

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2083 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define model and model development process in brief. Describe the linkage between transport planning and decision making. [4+4]
2. Write differences between regional planning and urban planning. Briefly describe household interview survey and roadside interview survey. [8]
3. A zone with 600 HH, among which 200 HH have vehicle and rest have no vehicle. Take 6 trips per day HH having their own vehicle and 2.5 trips per HH having no vehicle. Calculate the total present-day trips. Determine the future trip assuming all the HH will have vehicle and that the population and income level remains constant. Also determine the future trip assuming constant trip rate. [8]
4. A calibrated cost function for travel in a medium-sized city by car, bus, and motorcycle is $C = A + 0.003X + 0.06Y$ [8]
Where X= travel cost (Rs) and Y = Travel time (minute)

Mode	A	X	Y
Car	0.3	500	25
Bus	0.35	75	35
Motorcycle	0.2	250	20

Calculate the modal split for the given values. If a parking fee of Rs 50 and Rs 20 is imposed on car and a motorcycle, and at the same time, the government subsidy Rs 20 for a bus, and comment on the effectiveness of the government subsidy.

5. What are the characteristics of evaluation? Also describe the characteristics of benefits and costs. [4+4]
6. Explain the factors affecting airport site selection. Describe the airport classification system based on ICAO. [6+2]
7. Basic Length of runway for landing and takeoff are 2000 m and 1500 m respectively. The airport site has an elevation of 850 m. Its reference temperature is 20 degrees Celsius. If the runway centerline has max. and min. RL of 853 m and 847m, respectively. Find the corrected runway length. [8]
8. Explain the types of railway gradient. What are the factors that affect the selection of gradient? [6+2]
9. Calculate the superelevation, maximum permissible speed and transition length for a 2° BG curve on a high-speed route with maximum sanctioned speed of 110 kmph. The speed for calculating the equilibrium superelevation is 80 kmph, and the booked speed for goods train is 50 kmph. The permissible equilibrium cant, cant deficiency, and cant excess are 165 mm, 100 mm, and 75 mm respectively. [8]
10. Gravity goods ropeways are indispensable for the economic development of Nepal, especially for hill terrain," elaborates the statement. Explain the features of a gravity ropeway. [4+4]

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INSTITUTE OF ENGINEERING
Examination Control Division
2082 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define traffic simulation. Explain advantage and disadvantage of traffic simulation. Describe the calibration process in transport modeling. [2+4+2]
2. Define central places and discuss the hierarchical structure for transport planning. Describe the planning for the movement of people and goods. [4+4]
3. Develop the trip production equation for the following data. [8]

Average HH size	2	3	4	5	6	5
Average total trips per day	4	5	7	9	10	8

Find the total number of trips per day with 7 persons in a household. Also, find the R-squared value.

4. A travel market segment consists of 1000 individuals. A multinomial logit mode choice model is calibrated for this market segment, resulting in the following utility function: [8]

$$U = \beta_m - 0.05 C - 0.01 T$$

Where, C = out of pocket cost (Rupees) and T = travel time (minutes)

β_m values are 0, 0.2 and 2.4 for bus, rail and car. For a particular origin-destination pair, the cost of a car trip which takes 12 minutes is Rs.30, rail trip which takes 20 minutes costs Rs.20 and bus takes 40 minutes and costs Rs.12.5. Predict model travel demand. What will be travel demand if parking charge increase by Rs. 10?

5. Explain the evaluation of alternatives and criteria in transportation system analysis. [2+6]
6. What are the aircraft characteristics to be considered by airport planner and designer? [8]
7. The runway length required for landing at sea level in standard atmospheric conditions is 2,200 m. The runway length required for takeoff at a level site at sea level in standard atmospheric conditions is 1,800 m. Aerodrome elevation is 1,060 m. The monthly mean of maximum daily temperature and monthly mean of average daily temperature of the hottest month of the year are 38°C and 27°C respectively. Runway slope is 0.5%. Determine corrected length of runway. [8]
8. Briefly explain the railway station including its functions and types. [8]
9. Calculate the superelevation and maximum permissible speed for the 3-degree curve on a high-speed BG track with the following data: [8]
 - i) Maximum sanctioned speed = 130 kmph
 - ii) Equilibrium speed = 85 kmph
 - iii) Booked speed for goods train = 50 kmph

The permissible equilibrium cant, cant deficiency, and cant excess are 165 mm, 100 mm, and 75 mm respectively.
10. Explain the principles, benefits and limitations of gravity goods ropeway. [8]

Exam.	Regular	
Level	BE	Full Marks 80
Programme	BCE	Pass Marks 32
Year / Part	IV / I	Time 3 hrs.

Subject: - Transportation Planning and Engineering (*Elective I*) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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1. Define model and simulation. Explain their advantage in transportation planning. [8]
2. Discuss the difference between Regional planning and urban planning and why origin and destination study is essential for the transport planning. [4+4]
3. A study represents the following characteristics: [8]

Average HH size	1	2	3	4	5	6
Average total trips per day	4	6	7	9	11	10

4. Derive the trip generation model and Calculate the R^2 value (coefficient of determination). Explain whether it is a suitable model for transportation planning. [8]
A mode choice model for a city includes following modes: Autos (A), Light rail (L) and buses (B) with the utility function (U) as shown in tables.

Function:	Cost (C)	Time (T)
$U(A) = 3.2 - 0.3 \cdot C - 0.03 \cdot T$	5	20
$U(L) = 1 - 0.2 \cdot C - 0.04 \cdot T$	3	25
$U(B) = 0 - 0.1 \cdot C - 0.01 \cdot T$	2.5	45

Where C is cost in dollars and T is time in minute.

- a) Based on estimate that 15,000 workers will head for downtown each morning, how many workers will choose to take a particular mode?
- b) If government subsidizes light rail by 30%, buses by 40%, and at the same time increases automobile cost by 50%, what will be the new modal distribution?
5. Explain briefly the characteristics of benefits and costs. [8]
6. What are the factors that affect runway orientation? Explain the method of determining runway orientation by wind rose diagram II. [3+5]
7. The runway length required for landing and takes off at sea level in standard atmospheric condition are 3000 m and 2500m respectively. The effective runway gradient is 0.5% and the aerodrome elevation of Tribhuvan International Airport of 1339 m, the mean of maximum daily temperature and mean of average daily temperature are 36 degrees and 23 degrees respectively. Determine the corrected length of runway after correction. [8]
8. The ruling gradient on the BG track section has been fixed as 1 in 200. What should be the compensated gradient when a 4-degree horizontal curve is to be provided on this ruling gradient? Explain the components of the railway briefly. [4+4]
9. Calculate the superelevation and maximum permissible speed for the 5-degree curve on a high-speed BG track with the following data: [8]
 - Maximum sanctioned speed = 100 Kmph
 - Equilibrium speed = 75 Kmph
 - Booked speed for goods train = 40 Kmph
10. "Gravity goods ropeways are the indispensable for the economic development of Nepal, especially for hill terrain" elaborate the statement. Sketch the gravity good ropeway and list out its components with their function. [4+4]

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Subject: - Transportation Planning and Engineering (CE72509) (Elective I)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
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- Describe the scope of transportation planning and its significance. [5+3]
- Mention the differences between the planning for movement of people and goods. Describe types of movement to be considered in a planning area. [4+4]
- What are the factors that affects the traveller's mode choice behavior? Explain the difference between utility function and cost function. [4+4]
- A town consists of four residential areas W, X, Y, Z and two industrial areas P and Q. The trips from home to work generated by each residential area in the design year is as per table below.

W	990
X	2500
Y	1875
Z	3100

There are 3500 jobs in the industrial estate P and 4800 in the industrial estate Q. It is known that the attraction between zones is inversely proportional to the square of the journey times between zones. The journey times in minutes from home to work are:

Zones	P	Q
W	20	15
X	15	15
Y	10	10
Z	20	20

- Calculate and tabulate the inter-zonal trips for journeys from home to work. [8]
- What is transportation system analysis? What are the principles for developing a set of alternatives in transportation system analysis? [2+6]
 - Explain wind rose diagram. List out various factors to be considered in selecting the airport site. [4+4]
 - An airport site at sea level with standard atmospheric conditions, the runway-length requires for take-off and landing are 1600 m and 2000 m respectively. The proposed airport is situated at an altitude of 150 m. If the airport reference is temperature 20°C and if the effective runway gradient is 0.45 percent, calculate the length of the runway to be provided. [8]
 - What are the various advantages of a railway over roadway? Describe the components of a railway section with a neat sketch. [4+4]
 - Calculate the super-elevation, maximum permissible speed and transition length for a 3° curve on a high-speed BG section with a maximum sanctioned speed of 100 kmph, equilibrium speed of 80 kmph and booked speed of the goods train as 50 kmph. The permissible equilibrium cant, cant deficiency and cant excess are 165 mm, 100 mm and 75 mm respectively. [8]
 - Explain the basic components and working principle of gravity goods ropeway with neat sketches. [8]

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2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (CE72509) (Elective I)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ All questions carry equal marks.
- ✓ Assume suitable data if necessary.



1. What is simulation? What are the advantages and disadvantages of simulation techniques in transportation planning?
2. What is the different between planning of goods movement and passenger? Describe intermodal approach of transport planning.
3. Define trip and its type. List out various factors affecting trip generation.
4. A self-contained town consists of four residential areas W, X, Y, and two industrial estates P and Q. Generation equations show that, for the design year in question, the trips from home to work generated by each residential area per 24-year day are as follows.

W	990
X	2500
Y	1875

There are 2265 jobs in the industrial estate P and 3100 in the industrial Q. It is known that the attraction between zones is inversely proportional to the square of the journey times between zones. The journey times in minutes from home to work are:

Zones	P	Q
W	20	15
X	15	15
Y	10	10

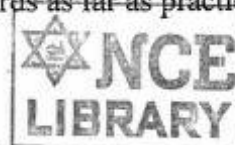
Calculate and tabulate the inter-zonal trips for journeys from home to work.

5. What are the principles for developing a set of alternative in transportation system analysis?
6. Classify the airport on the basis of ICAO and FAA. Define runway and taxiway with its types.
7. The runway length required for landing at sea level in standard atmospheric condition is 2500 m. Runway length required for take-off at level site at sea level in standard atmospheric condition is 2000 m. Aerodrome reference temperature is 24°C and that of standard atmosphere at aerodrome elevation of 150 m is 14.025°C. If the effective gradient is 0.4 percent, determine the runway length to be provided.
8. Discuss the components of railway track with neat sketch. Make a neat sketch of right-hand turnout.
9. Calculate the super-elevation and maximum permissible speed for a 2-degree curve on a high-speed BG track with the maximum sanctioned speed = 120 kmph, equilibrium speed = 85 kmph and booked speed for the goods train = 50 kmph.
10. Describe the suitability of Gravity Goods ropeway in the context of Nepal. Also describe the operating principle of Gravity goods ropeway.

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Level	BE	Full Marks 80
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Subject: - Transportation Planning and Engineering (Elective I)(CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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1. Describe the decision-making process in transportation planning. [8]
2. Enlist the types of transportation survey. Differentiate between regional planning and urban planning. Describe road side interview survey method. [8]
3. Explain four step models for urban transportation planning with example in each step. [8]
4. A simple work-mode-choice model is estimated from data in a small urban area to determine the probabilities of individual travelers selecting various modes. The mode choices include automobile driver-alone (DL), automobile shared-ride (SR) and bus (B), and the utility functions are estimated as:

$$U_{DL} = 2.2 - 0.2 (\text{cost})_{DL} - 0.03 (\text{travel time})_{DL}$$

$$U_{SR} = 0.8 - 0.2 (\text{cost})_{SR} - 0.03 (\text{travel time})_{SR}$$

$$U_B = -0.2(\text{cost})_B - 0.01 (\text{travel time})_B$$

Where cost is in dollars and time is in minutes. Between a residential area and an industrial complex, 4000 workers (generating vehicle based trips) depth for work during the peak hour. For all workers, the cost of driving an automobile is \$6.00 with a travel time of 20 minutes, and the bus fare is \$1.00 with a travel time of 25 minutes. If the shared-ride option always consists of two travelers sharing costs equally, how many workers will take each mode? [8]

5. Mention with examples 'impact trade off in evaluation. Write down the project evaluation criteria. [8]
6. What are the factors affecting the selection of airport sites? Explain the aircraft characteristics that affect the runway length. [8]
7. Determine the length of runway using general correction factor for an airport in Eastern Nepal using the data given. Runway length required for landing at sea level in standard atmospheric conditions 2200 m, runway length required for take-off at a level at sea level in standard atmospheric condition 1800 m, aerodrome elevation 200 m, aerodrome reference temperature 25°C, temperature in the standard atmosphere for 200 m is 14.5°C. The construction plan includes the following data. [8]

End to end of runway, m	Grade (%)
0 - 500	+1.00
500 - 1000	- 0.20
1000 - 1500	+ 0.50
1500 - 2000	+ 1.00
2000 - 2500	- 0.30

8. Describe the functions of ballast and the depth requirement. Explain different types of railway stations. [8]
9. Calculate the super-elevation, maximum permissible speed and transition length for a 2.5° curve on a high-speed BG section with a maximum sanctioned speed of 100 kmph, equilibrium speed of 80 kmph and booked speed of the goods train as 50 kmph. The permissible equilibrium cant, cant deficiency and cant excess are 165 mm, 100 mm and 75 mm respectively. [8]
10. Justify the importance of gravity goods ropeway in the present context of Nepal. Write down its features and limitations. [8]



2079 Baishakh



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2079 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain the scope of transportation planning and draw a flow chart depicting steps of transportation system analysis. [5+3]
2. Describe about multimodal transport planning approach. List various types of transport survey and highlight the importance of public transport survey. [4+2+2]
3. What is trip? Classify the different types of trips. [2+6]
4. A mode choice model was developed from a journey to work data from an urban area. The car and bus modes are available for travelers. The utility functions $U_i = -A_i - 0.4 IT_i - 0.1 OT_i - 0.008 C_i$. Where A = Modal constant, IT = In Vehicle Travel time, OT = Out Vehicle travel Time, C = Travel Cost [8]

Mode	Modal Constant	In Vehicle Travel Time (min)	Out Vehicle Travel Time (min)	Travel Cost (Rs)
Car	0.7	30	5	100
Bus	0.08	50	15	30

Determine the percentage of travel by Car and Bus for the existing condition. Suppose that rising fuel price lead to a cost increase by a Rs 50 for Car and Rs 10 for bus. How will mode shares be affected?

5. Briefly discuss several characteristics of evaluation for effective decision oriented planning process. [8]
6. Explain any two methods of air travel demand forecasting method. What are the factors that affect airport site selection? [4+4]
7. The length of runway under standard conditions is 2000 m. The airport site has an elevation of 400 m. The mean of maximum and mean of average daily temperature of the hottest month are 44.8 and 26.2 degrees respectively. The maximum elevation difference along the proposed profile of runway is 6.0 m. Determine the actual length to be provided. [8]
8. Write the functions of rails and sleeper in railway track. How does negative superelevation affect geometric design of railway tracks? [4+4]
9. A 600 m radius curve is introduced between two tangent portions of a BG line intersecting to form a deviation angle of 70°. The booked speed for good train in the section is 50 kmph and the maximum sanctioned speed is 110 kmph. Calculate the equilibrium cant, maximum permissible speed, length of transition curve and cant gradient. Limits for maximum cant and cant deficiency are 165 mm and 100 mm respectively. [8]
10. Explain the main features of gravity goods ropeway. Describe its limitation. [4+4]

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2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transport Planning and Engineering (Elective I) (CE 72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Windrose diagram will be provided.
- ✓ Assume suitable data if necessary.

1. Explain the four basic questions to be answered during transport planning. Differentiate between short term transport planning and long term transport planning with examples. [4+4]
2. What is multimodal transportation planning? What are the differences between planning of goods and people? [2+6]
3. Describe the use of linear regression models in estimating trip production. What is meant by logit model? Where is it used? [4+2+2]
4. Calculate the future trip distribution based on the average growth factor model using the existing trip matrix shown in table below upto 2 iterations. The set of future trip productions and attraction for zone A, B and C are (170,150), (170,180) and (160,170) respectively. [8]

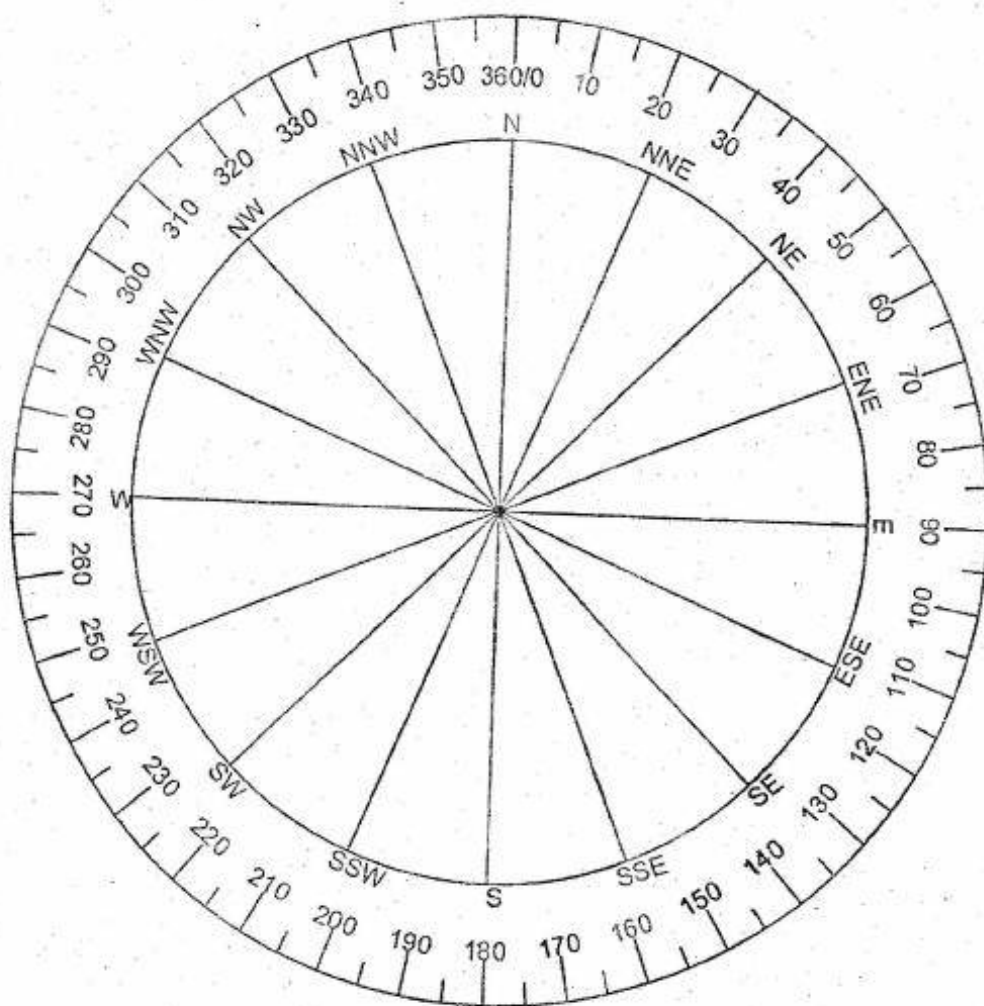
Zone	A	B	C
A	24	30	27
B	21	15	18
C	15	21	27

5. What is evaluation? Explain the issues that form the basis of evaluation. [1+7]
6. How is wind rose diagram utilized in airport design? Enumerate several factors affecting airport site selection. [4+4]
7. Explain wind rose diagram method II for determining the runway orientation. Find the runway orientation using Wind Rose Diagram Method I for the following data. [4+4]

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
7.2	9.7	5.9	3.8	3.3	2.9	3.1	3.8	6.6	10.3	11.1	9.2	8.7	5.9	4.7	3.8

(The Windrose diagram must be return back with the answer sheet)

8. What are the different component parts of railway track? Explain the different requirement of ideal railway track. [4+4]
9. The maximum sanctioned speed on a BG track for a circular curve is 100km/hr, speed of goods train is 50 km/hr and equilibrium speed is 80km/hr. Design super elevation to be provided. If length of transition curve to be provided is 100m what will be the permissible speed for the railway. The permissible equilibrium cant, cant deficiency and cant excess are 165, 100 and 75 mm respectively. The degree of curve is 3 degrees. [8]
10. Describe the operating mechanism of gravity goods ropeway with a sketch. Why such ropeways have limited applications for economic benefit? [4+4]



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2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain the scope of transportation planning and what are the factors to be considered in transportation planning? [8]
2. List out the types of transportation survey. Explain the road side interview method of O-D survey. [8]
3. The total trips produced in and attracted to the three zones A, B and C of a survey area in the design year are tabulated as

Zones	Trips produced	Trips attracted
A	950	1850
B	2100	1900
C	1950	1250

It is known that the trips between two zones are inversely proportional to the second power of the travel time between zones, which is uniformly 20minutes. If the trip interchange between zones B and C is known to be 600, calculate the trip interchange between zones A and B, A and C, B and A, C and B. [8]

4. What are the principles for developing the set of alternatives. [8]
5. What are the factors to be considered for airport site selection? Explain briefly about the Civil Aviation Authority of Nepal (CAAN). [8]
6. The length of runway under standard conditions is 1620m. The airport site has an elevation of 300m. Its reference temperature is 32.9°C. If the runway is to be constructed with an effective gradient of 0.20%, determine the corrected runway length. [8]
7. List the various types of gradients used in railway track. Explain the requirements of an ideal railway track. [8]
8. Calculate the cant and the maximum permissible speed for a 2° BG transitioned curve on a high speed route with a maximum sanctioned speed of 110Km/h. The speed for calculating the equilibrium cant as decided by the chief engineer is 80km/h and the booked speed of goods trains is 50km/h. [8]
9. What is gravity goods ropeway? Explain the scope and limitation of gravity goods ropeway. [8]
10. Why simulation technique is used for model development? List its limitations. [8]

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TRIBHUVAN UNIVERSITY
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2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- Define model and model developing process in brief. List the responsible agencies for planning in Nepal. [4+4]
- Distinguish urban and Regional Planning. Why origin and destination study is essential for the transport planning. [4+4]
- Total trips produced and attracted to the 3 zones A, B, C of a survey area in the design year are:

Zones	Trips produced	Trips attracted
A	2500	2000
B	2500	3000
C	3000	2500

It is known that the trips between two zones are inversely proportion to the second power of the travel time between zones which are shown in table below. If the trip interchange between zones A and B is 900, calculate the interchange between zones A and C, B and C, B and A, C and A, C and B.

Trip between	A and B	B and C	C and A
Travel time (min)	10	15	20

- A mode choice model for a city includes following modes: Autos (A), Light rail (L), buses (B) and Rapid rail (R) with the utility function (U) as shown in tables.

Function:	Cost (C)	Time (T)
$U(A) = 3.2 - 0.3 \cdot C - 0.03 \cdot T$	5	30
$U(L) = 1 - 0.2 \cdot C - 0.04 \cdot T$	3	25
$U(B) = 0 - 0.1 \cdot C - 0.01 \cdot T$	2.5	40
$U(R) = 1.5 - 0.3 \cdot C - 0.05 \cdot T$	6	20

where C is cost in dollars and T is time in minute.

- Based on estimate that 10,000 workers will head for downtown each morning, how many workers will choose to take a particular mode?
 - If government subsidizes light rail by 40%, buses by 30%, and Rapid rail by 20% and the same time increases automobile cost by 25%, what will be the new modal distribution? [4+]
- Mention the principle facilities that should be considered in an airport plan with neat sketch. Write down the procedure of demand analysis in airport planning. [4+]
 - Basic Length of runway is 1500m. The airport site has elevation of 1000m. Its reference temperature is 30 degree celcius. The maximum RL difference between highest and lowest point in the runway is 5m. Find the corrected runway length. Assume standard temperature at 1000m is 15 degree celcius.

7. Calculate the super elevation, maximum permissible speed, and transition length for a 3° curve on a BG section with a maximum sanctioned speed of 120 km/h. Assume the equilibrium speed to be 80 km/h and the booked speed of the goods train to be 50 km/h. [8]
8. Explain the components of railway track with neat sketch. Mention the types of railway station with their functions. [4+4]
9. "Gravity goods ropeways are the indispensable for the economic development of Nepal, especially for hill terrain" elaborate the statement. Explain the features of gravity ropeway. [4+4]
10. Write short notes on: (Any two) [4+4]
 - a) Intelligent Transportation System
 - b) Rolling Stock of railway
 - c) Wind Rose Diagram
 - d) Principle of developing set of Alternative

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- ✓ Attempt All questions.
- ✓ All questions carry equal marks.
- ✓ Assume suitable data if necessary.

1. List the various agencies involved in the planning stage in context of Nepal. Describe the decision making process in transportation planning.
2. Why the identification of freight transport and NMT demand is very important in planning. List the various types of transportation surveys.
3. Total trips produced and attracted to the 3 zones A,B,C of survey area in the design year is shown in table below. It is known that the trips between two zones are inversely proportion to the second power of the travel time between zones, which is uniformly 20 min. If the trip interchange between zones B and C is 850, calculate the interchange between zones A and B, A and C, B and A, C and B.

Zones	Trips Produced	Trips attracted
A	3500	2000
B	2000	2500
C	1500	2500

4. Trip rate corresponding to Household (HH) size are as shown in given table. Develop the trip generation model and compute the trip rate corresponding to household size of 3.25. Also check for statistical significance based on goodness of fit.

HH-size	Trips per day		
1	1	3	3
2	3	4	5
3	4	5	7
4	5	8	8

5. Define stop way and clear way. Explain the aircraft characteristics that affect the runway length.
6. At an airport site at sea-level with standard atmospheric conditions, the runway length requires for take-off and landing are 2000 m and 2400 m respectively. The proposed airport is situated at an altitude of 150 m. If the airport reference temperature is 25°C and if the effective runway gradient is 0.35 percent, calculate the length of runway to be provided.
7. Discuss the components of railway track with neat sketch. make a neat sketch of left hand turn-out.
8. Calculate the superelevation and maximum permissible speed for 3 degree curve on high speed BG track with the following data:
 - i) Maximum sanctioned speed = 130 Km/h
 - ii) Equilibrium speed = 85 Km/h
 - iii) Booked speed for goods train = 50 Km/h
9. Write down the steps in transport system analysis. What are the principles of developing a set of alternatives?
10. Why gravity goods ropeway is considered to be a viable option in context of rural areas of

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INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ All questions carry equal marks.
- ✓ Assume suitable data if necessary.

1. "Transportation planning is a continuous process, elaborate this statement". Explain land-use transportation cycle.
2. Enlist the types of transportation surveys. Mention difference between the planning for movement of people and goods.
3. Discuss about the Four Step modeling and mention the drawback of growth factor method of trip distribution.
4. A study represents the following characteristics:

Average HH size	2	3	4	5	6
Average total trips per day	5	7	8	10	10

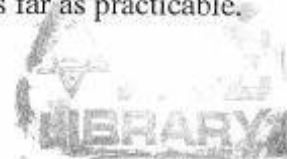
Derive the trip generation equation and Calculate R^2 value (coefficient of determination)

5. Define Effective Gradient. Find corrected runway length for Dang Airport, laying at 200 m elevation and having basic runway length of 1200 m. The Aerodrome reference temperature is 28 degree and Standard temperature at given elevation being 13.5 degree. Take the difference between Maximum elevation and minimum elevation as 20m.
6. What is Wind Rose diagram? Discuss its importance. What are the factors to be considered while selecting the airport sites?
7. Calculate the super elevation, maximum permissible speed and transition length for a 3° curve on a high-speed BG section with a maximum sanctioned speed of 100 km/h. Assume the equilibrium speed to be 80 km/h and the booked speed of the goods train to be 50 km/h.
8. What are the superior aspects of Railway over Roadway? Discuss about various component of railway track with neat diagram.
9. What are the principles for developing a set of alternatives in transportation system analysis?
10. Explain operating mechanism of Gravity goods Ropeway. Discuss the characteristics features of gravity goods ropeway.

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1. Transportation planning is necessary at national, regional and urban level. Give reasons why such level wise planning is required. Describe in detail elements of urban transport planning process. [8]
2. Discuss the need of identification of NMT demand. List the various types of transportation survey. Explain about Household Questionnaire Survey in brief. [2+3+3]
3. Why is project evaluation necessary? Discuss various aspects of evaluation of alternatives. [8]
4. Describe the factors that are to be considered for selecting suitable airport site. What is stop way? [8]
5. What are the superior aspect of Railway over Roadway? Discuss about various component of railway track with neat diagram. [2+6]
6. A 2 degree BG transitioned curve on a high speed route has a maximum sanctioned speed of 100 kmph. For computing the equilibrium super elevation the speed has been given as 75 kmph and the booked speed for goods traffic is 50 kmph. Determine the field super elevation and maximum speed that can be allowed. [8]
7. Calculate the modal split based on the calibrated cost function for one of the city of India as:

Mode	Auto	Micro	Bus
A	0.3	0.35	0.4
Y	20	32	40
X	26	18	15

$$C = A + 0.01 * X + 0.04 * Y$$

Where, A = Constant, X = travel cost (Rs.) and Y = travel time (min)

In order to reduce congestion, government tries to increase the patronage of public transportation by reducing fare of bus. What would be the changed modal split, if the travel cost (fare) of bus is subsidized to 60% of initial?

- [5+3]
8. Define effective gradient. Calculate corrected runway length for: Aerodrome elevation 1250m, mean of maximum and average temperature of hottest month of the year as 42°C and 20°C, maximum elevation difference 20m and basic runway length 1500m. [8]
9. What do you understand by trip production and trip attraction? What are the advantages and disadvantages of Growth factors trip distribution models. [3+5]
10. Describe the operations of gravity goods ropeways and mention why such rope-ways are beneficial. [8]

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- Discuss the basic elements of transportation planning. Why are physical models not used in transport planning? [4+4]
- Differentiate between urban and regional planning. Elaborate O-D study and road side interview survey. [2+3+3]
- How are production and attraction different from origin and destination? Mention important factors affecting trip production. Describe 'logic model' along with its use in transportation planning. [3+3+2]
- What is elevation? Explain the various basis for the evaluation of alternatives of transportation proposals. [2+6]
- A three zone city has the following characteristics. [8]

Zone	P	A
1	150	100
2	140	110
3	110	150

	time (minutes)		
	1	2	3
1	3	5	8
2	7	3	9
3	6	5	4

The travel distribution function is given by the following discrete function

$$f(c_{ij}) = \begin{cases} 10, & \text{if } 0 \leq c_{ij} < 5 \\ 5, & \text{if } 5 \leq c_{ij} < 8 \\ 3, & \text{if } c_{ij} \geq 8 \end{cases}$$

Distribute the trips using the gravity model.

- What are the superior aspects of railway over Roadway? Explain about the various components of Permanent Way with neat sketch diagram. [2+6]
- Define effective gradient. Determine the corrected runway length for Bankhe Airport, Nepalgunj (28°06'13"N, 81°40'01"E) with following information: [2+6]
 - The basic runway length is 1800 m.
 - Aerodrome elevation is 165 m
 - Average of mean daily temperature is 30 degree and average of maximum daily temperature is 42 degree during hottest month of year.
 - Difference between Maximum elevation and minimum elevation: 17m
- What is wind rose diagram? Explain the various factors to be considered for the selection of a suitable airport site. [3+5]
- Calculate super elevation, maximum permissible speed and transitional length for high speed BG track with radius of 580 m. The maximum sanctioned speed and booked speed of goods train is 120 kmph and 50 kmph respectively. [4+2+2]
- Why Gravity goods ropeways are gaining popularity in context of Nepal, discuss on basis of its features. What are the limitations of gravity goods ropeways? [5+3]

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Subject: - Transportation Planning and Engineering (Elective I)(CE72509)

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- ✓ Attempt All questions.
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1. What is simulation model? Explain decision making process with the help of flow diagram for transportation related investments. [2+6]
2. What are different types of movement in a zone? List the various methods of transportation surveys. Explain the importance of transportation survey in context of transportation planning. [1+4+3]
3. How are you influenced to choose a particular mode of transportation? What conclusion will you draw regarding usage of the mode based on the following data? [4+2+2]
 - a) $C(\text{Micro}) = -1.5$, $C(\text{Bus}) = -1.8$ and $C(\text{Tempo}) = 0.22$
 - b) $U(\text{Micro}) = -1.5$, $U(\text{Bus}) = -1.8$ and $U(\text{Tempo}) = 0.22$

Where C and U represents Generalized Cost Function and Utility function respectively.
4. The distribution of present trips among the zones A, B and C given in O-D matrix. If the future trips generated in zones A, B, and C are expected to be 360, 1260 and 3120 respectively due to socioeconomics changes of the zones. Distribute the trips using average growth factor method (3 iterations only). [8]

O/D	A	B	C
A	60	100	200
B	100	20	300
C	200	300	20

5. Why evaluation is needed? Explain the criteria for project evaluation. [4+4]
6. Explain the component parts of railway track. Estimate the quantity of material required per km of rail length. [4+4]
7. Calculate the field superelevation and maximum permissible speed on a curve of a high speed BG group A route having the following particulars: degree of the curve = 3° , equilibrium speed is 80 kmph, length of transition curve = 120 m, maximum speed likely to be sanctioned for the section = 160 km/h and assumed speed of goods train = 50 kmph. [8]
8. Define head wind and cross wind. Why is cross wind component important in airport operation? Enumerate the factors affecting airport site selection indicating why they are crucial. [2+2+4]
9. Find out the actual length of the runway required for the newly proposed Airport in Terai Region of Nepal if the length required for landing and take-off under standard atmospheric conditions are 2100 m and 1700 m respectively. The elevation of the airport site is 200 m above mean sea level and the airport site has mean value of average daily and mean value of maximum daily temperature 30 and 40 degree respectively of the hottest month June and effective runway gradient is as 0.5%. [8]
10. Define ropeway. Also explain the various components of gravity goods ropeway. Elaborate how such ropeways can partially upgrade the remote life. [2+4+2]

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Year / Part	IV / I	Time	3 hrs.

Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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- ✓ Assume suitable data if necessary.

1. a) What are the purpose of transportation planning? Department of Road is responsible for planning and implementing of 'Strategic Road Network', show how its organization is structured? (2+6)
- b) What do you understand by the term "urban" and "regional" transport planning? Describe the process of Urban Transportation Planning. (2+6)
2. a) Define four step modeling process in transportation planning. What are the outputs of each process? (4+2)
- b) What are the factors that affect the mode choice? (4)
- c) The calibrated utility function for private car and public transport travel are:

private car:	$V_c = -0.17 - 0.02X - 0.55Y - 0.023C$
public transport:	$V_p = -0.015X - 0.11Y - 0.12C$

Where, X= in-vehicle travel time; Y=out of vehicle travel time; C=cost of travel/income

	private car	public transport
in-vehicle travel time	50	150
out-of vehicle travel time	10	30
travel cost(Rs.)	500	100

What is the probability that a person with income Rs.20000 will travel by private car? (6)

3. a) Define the term hanger, taxiway and apron. How the airport is classified based on geometric design by International Civil Aviation Organization (ICAO)? (4+4)
- b) Calculate the corrected runway length for an airport if basic length of runway is 1800 m, the airport site elevation is 1320 m, its reference temperature is 23 degree Celsius and the runway is to be constructed with an effective gradient of 0.25%. (8)
4. a) Why ballast is used in railway track? A single line BG track with 60 kg rails has 20 cm cushion ballast. Calculate quantity of materials necessary to construct one Km railway track. Assume suitable data if necessary. (2+6)
- b) Calculate the super elevation and maximum permissible speed for a 3° curve on a high speed BG track with the maximum sanctioned speed =130 kmph, equilibrium speed =85 kmph and booked speed for goods train =50 kmph. (8)
5. a) What is evaluation of alternatives? Explain briefly the bases for transport project evaluation? (2+6)
- b) Explain the importance of gravity goods ropeway in the context of Nepal. Explain its features and limitations. (2+6)

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Subject: - Transportation Planning and Engineering (Elective I) (CE72509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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1. Explain the steps in transportation system analysis. Also explain the importance of simulation in transportation planning.
2. What are the various methods of transportation survey? Discuss the origin and destination (O and D) survey and road side interview survey in brief.
3. Discuss the basic elements that make up the urban transportation forecasting process. Why is the number of trips made usually calculated separately per trip purpose in trip generation? What is the drawback of category analysis and how can we overcome this drawback?
4. A three zone city has the following characteristics

	Production	Attraction
Zone 1	500	400
Zone 2	600	800
Zone 3	200	100

Initial travel time factors are as given

travel time (min)	10	15	20
friction factor	80	60	40

Distances (time)	
1 to 2	10 min
2 to 3	15 min
3 to 1	20 min

Distribute the trips using the gravity model

5. Define mobility and accessibility. Explain the basis of evaluation for major transport investments.
6. What are the component parts of aircraft? Explain minimum turning radius and wind rose diagram.
7. An airport is proposed at an elevation of 400 m above mean sea level where the mean of maximum and mean of average daily temperature of the hottest month are 44.8°C and 26.2°C respectively. The maximum elevation different along the proposed profile of runway is 6.3 m, if the basic runway length is 1280 m, determine the actual runway length to be provided.

8. What are the different component parts of railway track? Explain the requirements of ideal railway track.
9. Find out the superelevation to be provided and the maximum permissible speed for 2°BG transitioned curve on a high speed route having a maximum sanctioned speed of the section as 100 kmph. The speed for calculating the equilibrium superelevation as decided by the chief engineer is 78 kmph and the booked speed for goods train is 50 kmph.
10. Explain the importance of ropeway as compared to other modes of transportation in the context of Nepal. Briefly describe the mechanics, features and limitations of gravity goods ropeways.

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Subject: - Transportation Planning and Engineering (CE72509) (Elective I)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
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1. Describe the basic elements in the transportation planning process. State, why this process is not intended to furnish a single result.
2. What are the key factors which make planning for movement of people different from planning of goods movement? Highlight some indicators used.
3. Define trip production and attraction. Discuss the characteristics of urban travel.
4. Clearly state the objectives of conducting project evaluation. List the basic criteria for evaluating transportation projects.
5. Discuss the characteristics of aircraft which have influence on aerodrome planning design and operation.
6. What are the components of railway track structure? Identify the functions of each component.
7. What are the specific advantages of gravity goods ropeway as compared to other modes of transportation? Include relevant variables to support your answer in the Nepalese context.
8. Distribute the total 500 work trip productions from zone 1 to zones 1, 2, 3, 4, 5. The details are given in table. Assume socio-economic factor as unity.

From	To	Attraction	Friction
1	1	80	45
1	2	500	30
1	3	1000	8
1	4	40	15
1	5	90	5

9. Determine the length of a runway using general correction factor, for the data given. Runway length required for landing at sea level in standard atmospheric conditions 2200 m, runway length required for take-off at a level site at sea level in standard atmospheric conditions 1800 m, aerodrome elevation 200 m, aerodrome reference temperature 25°C, temperature in the standard atmosphere for 200 m 14.5°C, runway slope 0.7%
10. Calculate the super elevation and maximum permissible speed for a 2° BG track with the maximum sanctioned speed = 130 kmph, equilibrium speed = 80 kmph and booked speed for goods train = 50 kmph.

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- ✓ Attempt **All** questions.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

- Describe the basic steps in transportation planning and explain why the transportation planning process is not intended to furnish a decision. [4+4]
- Explain the different factors that affect non-motorized travel demand. What are the advantages and disadvantages of road side interview survey? [4+4]
- Classify trips. What are the different factors that affect trip production and attraction? [4+4]
- A small study area represented by six traffic zones has the following characteristics. [8]

Zone	1	2	3	4	5	6
Trip Production	600	450	900	850	750	290
Car ownership	250	200	710	615	280	130

Derive a trip generation equation and calculate R^2 value.

- Explain the issues that should be considered in making evaluation of alternatives. [8]
- What are the aircraft characteristics? Explain how they influence in airport site selection. [8]
- The length of runway under standard conditions is 1500 m. The airport is to be provided at an elevation of 110 m above mean sea level. The mean of maximum and the mean of average daily temperatures of the hottest month are 32.8°C and 16.5°C respectively. The construction plan includes the following data: [8]

End to end of runway (m)	0-300	300-900	900-1500	1500-1800	1800-2100
Grade (%)	+1	-0.20	+0.50	+1.00	-0.30

Determine the actual length of runway to be provided. Apply corrections for elevation and temperature as per ICAO and for gradient as per FAA specifications.

- What are the different types of railway stations and yards? Briefly explain with their functions. [4+4]
- A 600 m radius curve is introduced between two tangent portions of a BG line intersecting to form a deviation angle of 70°. The booked speed for goods train in the section is 50 kmph and the maximum sanctioned speed is 110 kmph. Calculate the cant to be provided, maximum permissible speed, length of transition curve and cant gradient. Limits for maximum cant and cant deficiency are 165 mm and 100 mm respectively. [8]
- Is gravity goods ropeway a viable alternate mode of transport in Nepal? Explain its limitations. [8]

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- ✓ Attempt All questions.
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1. What are the purpose of planning? Give an example of impact trade-off decision making. Explain land use transportation cycle.
2. What are the types of transportation survey? Why origin and destination study is essential for planning the transportation network?
3. The trip rate and corresponding household size for a sample are given below. Compute the trip rate if average household size is 3.5.

	Household size			
	1	2	3	4
	2	4	5	6
	4	5	6	9
Trips per day	4	6	8	9

4. Classify the trips. Explain the four step modeling process of urban transmission planning.
5. Define cross wind component and wind coverage. Discuss the importance of wind rose diagram.
6. The basic runway length of an airport is 2200m and the elevation of the site is 200m. The airport reference temperature is 25°C and effective gradient is 0.38% find the corrected runway length.
7. Explain the function of component parts of railway track.
8. Find out the super elevation to be provided and the maximum speed for a 3° BG transition curve on a high speed route having a maximum sanctioned speed of 120 kmph. The equilibrium speed is 80 kmph and booked speed for goods traffic is 55 kmph.
9. Justify the statement 'Gravity good ropeway can be the promising alternative to address remote life'. Discuss the limitations of such ropeway.
10. What is an evaluation? Discuss the principles for generating a set of alternatives.

[8]

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Subject: - Transportation Planning and Engineering (Elective I)

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1. Describe the decision making process in transportation planning.
2. What are the methods of transport survey? Why origin and destination study is essential for transportation planning?
3. Total trips produced in and attracted to the three zones A, B, C of a survey area in the design year tabulated as:

Zones	Trips Produced	Trips attracted
A	1200	1500
B	1800	2000
C	3000	2500

It is known that the trips between two zones are inversely proportion to the second power of the travel time between zones, which is uniformly 30 minutes. If the trip interchange between zones B and C is known to be 330, calculate the trip interchange between zones A and B, A and C, B and A, and C and B.

4. Write down the steps for urban transportation planning process. Where logit model is used in urban transport modeling.
5. What are the characteristics of an ideal airport layout? Discuss the importance of wind rose diagram.
6. Basic length of runway is 1280 m. The airport site has an elevation of 1200 m. Its reference temperature is 18°C. If the runway is to be constructed with an effective gradient of 0.5%, determine the corrected runway length.
7. Explain the components of railway track. Why grade compensation is done on curves of railway track?
8. Calculate the super elevation and maximum permissible speed for a 2° curve on a high speed BG track with the maximum sanctioned speed = 120 kmph, equilibrium speed = 85 kmph and booked speed for goods train = 50 kmph.
9. What are the principles of developing set of alternatives?
10. What is ropeway? Explain briefly the components of gravity goods ropeway.
