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B.Sc. Engg. (CEE)/ 8th Sem. 20 May, 2024 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COPERATION (OIC)
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Final Examination **Summer Semester: 2022-2023**
Course No.: CEE 4853 **Full Marks: 150**
Course Title: Public Transportation System **Time: 3.0 hours**

There are **5 (Five)** Questions. Answer **All** questions. Programmable calculators are not allowed. Do not write on this questions paper. The symbols have their usual meaning. Assume values as necessary.

1. Imagine you are responsible to run bus service which is currently operating only on a single route having terminals at A and B. Your service starts from both end at 5:00 AM and runs till 1:00 PM. The depot is located near one of the terminals and it takes the bus 15 min. to travel from the depot to the nearest terminal. Other relevant information will be as follows: (30) CO2 PO2

	AM Peak Period 9:00 – 10:30	Base Period Other times
Headways	15 min.	25 min
Scheduled trip time (A to B; B to A)	40 min; 35 min	25 min; 15 min
Min. layover time	2 min	4 min

Plan the vehicle blocks along with timetable and time-space network representation.

2. Imagine that you are in year 2035 and Dhaka city has an extensive BRT network. Construct these cost models: traditional model, variable cost model and peak and off-peak period models. The service will run for 7 days a week considering Fridays and Saturdays as the weekends. (30) CO2 PO2

The total cost assigned for this service is 150 million USD. Following data are given to complete the calculation:

Basis	*F/V*	*Cost Assigned ($M)*	*Operating Stat.**
Rev. Veh. Hr.	V	85	2 million
	F	3.7	
Rev. Veh. Km.	V	45	20 million
	F	2.5	
Peak Veh.	F	28.5	800
Total			

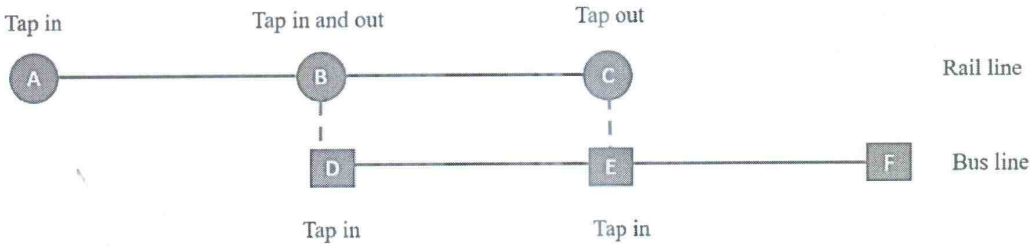
* Annual

Bus operating by day of week and corresponding hours per day:

	Weekday			Friday	Saturday
	Peak	Base	Evening		
#Buses Operating	800	450	200	250	500
Hours/day	5	6	4	14	12

3. As a public transport planner you are given the responsibility to assess four services serving the same route: express bus service, premium bus service, standard bus service, and light rail transit, using AHP. You will be evaluating the services based on these criteria: travel time, comfort and reliability. Generate hypothetical data, show all calculation steps and rank the services from the best to the worst. Then, introduce their cost of travel into the model and suggest how your selection may get impacted by cost. (30) CO2 PO2

4(a) A rail and a bus route are connected as follows: (20) CO2 PO2



The control data are as follows: A (in) = 210, B (in) = 90, B (out) = 140, C (out) = 60, D (in) = 240, and E (in) = 160. Assume the itinerary data and generate the corresponding OD matrix. Scale the journey matrix. Showing calculation of two iterations will be sufficient.

(b) The table below provides the boarding-alighting matrix for initial iteration and the total boarding and alighting at each station. Generate the OD matrix from the given values. (10) CO2 PO2

Route #ABC		Destination				
		A	B	C	D	Target (on)
Origin	A		1	2	3	550
	B			2	4	650
	C				5	400
	D					
	Target (off)		310	440	?	?

5. The catchment area of a public transportation hub in a CBD is illustrated below. The CBD has a population of 50,000 with a rate of decrease of population density with distance from CBD = 90. The population attracted by the hub reduces at a rate which is square root to the rate of decrease of population density. Angle served by the corridor is 45^0, $L_1 = 6$ km and $L_2 = 4$ km. The number of one-way trips per person per day, share of trips inbound to CBD, transit market share for CBD-bound trips and share of CBD-bound transit trips in peak hour are respectively 2.0, 0.15, 0.4 and 0.2. Design the transit line using different modes of public transport. The design should include capacity, cost of such a system as well as strategies to implement such a system (short, mid and long term). (30) CO2 PO2