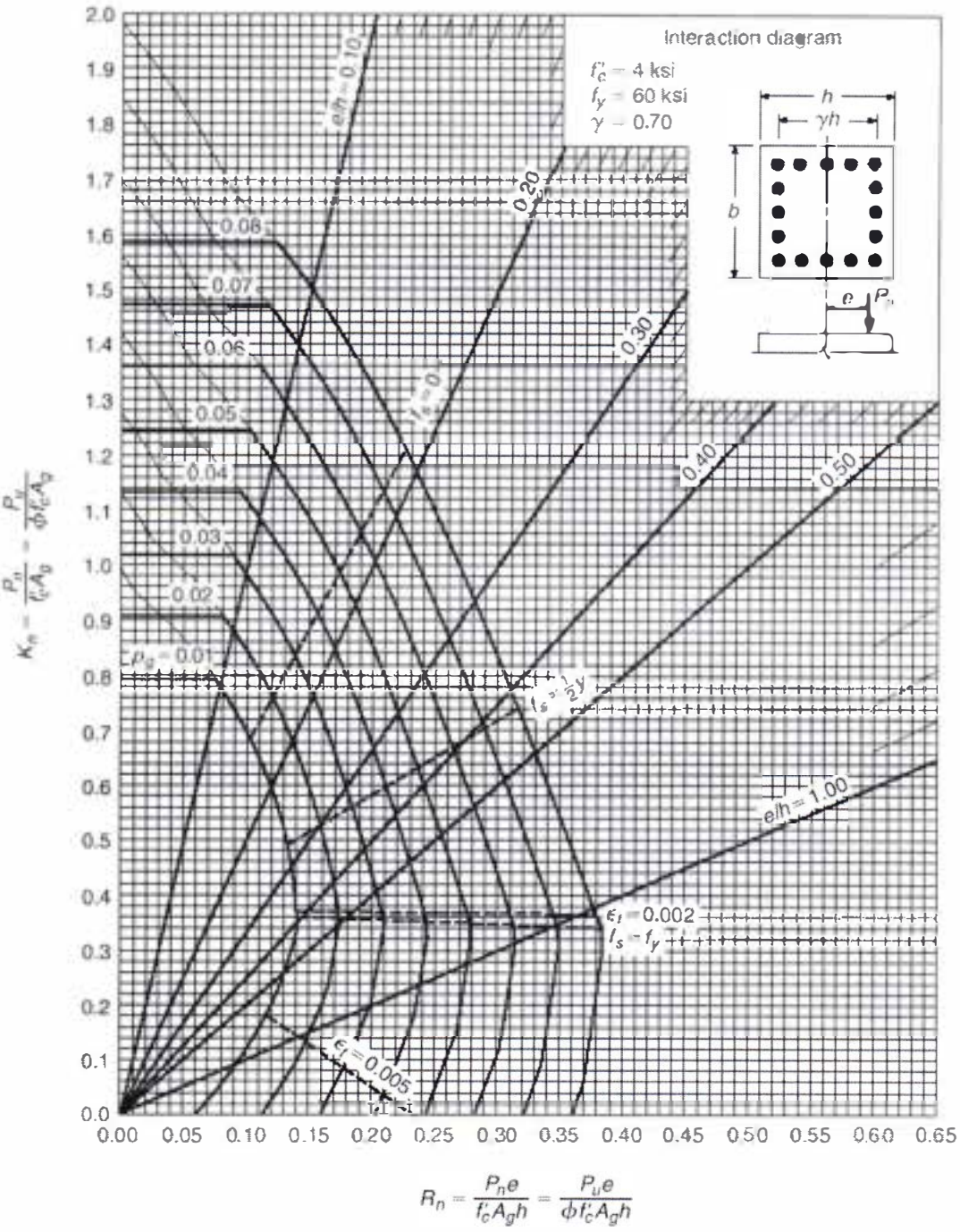
Figure 4: Sections of column

APPENDIX

Direct Design Method:

Minimum thickness of Flat Slab

Exterior Panels without Edge Beams	Exterior Panels with Edge Beams	Interior Panels
$L_n/33$	$L_n/36$	$L_n/36$



University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering II | Course Code: CE 333
Time: 3 hours | Full Marks: 100

There are Six (6) questions. Answer any Five (5). Assume any missing data.

1. (a) Explain operational mechanism of a septic tank employed for human excreta treatment. **[5]**
   (b) How corrosion occurs in a sanitary sewerage system? **[5]**
   (c) How grit materials are removed from municipal wastewater? **[5]**
   (d) Describe settling column analyses method for measuring settling velocities of discrete particles in wastewater. **[5]**

2. A completely mixed activated sludge process is required for the treatment of municipal wastewater using the following data set. Determine: *(i) Efficiency of the biological reactor (based on soluble BOD); (ii) Tank dimensions; and (iii) Sludge wasting flow from aeration tank.* Use the following equations if required. **[20]**

   - Average design flow=0.50 m^3/s
   - Influent BOD_5 concentration=500 mg/L
   - Influent TSS concentration=300 mg/L
   - Effluent BOD_5 concentration=25 mg/L
   - Effluent TSS concentration=30 mg/L
   - Sludge age, θ_c = 9 d
   - MLVSS=4000 mg/L
   - VSS/TSS=0.7
   - TSS concentration in RAS=8000 mg/L
   - Y=0.5 mg VSS/mg BOD_5, k_d=0.06/d
   - BOD_5=0.60 BOD_u
   - BOD_5 removal in primary clarifiers=20%
   - TSS removal in primary clarifiers=60%
   - Specific gravity of primary sludge is 1.05, with solid content 4.0%
   - Oxygen consumption is 1.42 mg per mg of cell oxidized

   Equations: $V = \frac{\theta_c Q Y (S_o - S)}{X(1 + k_d \theta_c)}$ $\qquad \theta_c = \frac{VX}{Q_{wa}X + Q_e X_e}$

3. (a) Derive the following Monod equation of bacterial growth and decay with necessary assumptions. **[5]**

$$r_{g,X_B} = \frac{\mu_{max} S}{S + K_S} X_B - k_d X_B$$

   (b) Describe HRT, sludge age and F/M ratio that are necessary for the design of a biological wastewater treatment reactor. **[5]**
   (c) Explain wastewater treatment mechanisms employing sequential batch reactors (SBR). **[5]**
   (d) What is the difference between MLSS formation and microbial sloughing in suspended and attached growth processes? **[5]**

4. (a) Write short notes on: *(i) Simultaneous phosphorus precipitation; and (ii) Three sludge systems for nitrogen removal.* **[10]**
   (b) How dissolved oxygen and carbon availability influence nitrification and denitrification in a tertiary wastewater treatment system? **[5]**

(c) Explain the anaerobic processes that occur in a sludge treatment digester. [5]

5. (a) Why sequential arrangement of anaerobic-aerobic reactors is required for achieving color compounds removal from textile wastewater? [5]

(b) *"CETP is not an attractive wastewater treatment technology for small scale industries"*- justify the statement. [5]

(c) What is the main difference between aerobic and maturation ponds? [5]

(d) Calculate the size of the anaerobic digester for sludge treatment and generated gas volume using the following data set. [5]

Average design flow	6000 m^3/d
Dry solids removed	0.20 kg/m^3
Ultimate BOD removed	0.20 kg/m^3
Solids content	5%
θ_c	25 d
Y	0.05kg/kg BOD
k_d	$0.03d^{-1}$
Solid specific gravity	1.01
Waste utilization efficiency	80%

6. You have been assigned to propose wastewater treatment plants for two industries. Pollutant concentration of wastewater generated from these industries is provided in the following table. Propose flow diagrams of: (i) Activated sludge process for industry 1; and (ii) Constructed wetland systems for industry 2. *Note that industry 2 has limited land for wastewater treatment plant.* [20]

Parameter	Unit	*Industry 1*	*Industry 2*
pH		5.1	6.8
DO	mg/L	0.7	0.8
NH_4-N		110	----
NO_3-N		----	80
TN		112	90
Solids		300	60
P		----	12
BOD		2000	110
COD		4500	200

University of Asia pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B.Sc. Engineering (Civil)

Course Title: Transportation Engineering I (Transport and Traffic Design) Course Code: CE 351
Time: 3 Hours Full Marks: 150

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

1. a) A driver detects a child 350 ft ahead of him while driving at 70 mph. If deceleration rate is 10.5 ft/sec^2, can the driver avoid accident? If not determine the driver's PR (perception reaction) time. 12

   b) Spot speeds of 8 vehicles traversing 5 km segment of a highway are given below. Calculate the Time Mean Speed and the Space Mean Speed of the vehicles. 10

Vehicle	Speed (km/hr.)
1	85
2	65
3	86
4	54
5	42
6	55
7	68
8	55

   c) Differentiate between (any **two**): 8
   i) Non-recurrent delay and recurrent delay.
   ii) Angular and parallel parking
   iii) Glare Resistance and Glare Recovery

2. a) Spot speeds (km/hr) of 55 vehicles navigating a section of an major road are as below: 25
   65, 39, 55, 37, 39, 32, 56, 46, 74, 56, 49, 56, 58, 52, 55, 67, 63, 48, 77, 42, 83, 37, 49, 57, 43, 37, 47, 44, 68, 54, 67, 64, 65, 46, 43, 86, 54, 43, 67, 66, 36, 68, 67, 73, 69, 78, 57, 47, 63, 65, 30,46, 52, 65, 72.
   Portray the safe speed, design speed, average speed, and modal speed.
   Consider pace as **10-19, 20-29** and so on students having **student ID: odd**
   or
   Consider pace as **11-20, 21-30** and so on students having **student ID: even**

   b) Outline the factors that affect the choice of a particular type of mode. 5

3. a) Briefly explain the constraints of water and air transportation sector in Bangladesh. 10

   b) A horizontal curve with a radius of 900 ft is designed for a two-lane highway having a design speed of 70 mph. If the section of highway is having a 5% upgrade and coefficient of friction is 0.348, determine the least possible distance of any object can be placed from the centerline of the inside lane of the curve. Assume PR time to be 2.5 sec. 14

   c) Categorize some speed and volume control devices of traffic calming. 6

4. a) A positive 7% grade vertical curve is followed by a negative 5% grade at a section of a two-lane highway. Estimate the required length of vertical curve needed to satisfy the design stopping sight distance. Assume height of driver's eye to be 3.5ft, object height to be 1.5 ft. and stopping sight distance to be 750 ft. 12

   b) An accident assessor guesses that a truck crashed with a bridge abutment at a speed of 25mi/hr. ascertained by her evaluation of damage. After inspection to the accident location she detected skid marks of 80 ft on the concrete pavement (f=0.355) and 70 ft on the gravel shoulder (f=0.45). There is +3% grade. Compute the speed of the vehicle at the commencement of skid marks. 18

5. a) Outline the objectives of street lighting. Combine the installation requirements of street lighting? 10

   b) An urban local road with 35 ft pavement width having a reflectance of 12% carries a maximum of 1150 vph at night-time. Design the lighting system considering Sodium source with mounting height of 35 ft and a maintenance factor of 0.88. Draw the lighting layout. 15

   c) Explain some crossing characteristics of pedestrians in Dhaka city. 5

Necessary equations:

$$S < L: \quad L = \frac{AS^2}{100(\sqrt{2h_1} + \sqrt{2h_2})^2}$$

$$S > L: \quad L = 2S - \frac{200(\sqrt{h_1} + \sqrt{h_2})^2}{A}$$

$$S < L: \quad L = \frac{AS^2}{200[2.0 + S(\tan 1^\circ)]}$$

$$S > L: \quad L = 2S - \frac{200[2.0 + S(\tan 1^\circ)]}{A}$$

Table for Question 5 b)

TABLE 1 RECOMMENDED AVERAGE ILLUMINATION (LUMENS/FT^2)

Pedestrian traffic[1]	Vehicular traffic[2] (vph)			
	Very light (<150 vph)	Light (150 – 500 vph)	Medium (500 – 1,200 vph)	Heavy (>1,200 vph)
Heavy	-	0.8	1.0	1.2
Medium	-	0.6	0.8	1.0
Light	0.2	0.4	0.6	0.8

Notes: (1) Heavy: As on main business street
Medium: As on secondary business streets
Light: As on local streets
(2) Night hour flow in both directions

TABLE 2 ADJUSTMENT FACTORS FOR RECOMMENDED AVERAGE ILLUMINATION VALUES

Surface Reflectance	Adjustment Factors
3 % or less	1.5
10%	1.0
20%or more	0.75

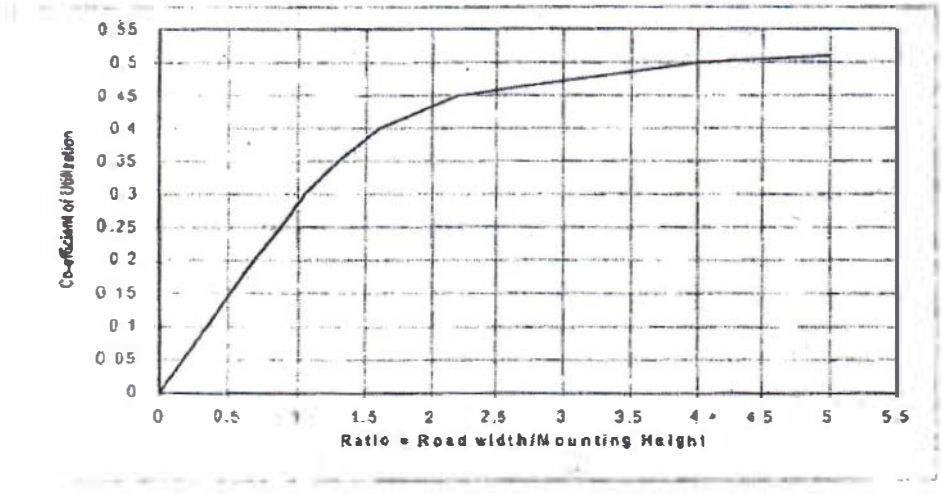
TABLE 3 LIGHTING SOURCE CHARACTERISTICS

Source Types	Expected Life (hrs)	Lighting Efficiency (Lumens/Watt)	Wattage (Watt)
Tungsten	1000	8 – 14	Up to 1000
Fluorescent	6000	50 – 75	Up to 250
Sodium	6000	100 – 120	Up to 160
Mercury	7500	20 – 60	Up to400

TABLE4 RECOMMENDED ARRANGEMENT OF STREET LIGHTING

Type of Arrangement	Pavement Width
One side	Width <= 30ft
Both sides – Staggered	30ft > Width <= 60ft
Both sides – Opposite	Width > 60ft

FIGURE 1 CO-EFFICIENT OF UTILIZATION CURVES (FOR LIGHT DISTRIBUTION TYPE III)



Note: Due to poor maintenance, the actual co-efficient of utilization is reduced by a factor usually 0.8 (i.e. taken as 80%).

University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2018
Program: B.Sc. Engineering (Civil)

Coarse Title: Engineering Hydrology | Course Code: CE 363
Time: 3:00 hours | Full marks: 100

Section-A is **compulsory** and **answer** any **three** from **Section-B (25+3*25=100).**
Assume any reasonable value, if not given.

[SECTION-A]

1. A catchment **(shown in Figure-1, page: 5)** having 50 km^2 of surface area. In this catchment, average monthly rainfall intensity, evaporation, evapotranspiration and other losses are shown below:

Month	Rainfall intensity (cm/h)	Evaporation (cm/h)	Evapotranspiration (cm/h)	Other Losses (cm/h)
January	0.77	0.05	0.015	0.25
February	1.93	0.08	0.018	1.2
March	4.12	0.15	0.021	2.4
April	15.8	0.77	0.032	7.6
May	27.03	0.90	0.044	10.8
June	48.28	1.1	0.051	16.5
July	51.21	1.4	0.060	19.8
August	43.26	0.95	0.047	14.2
September	30.06	0.99	0.050	9.1
October	16.5	0.81	0.037	4.0
November	3.21	0.09	0.020	0.8
December	0.68	0.06	0.017	0.5

a) Draw the direct runoff hydrograph at the gauging station. 10

b) Assuming base flow 5 m^3/s at the gauging station, route the flood hydrograph observed in **B**, predict the flood hydrograph at the 20 km downstream from the gauging station.
[Given values: C_0= 0.048, C_1=0.429, and C_2=0.523] 15

[SECTION-B]

2(a) A catchment that **(shown in Figure-1, page: 5)** has nine rain gauge stations. In a particular year, the annual rainfalls are recorded by the gauges as follows:

Station	A	B	C	D	E	F	G	H	I
Rainfall (mm)	78.6	102.5	108.3	135.7	145	165.1	190.6	175	89.5

For a 10% error in the estimation of the main rainfall, calculate the optimum number of stations in the catchment. 5

2(b) considering the catchment **(shown in Figure-1, page: 5)**, find average rainfall using *Isohyetal method.* 15

2(c) A reservoir with a surface area of 220 hectares had the following average values of parameters during the month of January: 5

Water temperature= 25°C;

Relative humidity= 45%;

Wind velocity at 2.0 m above ground= 18 km/h.

Estimate the average daily evaporation from the reservoir and volume of water evaporated from the reservoir during that month.

3(a) Explain the effect of catchment shape on hydrograph. 5

3(b) Rainfall of magnitude 4.2 cm and 2.5 cm occurring on two consecutive 4-h duration on a 50 km^2 catchment area. On the outlet of this catchment, is obtained following hydrograph. 10

Time (h)	-6	0	6	12	18	24	30	36	42	48	54	60
Observed flow (m^3/s)	6	5	14	28	20	15	12	9	7	5.5	5.5	5.25

Estimate the excess rainfall and ϕ index.

3(c) Ordinates of 6-h unit hydrograph is given below: 10

Time (h)	0	6	12	18	24	30	36	42	48	54
Ordinates of 6-h UH	0	25	90	130	165	150	115	55	25	0

Derive the 12-h unit hydrograph for the catch ment.

4(a) How to estimate the magnitude of a flood peak using *Rational method* and *Dickens formula*? 5

4(b) The following inflow and outflow hydrographs were observed in a river reach. Estimate the values of K and x applicable to this reach for use in the Muskingum equation. 15

Time (h)	0	6	12	18	24	30	36	42	48	54	60	66
Inflow (m^3/s)	5	20	25	50	54	35	28	21	16	9	5	5
Outflow (m^3/s)	5	8	15	30	35	40	30	25	18	12	9	7

4(c) Flood-frequency computations for Meghna river at Bhairab Bridge by using Gumbel's method yielded the following results: 5

Return period, T (years)	Peak flood (m^3/s)
50	75,450
100	82,750

Estimate the flood magnitude in this river with a return period of 80 years.

5(a) Data covering a period of 92 years for Padma river at Mawa Ghat yielded the mean and standard derivation of the annual flood series as 6437m^3/s and 2951m^3/s respectively. Using Gumbel's method, estimate the flood discharge with a return period of 500 years. What are the (a) 80% and (b) 99% confidence limits for this estimate? [Given values: Y_n=0.5589 and S_n=1.2020] 10

5(b) Explain the principle drawbacks of evaporation pan. 5

5(c) The data pertaining to a stream-gauging operation at a gauging site are given below: 10

Distance from left water edge (m)	Depth (m)	Revolutions of a current meter kept at 0.6m depth	Duration of observation (s)
0	0	0	0
1.0	1.1	39	100
4.0	2.0	58	100
5.0	2.5	112	150
7.0	2.0	90	100
8.0	1.7	45	100
11.0	1.0	30	100
12.0	0	0	0

Calculate the discharge in the stream. [Given values: a = 0.51 and b = 0.003]

Important equations and tables

$$Q_2 = C_0 I_2 + C_1 I_1 + C_2 Q_1$$

$$S = K (x I + (1 - x) Q)$$

$$x_T = \bar{x} + K \sigma_{n-1}$$

$$K = \frac{y_T - \bar{y}_n}{S_n}$$

$$y_T = -\left[\ln . \ln \frac{T}{T-1}\right]$$

$$x_{1/2} = x_T \pm f(c)\, S_e$$

$$S_e = \text{probable error} = b \frac{\sigma_{n-1}}{\sqrt{N}}$$

$$b = \sqrt{1 + 1.3\, K + 1.1\, K^2}$$

$$v = 0.51\, N_s + 0.03 \text{ m/s}$$

where $f(c)$ = function of the confidence probability c determined by using the table of normal variates as

c in per cent	50	68	80	90	95	99
$f(c)$	0.674	1.00	1.282	1.645	1.96	2.58

Answer script for question- 1 and 2(b).

1 square = 2 km^2

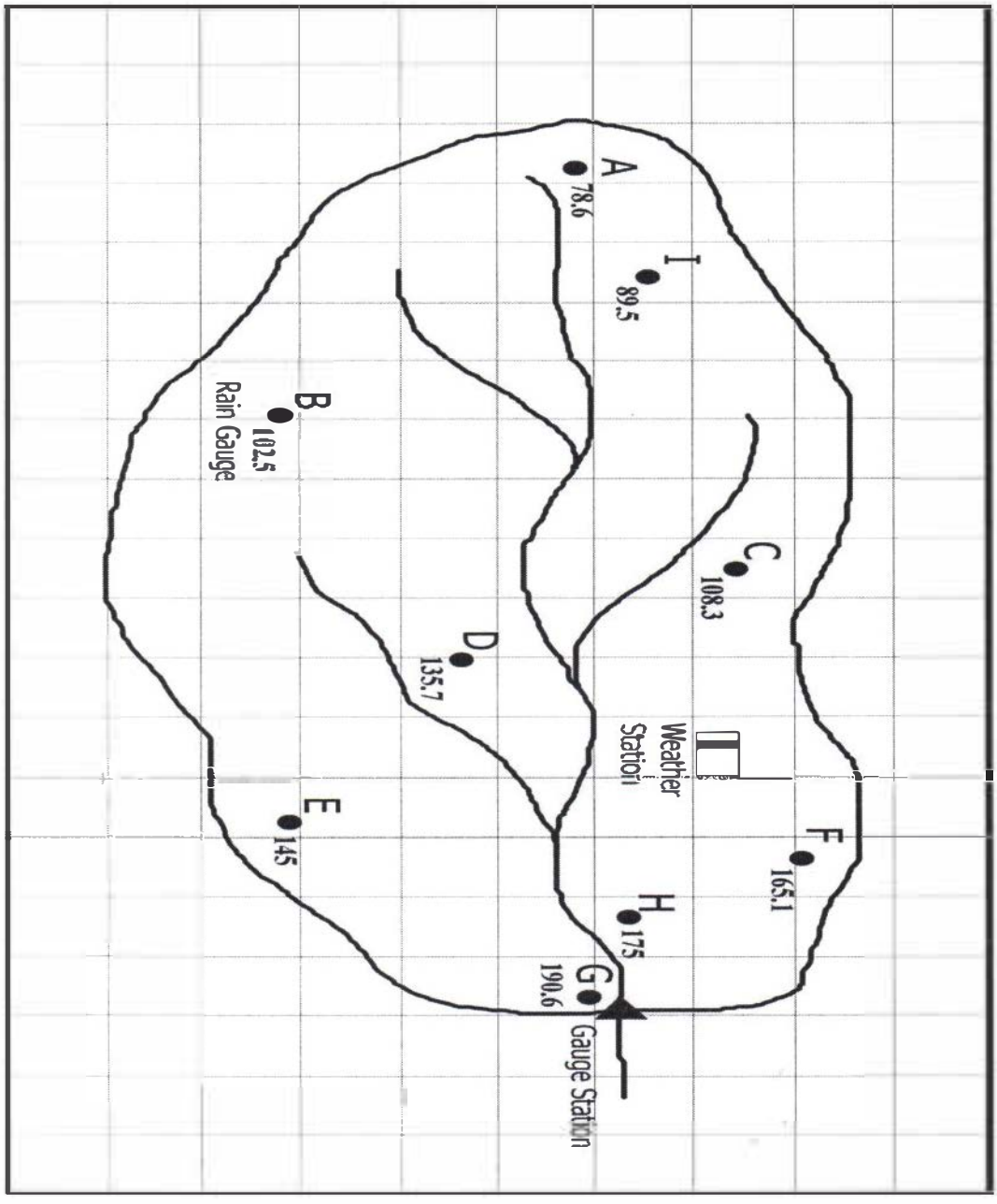


Figure-1

*** Please attach this page if you have answer question-1 and 2(b).**