

MSE

**University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2019
Program: MCE**

Course Title: Transportation Planning
Time: 3 Hours

Course Code: CE 6510
Full Marks: 150

There are **six** questions. Answer any **five** of them.

1. a) Briefly discuss the System Approach of Transport Planning. 15
 b) There are four alternative plan proposals for four regions: Plan A, Plan B, Plan C and D with different road length, populations and productivity. The details are given in the following table: 15

Plan	Road length (Km)	No of towns and villages served with population range				Productivity (1000 tones)
		1001-3500	3501-7000	7001-12500	>12500	
A	400	250	90	35	5	220
B	450	300	95	55	7	300
C	550	360	120	60	11	315
D	650	370	124	80	13	355

Work out the utility per unit length for each of the road systems and indicate which of the plans yield the maximum utility based on saturation system.

Assume utility units as given below:

Population:	1001-3500	Utility unit = 0.25
	3501-7000	Utility unit = 0.50
	7001-12500	Utility unit = 1.00
	> 12500	Utility unit = 2.50

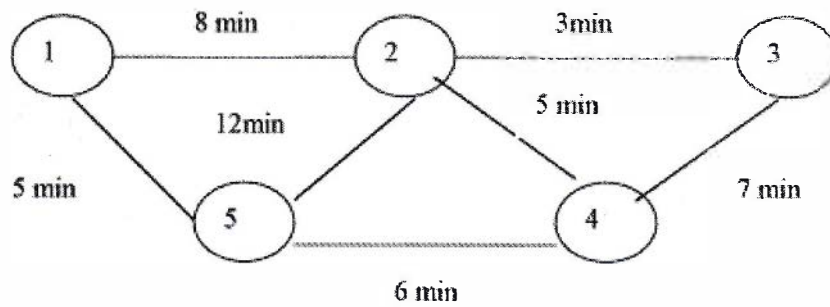
Productivity unit 1.00 for each 1000 tons products.

2. a) The number of convenient stores in 6 zones of a city in relation to the population in 1000s was as follows as discerned by a transport planner: 16

Convenient stores	8	7	6	3	10	12
Population	15	12	10	9	17	18

- b) Set up a linear equation regarding convenience stores and population. Determine R^2 . 7
 c) Discuss the Urban Transport Challenges faced by Dhaka city. 7
 Enumerate the ways public transport can become more operational in the context of Dhaka city.

3. a) Briefly discuss the difficulties if walking and bicycling in Dhaka city. 12
 b) Assign the vehicle trips shown in the following O-D trip table to the network, using the all-or-nothing assignment technique. To summarize your results, list all of the links in the network and their corresponding traffic volume after loading. 18



Origin-Destination Trip Table:

From/to	Trips between Zones				
	1	2	3	4	5
1	-	100	100	200	150
2	400	-	200	100	500
3	200	100	-	100	150
4	250	150	300	-	400
5	200	100	50	350	-

- 4.a) What is meant by Transportation System Management (TSM)? What are the objectives of Transportation Demand Management (TDM)? 10
 b) Outline various Transport Demand Management (TDM) strategies practiced in city streets. Describe any three of the TDM schemes. 20
5. a) Elucidate the advantage and disadvantages of grid pattern of street network. 12
 b) A calibration equation resulted the following utility function: 18

$$u_k = a_k - 0.035 X_1 - 0.057 X_2 - 0.063 X_3 - 0.0071 X_4$$

where

- a_k – constant for specific mode
- X_1 – approach time (min)
- X_2 – in vehicle travel time (min)
- X_3 – waiting time (min)
- X_4 – travel cost (tk)

Calculate the share of private vehicle, bus and paratransit out of 1000 trips having the attributes shown in following table by applying **Logit Model** :

	a_k	X_1	X_2	X_3	X_4
Private vehicle	-0.0037	3	10	0	100
Bus	-0.055	5	7	18	15
Paratransit	-0.032	10	12	14	25

6. a) Name the factors that affect the trip generation of an area.

2

b) Trip productions and attractions, travel time between zones for a 3 zone study area are given as follows:

28

Trip production-attraction

Zone	1	2	3	Total
Trip Production	240	350	290	880
Trip Attraction	380	260	240	880

Travel time vs Friction factor

Travel time between zones (min)

Zone	1	2	3
1	2	3	5
2	4	6	8
3	3	7	5

Time (min)	F value
1	79
2	48
3	46
4	37
5	34
6	27
7	19
8	12

Determine the number of trips between each zone using **Gravity Model**. Assume Socio-economic factor 1.

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2019
Program: MCE/M.Eng

Course Title: Analysis and Design of Tall Buildings
 Time: 3 Hours

Course Code: CE 6111
 Full Marks: 100

[Use f'_c is 40 MPa, f_y is 420 MPa for all design]

QUESTION 1 [20 MARKS]

- a. Conceptual model of skyscrapers is the most important element of structural system. There is several design requirements need to be considered to develop the structural model. State those design considerations with proper explanation to build up the structural system of tall building. [10 Marks]
- b. Review the structural system of Burj Khalifa. Justify the structural system of Burj Khalifa through critical analysis in terms of design requirements of tall building. [10 Marks]

QUESTION 2 [20 MARKS]

The floor layout plan of Burj Khalifa is shown in **Figure 1**. The spacing of the wing walls is about 9 m. The slabs supported by wing walls could be designed as one way joist slab, design the interior **joist slab (slab and rib)** of panel “A” (**Figure 1**) for bending moment. Assume required data to design the slab and rib, the weight of random wall could be considered as 4 kN/m² and live load is 2.4 kN/m². As per ACI 318, the minimum thicknesses of end span and interior span of one way slabs are $l_n/24$ and $l_n/28$ respectively to control deflection. [20 Marks]

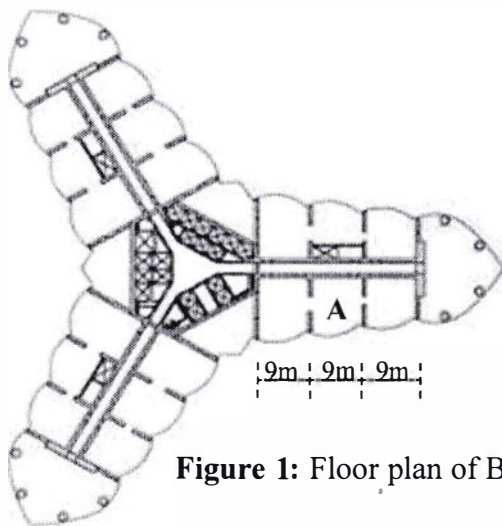


Figure 1: Floor plan of Burj Khalifa

Moments of interior panel for one way slab and beam:

$$\text{Positive moment: } \frac{wl^2}{16}$$

$$\text{Negative moment: } \frac{wl^2}{11}$$

QUESTION 3 [20 MARKS]

- a. An architectural plan of a 30 storeyed office building (2.4 kN/m^2) will be finalized based on the frame wall structural system as shown in **Figure 2**. The spacing of column / wall grid line is 8 m c/c. All columns and walls are connected by 200 mm x 600 mm floor beams. The structure is critical for wind load, the average wind pressure at Dhaka city on wall of the structure could be assumed as 3 kN/m^2 . The thickness of slab could be assumed as 200 mm and random wall load is 2 kN/m^2 . Analyze the frame of **grid D** using portal method due to wind load to obtain maximum bending moment and shear force of shear wall **W1** and column **C1** as shown in **Figure 2**. Also apply approximate method to obtain axial load (at ground floor) due to gravity load of shear wall **W1** and column **C1** as shown in **Figure 2**. The floor height could be assumed as 3.3 m. Assume required data to analyze. [10 marks]

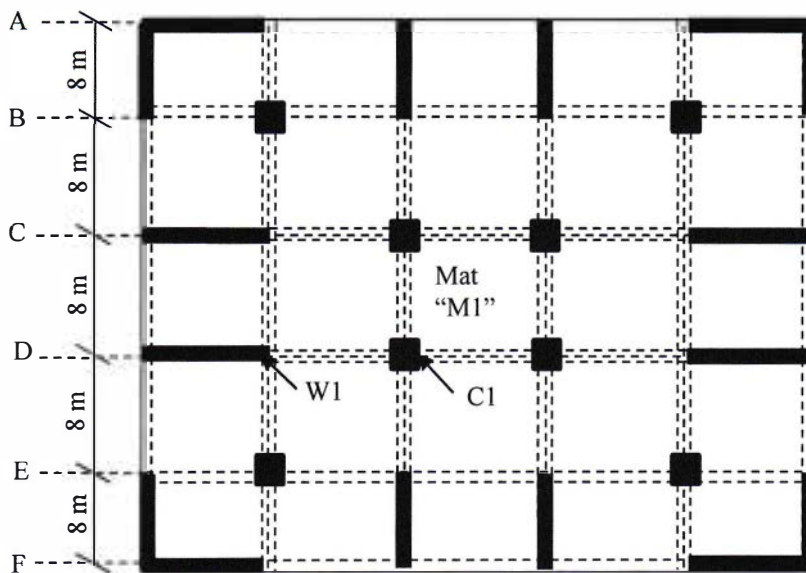


Figure 2: Column and wall layout plan

- b. Analyse the shear wall **W1** and column **C1** of the structure of **Question 3(a)** to obtain extra bending moments at ground floor due to P-delta effect. The floor and total heights of the structure are 3.3 m and 99 m respectively. Consider maximum allowable sway to calculate deflection of column and wall. Assume that the sway is uniformly distributed over the floor. [10 marks]

QUESTION 4 [20 MARKS]

- a. Design the shear wall **W1** for axial compression, uniaxial bending moment and shear force at ground floor level considering P-delta effect). The results of analysis obtained in **Question 3(a), (b)** could be used to design the wall. [10 marks]
- b. Design the column **C1** for axial compression and uniaxial bending moment (obtained in **Question 3-a)** along with extra moment due to P-delta effect (obtained in **Question 3-b)** at ground floor. Use design chart as shown in **Figure 3** to design the column. The concrete of column could be used as high strength concrete. [10 marks]

QUESTION 5 [20 MARKS]

- a. The column C1 as shown in Figure 2 is supported by pile foundation. The capacity of 800 mm diameter bore pile is 1600 kN. Design the pile cap. The size of column could be assumed as 800 mm x 800 mm. Assume required data to design. [10 marks]
- b. If the foundation of the structure is constructed with mat with pile, design the column strip of mat M1 (8 m x 8 m) as shown in Figure 2. Assume that the loads of piles would be uniformly distributed on mat. The size of column could be assumed as 800 mm x 800 mm. Assume required data to design. [10 marks]

