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Internal Assessment Test 1 – October 2022

Sub :	Urban Transportation and Planning				Sub Code:	18CV745	Branch:	CV		
Date:	20.10.2022	Duration:	90 min's	Max Marks:	50	Sem/Sec:	VII	OBE		
<u>Answer any five questions.</u> <u>Provide neat sketches wherever necessary</u>								MARKS	CO	RBT

1	What is Urbanisation? What are the causes and effects of Urbanisation?	[10]	CO1	L1
2	What are the problems faced in the Urban transportation in the present scenario?	[10]	CO2	L1
3	What is External Cordon Line. What factors should be given due weightage in selection of external cordon line.	[10]	CO1	L1
4	Compare BRTS and MRTS.	[10]	CO1	L2
5	Explain zoning. Explain the points to keep in mind while dividing area into zones.	[10]	CO1	L2
6	Explain: Trip generation, trip distribution, trip assignment and modal split.	[10]	CO1	L2
7	Draw a flow chart and explain the transportation planning process.	[10]	CO1	L1
8	What are the classifications of transit system. Explain with examples.	[10]	CO1	L2

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UTP IAT-1 Solution 20/10/2022

Q1 Define Urbanisation? What are the causes and effects of Urbanisation?

Urbanization is a process whereby populations move from rural to urban area, enabling cities and towns to grow. It can also be termed as the progressive increase of the number of people living in towns and cities. It is highly influenced by the notion that cities and towns have achieved better economic, political, and social mileages compared to the rural areas.

Majority of people move to cities and towns because they view rural areas as places with hardship and backward/primitive lifestyle. Therefore, as populations move to more developed areas (towns and cities) the immediate outcome is urbanization. This normally contributes to the development of land for use in commercial properties, social and economic support institutions, transportation, and residential buildings. Eventually, these activities raise several urbanization issues.

Causes of Urbanization

1. Industrialization

Industrialization is a trend representing a shift from the old agricultural economics to novel non-agricultural economy, which creates a modernized society. Through industrial revolution, more people have been attracted to move from rural to urban areas on the account of improved employment opportunities.

2. Commercialization

Commerce and trade play a major role in urbanization. The distribution of goods and services and commercial transactions in the modern era has developed modern marketing institutions and exchange methods that have tremendously given rise to the growth of towns and cities.

3. Social benefits and services

There are numerous social benefits attributed to life in the cities and towns. Examples include better educational facilities, better living standards, better sanitation and housing.

4. Employment opportunities

In cities and towns, there are ample job opportunities that continually draw people from the rural areas to seek better livelihood.

5. Modernization and changes in the mode of living

Modernization plays a very important role in the process of urbanization. As urban areas become more technology savvy together with highly sophisticated communication, infrastructure, medical facilities, dressing code, enlightenment, liberalization, and other social amenities availability, people believe they can lead a happy life in cities.

6. Rural urban transformation

The increase in productivity leads to economic growth and higher value-added employment opportunities.

Positive effects:

Efficiency: Cities are extremely efficient. Less effort is needed to supply basic amenities like electricity and water. Research and recycling programs are possible only in cities.

Employment opportunities: Plenty of job opportunities in all sectors- banking, retailing, industries, IT, export companies, educational institutes, medical, Pharmaceutical, research and development.

Transport and communication facilities: easy connectivity to all locations. Good infrastructure and transportation facilities to reach any destination faster.

Educational facilities : schools, colleges, universities are established in cities to develop human resources. Increase in the standard of living : Better health care facilities, advanced communication , high concentration of resources, access to social and cultural activities make city life sophisticated and comfortable.

Improvement in economy: High Tech industries earn big part of their money in dollars thus boosting country's economy

Adverse effects

Problem of over population – this result in accommodation problem resulting in growth of slums.

Disintegration of joint families-Joint family can't be maintained in cities on account of high cost of living: People prefer to live in the nuclear type of families.

High Cost of living: it is very difficult for lower income groups to maintain a decent standard of living.

Increase in Crime rates: Urban areas are known for high rate of crimes. Theft, Dacoity, Murder, Cheating, Pick pocketing, rape etc. are common in urban localities.

Environmental impacts of urbanization

- Problem of Pollution: caused by industries or by excessive movement of vehicles.
- Rise in temperature: Due to construction of high rise buildings and apartments, industries lead to loss of vegetation, thus increasing temperature drastically.
- Water related issues: Ground water depletion due to high water consumption and water pollution due to industry effluents and improper dumping of waste generated from industries.

Q2 Explain the problems in the Urban transportation in the present scenario?

Road congestion:

Road congestion occurs when urban transport networks are no longer capable of accommodating the volume of movements that use them. During peak hours, traffic movement gets disrupted causing hours of delay to the users. Increasing volume of cars, narrow roads, uncontrolled intermixing of motorized and non-motorized vehicles also cause road congestion. Improvement in road condition, installing and maintaining signals at intersections will alleviate the problem.

Parking difficulties: The acute shortage of parking spaces on and off the streets increases the time spent for searching for a parking space and this induces traffic congestion. Even if cities invest in multilevel car parking, in prime areas, the parking rates are not expected to recover the cost. Parking charges are highest in Kolkata, Rs 80 for 8 hours of parking during day time.

Environmental impact-Automobile traffic creates lots of atmospheric pollution and noise.

The severity of air pollution is judged based on Central Pollution Control Board's air quality classification. In 2016, a World Health Organisation (WHO) study (2016) 14 of the 20 world's most polluted cities belonged to India. Kanpur, in Uttar Pradesh, emerged as the city with the highest PM_{2.5} level, standing at 173 micro m/cum (17 times higher than the limit set for safety).

According to US based Health Effects Institute people residing within 500m from roads are exposed to fumes. The danger is very much pronounced when diesel

vehicles are operating. Diesel emissions are known to trigger adverse respiratory health effects.

Difficulty for pedestrians

In developing countries like India, non motorized transport modes like cycling and walking share the roads with motorized fast moving vehicles, causing traffic mix, leading to increasing number of fatalities and road accidents. Pedestrian fatalities constitute a significant share of total fatalities and the magnitude is much higher in cities that lack adequate pedestrian facilities.

In New Delhi, Bengaluru and Kolkata the pedestrian fatality share is greater than 40 %. In Bengaluru three pedestrians are killed on every two days and more than 10000 are hospitalized annually. The percentage of streets with pathway is hardly 30% in most of the Indian cities.

Public transport inadequacy and peak hour crowding

The disparity of vehicle use is one of the transportation problems. Many public transit systems are either over or under used. Many now have to maintain sufficient vehicles, plant and labour merely to provide a peak-hour service, which is a hopelessly uneconomic use of resources.

Often the only way of cutting costs is by reducing off-peak services, but this in turn encourages further car use. Low ridership makes many services financially unsustainable, particularly in suburban areas. In spite of significant subsidies and cross-financing (e.g. tolls) almost every public transit system cannot generate sufficient income to cover its operating and capital costs.

Accidents and safety

Growing traffic in urban areas is linked with a growing number of accidents and fatalities, especially in developing countries. Accidents account for a significant share of recurring delays.

As traffic increases, people feel less safe to use the streets. The diffusion of information technologies leads to paradoxical outcomes. While users have access to reliable location and navigation information, portable devices create distractions linked with a rise of accidents for drivers and pedestrians alike.

Q3 What is External Cordon Line. What factors should be given due weightage in selection of external cordon line.

- The imaginary line representing the boundary of the study area is termed as the external cordon line. The area inside the external cordon line determines the travel pattern to a large extent and as such, it is surveyed great detail.
- The land use pattern and the economic activities are studied intensively and detailed

survey (such as the home-interview) are conducted in this area to determine the travel characteristics. On the other hand, the area outside the cordon line is not studied in such details.

Selection of External Cordon Line

The selection of the external cordon line for urban transportation planning should be done carefully with due to consideration to the following factors:

1. The external cordon line should circumscribe all areas, which are already built up, and those areas, which are considered likely to be developed during the planning period.
2. The external cordon line should contain all areas of systematic daily life of the people oriented towards the city center and should in effect be the commuter shed.
3. The external cordon line should-be continuous and uniform in its courses so that movements cross it only once. The line should intersect roads where it is safe and convenient for carrying out traffic survey.
4. The external cordon line should be compatible with the previous studies of the areas studies planned for the future.

Q4 Compare BRTS and MRTS.

Table 7. Comparison between Metro Rail System and Bus Rapid Transit System

	Metro Rail System	Bus Rapid Transit System
Commercial speed (km/h)	24–55	25–30
Catchment area	Low	High
Average cost/trip (₹)	45–50	10–15
Required minimum trip length	10–15 km	5 km
Space required	2 lanes for elevated corridor	2–4 lanes
Parking	Needs parking facilities for feeder services	Needs parking facilities for feeder services
Air pollution reductions (along its influence area)	Significantly decreases due to shifting of vehicles to MRTS (particularly private vehicles)	Expected to improve slightly if BRTS is able to shift private vehicle to its system
Noise pollution reductions	Noise levels may slightly increase, if background levels are less than the noise generated by metro rail	No significant improvement in ambient noise levels expected

(Table 7 Continued)

	Metro Rail System	Bus Rapid Transit System
Environmental conditions (inside the system)	Noise and vibration levels along with SPM/PM ₁₀ levels are very low	Noise and Vibration levels comparatively higher, SPM/PM ₁₀ levels inside generally higher than ambient levels
Road safety	Reduces accidents in urban arterials and in its influence zone	Less safe for pedestrians and NMT movement
Congestion reduction	Reduces the congestion problem in its influence zone and other city arterials	With increase in frequency congestion increases resulting in decrease in LOS (level of services)
Infrastructure cost	Very high	Apparently low
Cost/km of corridor	₹285 crores/km—Underground (–57 million US\$) ₹115 crores/km—Elevated (–23 million US\$)	Comparatively lower (₹5–7.5 crore/km) (–1–1.5 million US\$)
Passenger carrying capacity (PPHPD)	More (30,000–60,000)	Less (15,000–20,000)
Vulnerability to natural and man-made disasters	High	Less
Corridor alignment	Mostly 'Elevated', 'Underground' along the Congested and CBD areas, Very small portion at surface levels	Mostly At-Grade, in some cases Elevated section
Passenger fare	Generally economical in long distances (>10 km)	Economical in short distance travels (3–5km), Comparable with MRT for distances between 5–10 km
USP of the system	Time saving, safe, punctuality, comfortable, environment friendly	Time Saving for Bus commuters, 'Door to Door Service' 'Economical' (travel distance up to 10 km)
Public perception (Indian experience)	Mostly favourable	Mostly apprehensive (bus commuters—mostly favourable)

Q5 Define zoning. Explain the points to keep in mind while dividing area into zones.

- The defined study area is sub-divided into smaller areas called zones. The purpose of such a sub-division is to facilitate the spatial quantification of land use and economic factors which influence travel pattern. The data collected on individual household basis cannot be conveniently considered and analysed unless they are aggregated into small zones.
- Sub-division into zones further helps in geographically associating the origins and destinations of travel. Zones within the study area are called internal zones and those outside the study area are called external zones. In large study projects, it is more convenient to divide the study area into sectors, which are sub-divided into smaller zones.

- A convenient system of coding of the zones will be useful for the study. One such system is to divide the study area into 9 sectors. Each sector is sub-divided into 10 zones. A sub-zone bearing a number 481 belongs to sector 4 and to zone 8 in that sector and is sub-zone 1 in that zone.
- The intersection from outside world is normally represented through external zones. The external zones are defined by the catchment area of the major transport links feeding to the study area.



The following points are kept in view when dividing the area into zones:

1. Land use is the most important factor in establishing zones for a transportation survey. The traffic generated within the zones can be predicted, quantified and measured accurately; only when origin and destination reflects the land use properly.
2. The zones should have a homogenous land use so as to reflect accurately the associated trip making behavior.
3. Anticipated change in land use should be considered when sub-dividing the study area into zones.
4. It would be advantages, if the subdivision follows closely that adopted by other bodies (e.g. census department) for data collection. This will facilitate correlation of data.
5. The zones should not too large to cause considerable errors in data. At the sometime, they should not be too small either to cause difficulty in handling and analyzing the data. As a general guide, a population of 1000-3000 may be the optimum for a small area, and a population of 5000-10000 may be the optimum for large urban areas. In residential areas, the zones may accommodate roughly 1000 households.

6. The zones should preferably have regular geometric form for easily determining the centroid, which represent the origin and destination of travel.

Zones should be compatible with screen lines and cordon lines.

7. Zone boundaries should preferably be watersheds of trip making.

8. Natural or physical barriers such as canals, rivers, etc. can form convenient zone boundaries.

In addition to the external cordon lines, there may be a number of internal cordon lines arranged as concentric rings to check the accuracy of survey data. Screen lines running through the study area are also established to check the accuracy of data collected from home- interview survey.

Q6 Define: Trip generation, trip distribution, trip assignment and modal split.

Trip generation

Trip generation is the first stage in travel demand modelling. The trip generation aims at predicting the total number of trips generated and attracted to each zone of the study area. This stage answers the questions like how many trips originate at each zone, from the data on household and socioeconomic attributes.

Trip distribution

This is the 2nd stage in travel demand modelling

Trip distribution is a model of the number of trips that occur between each origin zone and each destination zone. It uses the predicted number of trips originating in each origin zone (trip production model) and the predicted number of trips ending in each destination zone (trip attraction model).

Modal split

This is the third stage in travel demand modelling. The modal split model determines the mode of travel chosen by the traveler. Modal split can be considered at any stage between trip generation and trip assignment.

Trip assignment

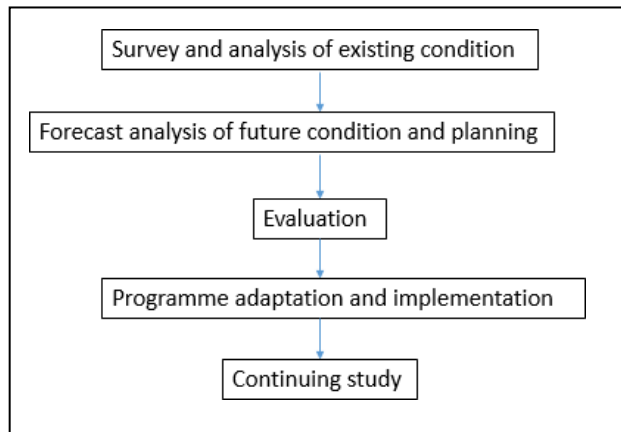
A trip assignment model aims to estimate how traffic flows through a road system and the associated effects of traffic on the system. These effects can be measured by a number of criteria including distance travelled, travel time, delay, fuel consumption and environmental pollution.

Trip assignment models can also be used to investigate the responses of traffic to changes in the system (for example, changes in travel demand, travelers' information, road capacities, signal timings, and road tolls).

Trip assignment is the procedure by which the route chosen by the trip maker is determined.

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Q7 Draw a flow chart and explain the transportation planning process.



Stage 1: survey and analysis of existing condition

Define the area to be surveyed

Divide the survey area into smaller units called zones to study the pattern of movement. Formulate goals

Common goals

- Min disruption of environment
- Min demolition of housing
- Revitalization of public transport
- A high benefit cost ratio
- Operational feasibility

Goals that are set for transport planning

- To improve safety of travel
- To enhance the level of mobility, reduce the dependence on personal vehicles, conserve fuel and protect environment.
- To minimize the loss of human life, injury through transportation related accidents.

- The above data describing the socio economic characteristics, travel pattern, existing land use pattern and the transportation system are analyzed to determine any quantifiable relationship between the measurements. Mathematical models are built to relate the present travel pattern and land use and socio economic characteristics.

Stage 2 Forecast, Analysis of future conditions and plan

- Future economic activity and future land-use are important for forecasting future transportation demand. Economic activity can be predicted by observing the past trends in parameters representing economic activity.
- Population forecast
- Birth, death and migration data- population prediction models. Age distribution, family size and number of households Employment pattern
- Level of car ownership- important parameter that influence future travel and mode of travel

Stage 3 Evaluation

- For a given set of goals and policies, a number of alternative transport plans are feasible. It is important to evaluate the alternatives.
- Cost/benefit techniques are used to evaluate the alternatives.
- May have to revise the plan and go back to initial stages of design to evolve further alternatives.

Stage 4 : Programme adoption and implementation

- The best alternative selected will be implemented based on the availability of financial resources. Organization, handling the project is built up and work is executed.

Stage 5 Continuing study

- Transportation planning is dynamic and complex process because there is always an uncertainty associated with the system. Plan can never be finalized. Plan and policies that are relevant today will not be the same in future. So, There is a need to continuous review and updating of the plan. Periodic survey to be conducted on the trend of travel pattern, journey time etc.

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Q8 Explain the classification of transit systems with examples.

1. Heavy Rail Transit (HRT)

- Trains of high performance, electrically powered rail cars operating in exclusive rights-of-way
- Metro is the most common international term for Heavy Rail Transit.
- Maximum service speeds range from 50 to 70 kmph
- Conventional two rail "railroad" tracks, plus a slightly raised third rail
- Full grade separation ensures safety

2. Automated Guide Way Transit

Guided transit mode with fully automated operation

The Automated Guide way Transit would include

a. Personal Rapid Transit (PRT)

2-6 passengers per vehicle

- Maximum Speed of +/- 30 mph
- Short trips - local circulators/shuttles
- Lighter passenger loads.

b. People Movers

- 30-100 Passengers/Vehicle,
- +/-30 mph maximum speed,
- Short trips - local circulators/ shuttles, medium passenger loads.

c. Advanced Rapid Transit (ART)

- 75-135 P/V, +/-
- 50 mph maximum operating speed,
- 4-6 cars per train,
- medium trips - regional trunk routes,
- heavier passenger loads

3. Monorail

- These are guided transit mode with vehicles riding on or suspended from a single rail, beam, or tube.
- Vehicles may employ steel wheel or rubber tire support. Supported or suspended
- Won't run on a single rail, runs on the surface of a rather large beam, or inside an enclosed box structure.
- Grade separated guide ways to accommodate rubber-tire mono-beams

- Trains are articulated, 4-car units about 42 m long by 2.6 m wide, with about 60 seats. Seat & standing capacity of 215 passengers
- Ultimate capacity of 20,000 PHPD passengers

4. Light Rail Transit

- Commonly referred as “streetcars” or “trolleys.”
- Most systems are powered by overhead electric wires
- Run on either exclusive or shared rights-of-way with or without grade crossings, or occasionally in mixed traffic lanes on city streets.
- Tracks can be laid in any of three generic right-of-way (ROW) categories
- Cars are typically articulated, about 28 m long by 2.65 m wide, with about 75 seats
- Trains vary from 2-4 cars, with a 4-car train capable of carrying about 300 seated passengers, and a total of up to 750 passengers.

5. BRT Buses

- By use of exclusive or reserved rights-of-way (bus ways) that permit higher speeds and avoidance of delays from general traffic flows.
- Include reverse lane operation on limited access roadways, and/or prioritization of at grade bus movements through signalized intersections.
- A standard BRTS bus can carry 5000 pphpd and with an overtaking lane, this number could reach 8000.

5. Commuter Rail / Regional Rail

- Commuter Rail is a mode of transportation that is based on operating passenger trains on the tracks of the general railroad system, which is shared with freight trains.
- The Commuter rail can carry about 75,000 passengers per hour per direction.