

(3 Hours)

[Total Marks : 80]

N.B:

1. Question No **ONE** is **Compulsory**.
2. Attempt any **Three** from remaining five questions
3. Assume suitable data wherever required.
4. Figures to the right indicate full marks.

1. Attempt any **four** of the following [20]
 - a) Explain the Principle of Transportation Economics [05]
 - b) How Parking systems are classified [05]
 - c) How trips are classified and explain the classification of trip ends with neat sketch [05]
 - d) What are the four stages involved in the traditional four-step travel demand modeling process? [05]
 - e) Find IRR for a project having investment 1 lakh and cash inflow 30,000 per year for 5 years. [05]

2. a) Determine whether a project is economically viable using the Benefit-Cost (B/C) Ratio Method. The project requires an initial investment of Rs.90 lakhs, and the annual returns (benefits) over the next 5 years are Rs.15, Rs.20, Rs.21, Rs.28, and Rs.50 lakhs respectively. [10]

Assume an interest (discount) rate of 8% per annum.
Theory: Benefit-Cost Ratio (B/C Ratio)
The Benefit-Cost Ratio is a key parameter in engineering economics and project evaluation
- b) Compare sub-urban trains, BEST busses and taxi for Mumbai region on the following points: Accessibility, Capacity, Reliability, Comfort, Cost and Travel time. [10]

3. a) What do you mean by category Trip Generation? What is Category Analysis in trip generation studies? Explain the steps involved in Category Analysis. [20]

How does Category Analysis differ from Regression Analysis in Trip Generation modeling?

4. a) The following analysis determines the fare collected by different public transport modes using a multinomial logit model. The utility function governing traveler mode choice is given as: [10]

$$u = A_0 - 0.002(TT) - 0.001(TC) + 0.001(C)$$

There are 20,000 trips between two zones.
Mode Attributes (Initial Scenario)

Mode	A_0	Travel Time (TT) min	Travel Cost (TC) Rs.	Comfort (C)
Car	0	45	50	6
Bus	-0.001	65	35	2
LRT	-0.001	50	40	4

Task 1: Find fare collected by Bus and LRT.
Task 2: If Metro is introduced with $A_0 = -0.001$, $TT = 40$ min, $TC = 45$ Rs, and $C = 5$, find the fare collected by Bus, LRT, and Metro.
- b) Explain calibration of Gravity model. [10]

5. a) Explain the concept of Lowry land use Model with flow chart. [10]
 b) From the following data develop linear regression model and predict the number of [10]
 trips if population grows to 35,000

Population in thousand	26	28	31	33	22	30	20	25
Trips in hundreds	12	11	17	15	12	15	9	13

6. a) A highway corridor is proposed to be converted into a Bus Rapid Transit (BRT) [10]
 system. The following operational details are available:
- Headway: 10 minutes
 - Bus seating capacity: 100 passengers
 - Permissible standing: 50% of seating capacity
 - Operational reliability: 0.90
- Determine the effective vehicle capacity (in buses per hour) and the effective passenger carrying capacity
- b Explain how operational reliability influences effective vehicle and passenger [10]
 capacity in a Bus Rapid Transit (BRT) corridor. Describe three operational measures that can increase effective passenger-carrying capacity without changing vehicle headway.
