I.D 14982

MS CEM

EXAM FINAL

PAPER TRANSPORTATION PLANNING & MANAGEMENT

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Q-1)

Ans:-

ZONE i	Interzonal Impedance					
	Productions	Attractiveness	1	2	3	4
Peshawar	67000	45	45	50	17	46
Charsadda	62000	37	30	45	091	70
Nowshera	9700	24	50	75	65	35
Mardan	56000	28	65	70	17	80
D.I Khan	53100	24	25	70	29	26
Swabi	50300	14	60	50	49	65
Abbottabad	47800	21	38	90	86	82
Kohat	51500	13	25	69	80	38

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ZONE I	IMPEDANCE-i						
	1	2	3	4	5	6	7
PESHAWAR	28	80	93	75	55	45	38
CHARSADDA	30	23	63	70	63	85	38
NOWSHERRA	35	90	15	73	60	48	40
MARDAN	77	58	05	85	65	38	32
KOTLAMIRI	53	83	83	73	55	53	35
DI KHAN	73	25	35	85	13	18	15
ABBOTTABAD	95	65	75	45	90	48	10
KOHAT	52	13	10	55	54	55	43

The following table is formed by the product of Gravity model with person trips.

Trip generation for corresponding category

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Now to find the number of trip attractions each trips will have a production and attraction. So the productions and attractions should be equal in number

TRIP ATTRACTION						
1	2	3	4	5	6	7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,104,860

Land use category	TRIP generated						
	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7
Residential	990,320	[illegible]	1586,952	3,845,300	162,435	[illegible]	4030,980
Retail	2826,200	[illegible]	14,761,860	4,175,240	18,385,137	[illegible]	450,200
Commercial	[illegible]	[illegible]	2,462,240	563,195	[illegible]	366,480	72,400
Services	2609,200	[illegible]	882,740	2,376,320	59,170,36	[illegible]	564,160
Manufacturing	265,320	898,240	804,912	1276604	334,195	[illegible]	146,375
Entertainment	24,355	224,100	199,880	131,100	60,177	1,621,170	152,200
Public building	[illegible]	[illegible]	1,659,000	1,703,040	277,240	[illegible]	305,400
Public open space	15,050	68,324	158,000	358,340	462,100	1,145,014	343,575
Total trips	[illegible]	[illegible]	21,764,784	12,430,885	[illegible]	[illegible]	[illegible]

Q2) The choice transport modes at a city includes autos (A), Light Circular Rail (LCR), Local Buses (LB), Riding Bikes (RB) & Fast Rail (FR). The utility functions of each mode are

S.No	Mode	Utility functions	C	A	W	R
1	Autos	3.2-0.85C-0.015A-0.5W	300	6	4	25
2	Light Circular Rail	1.1-0.35C-0.025A-0.7W	70	7	10	30
3	Local Buses	1.7-0.15C-0.075-0.9A-0.075	50	10	15	40
4	Riding Bikes	1.3-0.7C-0.012A-0.05W	45	1	0	20
5	Rapid Rail	1.5-0.25C-0.045A-0.6W	90	5	20	15

Sol: Part (a) Utility functions

$$U(A) = 3.2 - 0.85(300) - 0.015(60) - 0.5(4) - 0.035(25)$$
$$= -254.765.$$

$$U(LCR) = 1.0 - 0.35(70) - 0.025(7) - 0.7(10) - 0.05(30)$$
$$= -32.32.$$

$$U(LB) = 1.7 - 0.15(50) - 0.075(10) - 0.9(15) - 0.075(40)$$
$$= -23.5$$

$= -7.3$

$U(RR) = 1.5 - 0.25 - 0.95(4) - 0.6(\omega) - 0.025(R)$

$= 1.5 - 0.25(90) - 0.95(5) - 0.6(20) - 0.025(1$

$= -33.85$

As we know

$$P(x) = \frac{e^{4x}}{\Sigma_x e^{4x}}$$

$$P(A) = \frac{e^{-25.475}}{e^{-25.475} + e^{-26.9} + e^{-22.5} + e^{-7.3} + e^{-33.85}}$$

$= 0$

b) Total Revenue

$P = 30\% - 0.05Q$

$R = Q(30 - 0.05Q)$

$R = 10Q - 0.05Q^2$

$dR/dQ = 10 - (0.05 \times 2)Q$

$R = 70 \times 0.7 = 56$

$LB = 50 \times 0.80$

$= 40$

$RR = 90 \times 0.9$

$= 81$

Total Revenue $= 56 + 40 + 81$

$= 181$

C) Subway Team Introduced

$U = 1.2 - 0.22C - 0.015A - 0.65W - 0.020R$

$U = 1.2 - 0.22(80) - 0.015(4) - 0.65(5) - 0.020(10)$

$= 3.1$

Increased by 15%

$= 3.1 \times 1.15$

$= 3.2$

Increased by 5%

$= 3.1 \times 1.05$

$= 3.13$

The revenue will be increased.

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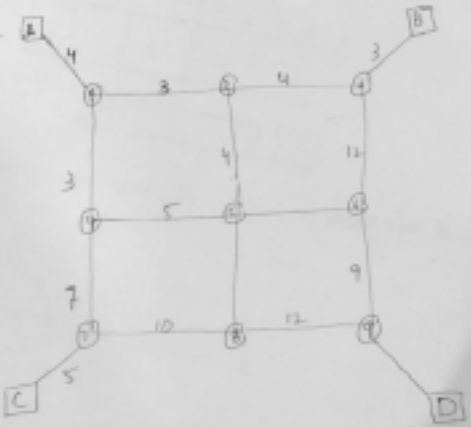
Question 3:- Find link array and minimum impedance tree originated from zone-A for the network described below.

Solution:-



Link Array originated for zone-A

Link array:- Page (6) ID#14982

i \ j	1	2	3	4	5
1		3	5		
2	4			2	
3		2	4		
4					
5				8	

⇒ Intersection vehicular - trips originating from Zone

1	B	C	D
Adj	900	1200	1750

1750
900
1200
3850

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Final Array table

Node (i to j)	Total Properties from node i to node j	Node preceding (j)
1	0	–
2	15	7
3	21	8
4	18	11
5	19	12
6	5	1
7	13	6
8	17	7

Question #04: The city government wants to start a transit service b/w three cities A, B & C. The alternatives are having the following attributes.

Ans: Evaluation of Transportation proposals For Economic Efficiency:

⇒ By using Net present value (NPV):-

⇒ The NPV of an investment is the difference b/w the present worth of benefits and the present worth of costs.

$$NPV = PW(\text{Benefits}) - PW(\text{costs})$$

⇒ NPV reflects the value of the project at the time of the base year of the analysis which may be considered the year of decision making.

⇒ NPV provides a magnitude of net benefits in monetary terms.

We will select three alternatives A, B, & C.

1. CNG Bus.
2. Bus Rapid Transit.
3. Light Rail.

By using NPV. we will recommend which alternative will be feasible.

For CNG Bus:- (Alternative A).

NPV = PW (Benefits) - PW (costs)

NPV_A (In millions).

$= 25 \times USPWF(7\%, 11) - 60 - 7.04\ USPWF(7\%, 11) + 11 \times CPPWF(7\%, 11)$

$NPV_A = \$\ 25.6\ M$

For Six Rapid Transit:

NPV_s (In millions) = 12 USPWF(7%,27) - 50 - 16 USPWF(7%,27) + 14 SPPWF(7%,27)

NPV_s = $198 M

For Light rail:

NPV_L (In millions) = 12 USPWF(5%,27) - 66 - 14 USPWF(5%,27) + 17 SPPWF(5%,27).

NPV_L = 218 M

In all of the above NPV:
Alternative "A" is economically desirable.