Exam 1

Open Book: 85 points (85%)

1. Given: Cross-classification data for the Jeffersonville Transportation Study Area

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Income ($) | % of Households | | | Autos per Household | | | | Trip Rate per Auto | | | |
|  | High | Med | Low | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 3+ |
| 10000 | 0 | 30 | 70 | 48 | 48 | 4 | 0 | 2 | 6 | 11.5 | 17 |
| 20000 | 0 | 50 | 50 | 4 | 72 | 24 | 0 | 2.5 | 7.5 | 12.5 | 17.5 |
| 30000 | 10 | 70 | 20 | 2 | 53 | 40 | 5 | 4 | 9 | 14 | 19 |
| 40000 | 20 | 75 | 5 | 1 | 32 | 52 | 15 | 5.5 | 10.5 | 15.5 | 20.5 |
| 50000 | 50 | 50 | 0 | 0 | 19 | 56 | 25 | 7.5 | 12 | 17 | 22 |
| 60000 | 70 | 30 | 0 | 0 | 10 | 60 | 30 | 8 | 13 | 18 | 23 |

Determine the number of trips produced for a traffic zone containing 500 houses with an average household income of $35,000. (Use high = $55,000; medium = $25,000; low = $15,000.) **(35 points)**

1. Given: Small town with three transportation analysis zones, and origin-destination survey results. Provide a trip distribution calculation using the gravity model for one iteration; assume Kij = 1. The following table shows the number of productions and attractions in each zone: **(35 points)**

|  |  |  |  |
| --- | --- | --- | --- |
| Zone | 1 | 2 | 3 |
| Productions | 250 | 450 | 300 |
| Attractions | 395 | 180 | 425 |

The survey’s results for the zones travel time in minutes were as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Zone | 1 | 2 | 3 |
| 1 | 6 | 4 | 2 |
| 2 | 2 | 8 | 3 |
| 3 | 1 | 3 | 5 |

The following table shows travel time vs friction factor:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Friction factor | 82 | 52 | 50 | 41 | 39 | 26 | 20 | 13 |

1. A mode choice logit model is to be developed based on the following information. A survey of travelers in an area with bus service found the following data:

|  |  |  |
| --- | --- | --- |
| **Model parameter** | **Auto** | **Bus** |
| X1, waiting time (min.) | 0 | 10 |
| X2, travel time (min.) | 20 | 35 |
| X3, parking time (min.) | 5 | 0 |
| X4, out-of-pocket cost (cents) | 225 | 100 |
| Ak, calibration constant | -0.33 | -0.27 |

The following utility function was calibrated based on an observed mode split of 84.9% private auto use and 15.1% bus use.

Utility function: Uk = Ak – 0.10 X1 – 0.13 X2 – 0.12 X3 – 0.0045 X4

After implementing service improvements to the buses, the mode split changed to 81.6% private auto use and 18.4% bus use. Determine a value for the calibration constant for the bus mode that reflects this shift in mode split. **(15 points)**