

Sub : **PLAN 333** (Transportation Policy and Planning)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Produce a Löschian Demand Cone and elaborate the theory behind it, including the assumptions. (20)
(b) Relate the limitations of industrial location theories with real life scenarios. (15)
2. (a) “In Central Place Theory, K value is often used to define the geographical relationship between different orders”- Discuss this concept of alternative forms of hierarchy in central place theory using different k values. (20)
(b) “While there are many economies to polarization, limitations also exist” – Discuss this statement. (15)
3. (a) Estimate the money transfer from Uttara to a shopping center at Dhanmandi in the month January; When the mass of shopping center is 5000 square meters, distance between these two areas is 25 Kms and total expenditure of the consumers at Uttara is 6,00,000 BDT on the same month. Assume the scaling factor is 20, parameters $a = 2$, $b = 1$. (15)
(b) Sketch the typology for guiding the practical implications of growth Pole theory in regional Planning. (20)
4. (a) Construct the idea of central control of macro policy options being useful in regional policy preparation, with examples. (15)
(b) Calculate Gini Coefficient for the country A. The distribution of income within its population is shown in table 1 and figure 1. (20)

SECTION – BThere are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Do you think regional planning is necessary for a small country like Bangladesh? Explain your opinion. (8)
(b) The following table shows the employment data for five sections in four regions for any particular year. Answer the following questions using the table.

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Contd... Q. No. 5(b)

Sectors	Region A	Region B	Region C	Region D
Sector A	221	120	404	627
Sector B	1334	2470	3560	1450
Sector C	138	220	120	374
Sector D	570	2841	788	269
Sector E	350	460	120	540

(i) Calculate the total basic employment for Region A and interpret its meaning. (15+5=20)

(ii) Is there any limitation in the method you used in calculating the basic employment? If yes, Discuss the limitations. (7)

6. (a) Discuss the differences between inter-and intra-regional planning. (5)

(b) Prepare a list of structural determinants of migration. (12)

(c) The following table gives the shift-share components of employment growth in two industries for two districts between 2003 and 2013. (18)

District A			
Industries	National Share	Industrial Mix	Regional Shift
Industry A	2346	-1900	1200
Industry B	1035	2500	-1062
District B			
Industry A	213	-417	990
Industry B	3218	1553	-1389

Compare the growth of the two districts using the table.

7. (a) “Administration of planning areas is very important for the implementation of a regional plan.” – interpret the statement. (10)

(b) The following table shows the supply and demand position of three sectors in any economy in crores of taka. Answer the following question using the table. (15)

Seller Sectors	Purchase Sector			Final	Total
A	20	30	10	10	70
B	10	35	15	20	80
C	10	30	20	30	90

(i) Calculate the outputs when the final demand changes to 25 for A, 45 for B, and 50 for C. (13)

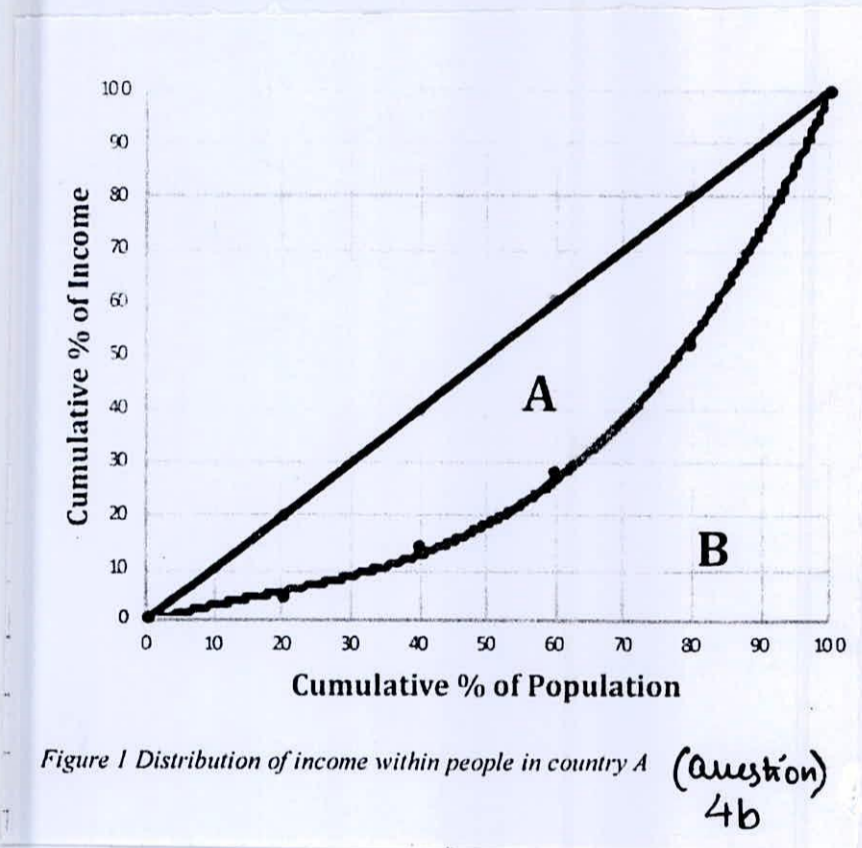
(ii) Calculate the output multiplier for sector A and interpret its meaning. (12)

8. (a) How is the technique of graph theory applied to delineate functional regions? Demonstrate with a hypothetical example. (12)

(b) “The informal job sector is an unavoidable counterweight to the formal job sector in urban areas, While the formal wage is higher than the rural wage.” Interpret the statement using an appropriate migration model. (23)

Table 1: Distribution of income within people in country A (Question 4b)

Observed group		Cumulative	
% of population	% of income	% of population	% of income
Poorest 20%	4	20	4
2 nd Poorest 20%	10	40	14
Middle 20%	14	60	28
2 nd Richest 20%	24	80	52
Richest	48	100	100



Sub : **PLAN 345** (Transportation Policy and Planning)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Two routes connect an origin and a destination. Route 1 has a performance function $t_1 = 6 + 3x_1$, and Route 2 has a function $t_2 = 3.2 + 8x_2$, with X expressed in thousands of vehicles per hour and t in minutes. The demand flow rate between the O-D pair is 12,000 veh/hr. (5+5+15=25)
- (i) Which route will be chosen if all-or-nothing assignment procedure is used, and what will be the flow on that route?
Next, apply the capacity restraint assignment procedure.
- (ii) How many vehicles will initially use the route as found in (i) before starting to use the other route?
- (iii) Distribute 12,000 trips between the two routes.
You are expected to provide relevant explanations on the steps.
- (b) Describe the characteristics of bus service. (10)
2. (a) Explain the factors behind the growth of personal travel over the years using graphs of the USA as examples. (20)
- (b) Compare 'diverted traffic' and 'converted traffic'. (15)
3. (a) Discuss why travel demand management (TDM) is important for any city. (20)
- (b) Describe different types of parking measures. (15)
4. (a) Appraise the step 'collect and maintain socio-economic and land use data' in regards to its role in the transportation planning process. (20)
- (b) Predict the use of intelligent transportation system (ITS) in Dhaka in the hear future. (15)

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SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) 'Since the independence of Bangladesh there is a marked variation in the growth of share of passengers and freight for different transport sub-sectors'. Explain the statement. (12)
- (b) 'Transport system and services can cause social exclusion and mobility poverty'. Verify the statement. (13)
- (c) Construct a graphical model showing the relationship between 'Access', 'Activities', 'Money' and 'Speed'. (10)
6. (a) Summarize the problems of railway and waterway in Bangladesh. (15)
- (b) Investigate the problems associated with non-adherence to height clearance of Civil Aviation Authority and Maritime Clearance of Inland Water Transport Authority. (10)
- (c) 'Cost refers to the trade-offs between use of resources: money, time, land or the loss of opportunity to enjoy a benefit'. Set up three policy objectives for urban transport in Bangladesh considering associated transport issues as cost not problems. (10)
7. (a) Explain why Syedpur Airport is one of the busiest airports in Bangladesh. (8)
- (b) Criticize the ongoing or recently completed transport sector development projects in Dhaka in the context of sustainability and equity. (15)
- (c) The planning commission of Bangladesh envisions a huge growth of freight traffic, if Bangladesh's GDP grows more than 7% per annum till 2041. In such a context, predict the potential problems in transport sub-systems along Dhaka-Chattagram corridor if multi-modal options are not considered and implemented. (12)
8. (a) Briefly describe the transport sub-systems in Bangladesh. (15)
- (b) Cite factors you will consider for prioritization of Rural Roads in Bangladesh. (8)
- (c) Keeping in mind the mobility crisis in the city, compile two examples for each of the concepts: Access, competence and Appropriation. (12)
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BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-2 B. Sc. Engineering Examinations 2021-2022

Sub : **PLAN 393** (Operations Research and system Analysis)

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this section. Answer any **THREE**.

Assume any missing data as needed (based on the question description)

1. (a) Describe the steps of the analytical hierarchy process (AHP) with relevant examples. **(10)**
- (b) Suppose the newly constructed BRT Line-3 wants to start a trial operation from Airport to Gazipur with a limited capacity of 2 ticket counters for each station, with one counter operating continuously, while the other is designated for use in case of emergency situations, such as maintenance or unexpected shutdowns. The initial survey anticipated that on average, 8 passengers would arrive at the ticket counter every 1.5 minutes. And the ticket counter are expected to be capable of serving an average of 360 tickets per hour. Assuming Poisson distribution for arrival rate and exponential distribution for service time calculate the:
- (i) Probability that the server will be busy **(2.5)**
- (ii) Probability that the server will be idle and probability that there will be 10 passengers in the system. **(5.0)**
- (iii) Expected no of passengers in the system and queue. **(5.0)**
- (iv) Average waiting time in the system and queue. **(5.0)**
- (v) Probability that the number of passengers will be greater than 5 in the system. **(5.0)**
- (vi) The average length of the non-empty queue. **(2.5)**
2. (a) Demonstrate kendall's Notation for the queuing model with relevant examples. **(10)**
- (b) Calculate the initial basic feasible solution of the following transportation problem using the least-cost method. Then Detect the optimal solution using the modified distribution (MODI) method. **(10+15)**

		Destination				
		D ₁	D ₂	D ₃	D ₄	Supply
Source	O ₁	3	1	7	4	250
	O ₂	2	6	5	9	350
	O ₃	8	3	3	2	400
	Demand	200	300	350	150	

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3. (a) A book salesperson who lives in Basin must call once a month on four customers located in wald, Bon, mena, and kiln before returning home to Basin. The following table gives the distance in miles among the different cities. Solve the problem to find the optimal path for the salesperson. (15)

	Basin	Wald	Bon	Mena	Kiln
Basin	0	125	225	155	215
Wald	125	0	85	115	135
Bon	225	85	0	165	190
Mena	155	115	165	0	195
Kiln	215	135	190	195	0

- (b) Predict the player A and player B strategy lies from the following payoff matrix for player A. (20)

	B	B ₁	B ₂	B ₃	B ₄
A					
A ₁	3	2	4	-2	
A ₂	2	4	2	4	
A ₃	4	2	4	0	
A ₄	0	4	0	8	

4. (a) Describe the fundamental concept of decision under risk and decision under uncertainty. (10)

(b) Suppose you are the author of what promises to be a successful novel. You have the option to either publish the novel yourself or through a publisher. The publisher is offering you \$20,000 for signing the contract. If the novel is successful, it will sell 200,000 copies. Else, it will sell 10,000 copies only. The publisher pay a \$ 1 royalty per copy. A market survey indicates that there is a 70% chance that the novel will be successful. If you undertake publishing, you will incur an initial cast of \$90,000 for printing and marketing, but each copy sold will net you \$2. (10+15)

(i) Formulate the decision tree based on the given data. Would you accept the publisher's offer or publish yourself?

(ii) Suppose that you contract a literary agent to conduct a survey concerning the potential success of the novel from past experience, the agent advises you that when a novel is successful, the survey will predict the wrong outcome 20% of the time. When the novel is not successful, the survey will give the correct prediction 85% of the time. Integrate the new data in your final decision and explain the reasons of your decision.

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SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

All the abbreviations have their usual meanings. Assume reasonable value for any missing value.

5. The following table summarizes the key facts about two products, A and B, and the resources Q, R, and S, required to produce them.

Resource	Resource Usage Per unit produced		Amount of resource Available
	Product A	Product B	
Q	2	1	2
R	1	2	2
S	3	3	4
Profit per unit	3	2	

All the assumptions of linear programming hold.

- (a) Formulate a linear programming model. (20)
- (b) Solve the model graphically. (15)
6. (a) You are given the following data for a linear programming problem where the objective is to maximize the profit from allocating three resources to two nonnegative activities. (35)

Resource	Resource Usage Per unit of each activity		Amount of resource Available
	Activity 1	Activity 2	
1	2	1	10
2	3	3	20
3	2	4	20
Contribution per unit	\$20	\$30	

Contribution per unit = profit per unit of the activity

Solve the problem using tabular form of simplex method.

7. (a) Solve the following mathematical formulation of a problem using revised simplex method. (15)

$$\text{Max } Z = 3x_1 + 5x_2$$

S.t.

$$x_1 \leq 4$$

$$2x_2 \leq 12$$

$$3x_1 + 2x_2 \leq 18$$

and

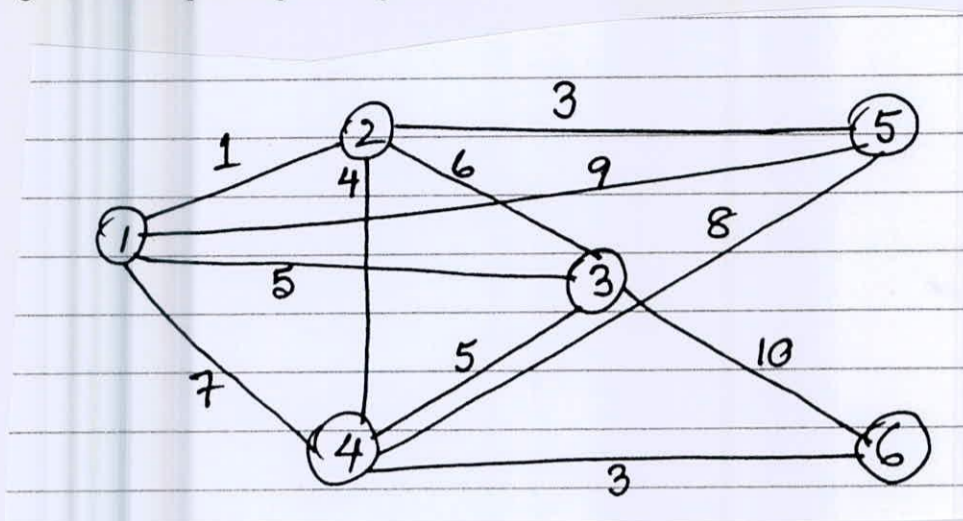
$$x_1 \geq 0, x_2 \geq 0$$

Contd P/4

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(b) You are given the following network. Find the shortest distance connecting all nodes using minimum spanning tree algorithm. (20)



8. (a) Show the dual form of the following problem. (15)

Maximize $Z = x_1 + 2x_2$

Subject to

$x_1 \leq 5$

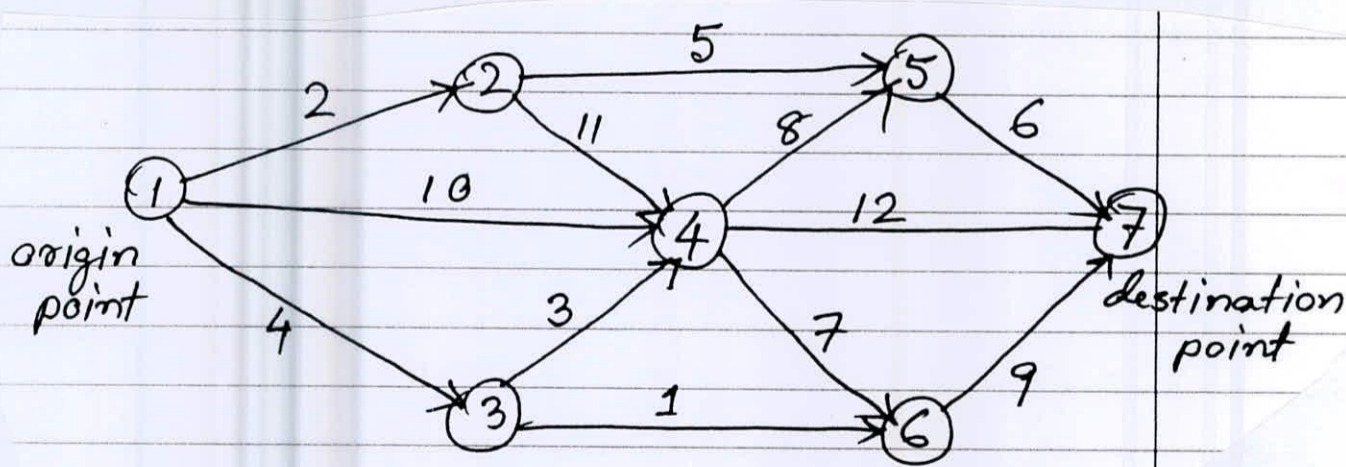
$x_2 \leq 6$

$x_1 + x_2 \leq 8$

and

$x_1 \geq 0, \quad x_2 \geq 0$

(b) Find the shortest path from the origin point to destination point. (20)



To solve the problem use the dijkstra's algorithm.
