B.Sc. Engg. (CEE)/ 8th Sem.   05 March, 2024 (Morning)

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

Mid Semester Examination	Summer Semester: 2022-2023
Course No.: CEE 4853	Full Marks: 75
Course Title: Public Transportation System	Time: 1.5 hours

There are **3 (Three)** 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(a)	Classify various modes of the public transport system based on ownership pattern and OD flow concentration for Dhaka city and represent it in a tree format.	(5) CO1 PO6
(b)	Define: Right of Way in Public Transport, Fleet Size, Fleet utilization factor, Frequency of service, Transit capacity	(10) CO1 PO6
2(a)	You are required to design a survey to calculate the average travel time of a route. What will be your sample size if you use a confidence interval of 95% with coefficient of variation varying from 0.1 to 1.0 with a step of 0.1 (i.e., 0.1, 0.2, 0.3,…, 1.0) and tolerance varying from 5% to 50% with a step of 5% (i.e., 5%, 10%, 15%, ….., 50%)? Generate the table and comment on your findings.	(10) CO2 PO1
(b)	How will the tolerance corresponding to ±5% of AET vary for expected proportion value varying for these percentages: 50%, 60%, 70%, 80%, 90%, 95% and 99%? Show the calculations.	(7) CO2 PO1
(c)	What will be the sample size if the relative tolerance is ±4%, confidence level is 90% and coefficient of variation is 0.1? Show calculation.	(3) CO2 PO1
3(a)	Mathematically explain the relationships among travel time, travel cost and number of transfers from the relationships below: $V_{qC} = \beta_0 + \beta_1 TT_C + \beta_2 TC_C$ $V_{qT} = \beta_1 TT_T + \beta_2 TC_C + \beta_3 NT_T$ Where C = car, T = Transit, TT = In-vehicle travel time, TC = Travel Cost, NT = no. of transfers and q = person q. [Hint: *How will change in one variable impact the others?*]	(6) CO2 PO1
(b)	The equation in 3(a) only considers specific variables in the utility function. How can you include individual's income and gender in the utility function (use β_5 and β_4 as coefficients for these new variables)? What can the signs of these coefficients tell us regarding income and gender-based natural selection?	(6) CO2 PO1
(c)	From your analysis, you have identified that mode choice depends on individual's income. How can you incorporate individual's income into the equations in 3(a)? Explain mathematically.	(6) CO2 PO1

(d) Write down the null and alternative hypothesis for the following utility functions for each of the coefficients. Also, what does the value of β_6 represent from mode choice perspective? (12) CO2 PO1

$V_{dc} = \beta_0 + \beta_1 TT_C + \beta_2 TC_C + \beta_3 Male_q + \beta_4 LI_q + \beta_5 MI_q$

$V_{cp} = \beta_1 TT_C + \beta_2 TC_C$

Where, LI = low income, MI = Middle Income

(e) The utility function for a person 'q' to choose among three modes – drive alone, car pool and bus, is given by: (10) CO2 PO1

$V_{qm} = -1.5\ TT_m - 6\ (Cost_m / Income_m)$

Where TT = travel time, Cost = cost of mode, and Income = income of traveler in 1000s of $

If the current travel time and cost for different modes are like: Drive alone (0.5, 3), Car pool (0.8, 1.5) and Transit (1.5, 0.5) then what mode will a person choose with income of $ 15,000 and $ 20,000? What will happen if we improve the service of transit to reduce the travel time to 1.0?