

Final term exam paper

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Subject: Transportation planning and management

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Ans1

For Peshawar $P_i=67000$						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.00049	1	0.022	0.2	13400
2	37	0.0011	1	0.04	0.36	24120
3	24	0.00049	1	0.012	0.11	7370
4	28	0.00073	1	0.02	0.18	12060
5	24	0.00027	1	0.0065	0.06	4020
6	14	0.000017	1	0.00036	0.0032	2144
7	21	0.00049	1	0.01	0.09	6030
8	13	0.0000043	1	0.000056	0.0005	33.5
Total				0.111	1	67000

For Charsada $P_i=63300$						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.001	1	0.045	0.3	18990
2	37	0.001	1	0.037	0.23	14559
3	24	0.0016	1	0.038	0.24	15192
4	28	0.001	1	0.028	0.17	10761
5	24	0.00049	1	0.012	0.074	4684
6	14	0.00002	1	0.00028	0.0017	107.61
7	21	0.00027	1	0.000567	0.00035	22.155
8	13	0.000004	1	0.000052	0.00032	20
Total				0.161	1	63300

For Mardan $P_i=59400$						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.00049	1	0.022	0.169	10038

2	37	0.0016	1	0.059	0.45	11880
3	24	0.0011	1	0.026	0.2	11880
4	28	0.0044	1	0.123	0.94	55836
5	24	0.000031	1	0.00744	0.057	3385
6	14	0.000026	1	0.0004	0.003	178
7	21	0.00014	1	0.0029	0.018	1069
8	13	0.0000035	1	0.000045	0.00035	21
Total				0.13	1	59400

For Nowshera $P_i=56200$						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.00073	1	0.033	0.132	7418
2	37	0.0011	1	0.041	0.164	9216
3	24	0.0044	1	0.105	0.42	23604
4	28	0.0016	1	0.044	0.176	9891
5	24	0.0011	1	0.026	0.104	5844
6	14	0.000031	1	0.000031	0.00012	6.7
7	21	0.00009	1	0.00189	0.0075	421
8	13	0.0000033	1	0.000043	0.00017	9
Total				0.25	1	56200

For Swabi $P_i=53100$						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.00027	1	0.012	0.098	5203
2	37	0.00049	1	0.018	0.15	7965
3	24	0.0011	1	0.026	0.86	45666
4	28	0.0011	1	0.03	0.24	12744
5	24	0.0008	1	0.0192	0.098	5203
6	14	0.000035	1	0.0005	0.0041	217.71
7	21	0.000076	1	0.0016	0.13	6903

8	13	0.0000029	1	0.000037	0.0003	16
Total				0.122	1	53100

For Appotabad $P_i=50300$						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.000017	1	0.000765	0.03	1509
2	37	0.00002	1	0.000074	0.003	150.9
3	24	0.000026	1	0.00062	0.0248	1247
4	28	0.00003	1	0.00084	0.0336	1690
5	24	0.000035	1	0.00084	0.00336	169
6	14	0.0014	1	0.0196	0.11	5533
7	21	0.000013	1	0.0027	0.1	5030
8	13	0.0000019	1	0.000028	0.00112	56
Total				0.025	1	50300

For Kohat $P_i=47800$						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.00049	1	0.022	0.25	11950
2	37	0.00027	1	0.0099	0.1125	5377
3	24	0.00014	1	0.0034	0.039	1864
4	28	0.00009	1	0.0025	0.028	1338
5	24	0.000075	1	0.0018	0.02	956
6	14	0.000013	1	0.0018	0.02	956
7	21	0.0011	1	0.0242	0.277	13240
8	13	0.00052	1	0.0067	0.076	3639
Total				0.088	1	47800

For DI Khan=51500						
J	a_j	F_{aj}	K_{aj}	$a_j F_{aj} K_{aj}$	P_{aj}	Q_{aj}
1	45	0.000043	1	0.002	0.083	4275

2	37	0.000004	1	0.00015	0.00625	322
3	24	0.0000035	1	0.000084	0.000336	17
4	28	0.0000033	1	0.000092	0.0038	195
5	24	0.000003	1	0.00072	0.03	1545
6	14	0.0000019	1	0.000026	0.0011	51
7	21	0.0000052	1	0.00011	0.0046	206
8	13	0.0016	1	0.021	0.875	45062
Total				0.024	1	51500

$$1 = A_1 + A_2 + \dots + A_8 = 72783$$

$$2 = 322 + 1338 + \dots + 2412 = 47843$$

$$3 = 17 + 956 + \dots + 7370 = 96380$$

Like above we can find for every zone.

Ans2:

Uutos:

$$3.2 - 0.85C - 0.015A - 0.5W - 0.035R$$

$$C=300, W, A=6, W=4, R=25$$

Utility fuctins:

$$U(\text{uto}) = 3.2 - 0.85 * 300 - 0.5 * 4 - 0.015 * 6 - 0.035 * 25 = -254.765$$

Light circular rail:

$$1.0 - 0.35C - 0.025A - 0.7W - 0.055R$$

$$U(\text{LCR}) = 1 - 0.35 * 70 - 0.025 * 7 - 0.7 * 10 - 0.05 * 30 = -32.32$$

Local Bus:

$$1.7 - 0.15C - 0.075A - 0.9W - 0.075R$$

$$U(\text{LB}) = 1.7 - 0.075 * 50 - 0.07 * 10 - 0.9 * 15 - 0.075 * 40 = 23.5$$

Riding Bikes:

$$1.3 - 0.17C - 0.012A - 0.0W - 0.095R$$

$$U(\text{RB}) = 1.3 - 0.17 * 45 - 0.012 * 1 - 0.0 * 0 - 0.095 * 20 = -7.3$$

Rapid rail:

$$1.5 - 0.25C - 0.095A - 0.6W - 0.025R$$

$$U(\text{RR}) = 1.5 - 0.25 * 90 - 0.6 * 20 - 0.095 * 5 - 0.025 * 15 = -33.85$$

As known

$$P(K) = \frac{e^{uk}}{\sum_x e^{uk}}$$

$$P(A) = \frac{e^{-245.76}}{e^{-254.76} + e^{-26.9} + e^{-23.5} + e^{-7.3} + e^{33.85}} = 0$$

$$P(\text{LCR}) = \frac{e^{-32.9}}{6.75 * 10^{-4}} = 3.077$$

$$P(\text{LB}) = \frac{e^{-23.5}}{6.75 * 10^{-4}} = 0$$

$$P(\text{RB}) = \frac{e^{-7.3}}{6.75 * 10^{-4}} = 0$$

$$P(\text{RR}) = \frac{e^{-33.85}}{6.75 * 10^{-4}} = 0$$

B:

When give subsidizs:

Subsidize with:

Light circular rail by 30%= $0.3*70=21+70=91$

Local bus by 20%= $0.2*50=10+50=60$

Rapid rail 10%= $0.1*90=9+90=99$

$U(LCR)=1.0 - 0.35C - 0.025A - 0.7W - 0.055R=1-0.35*91-0.025*7-0.7*10-0.055*30=-39.67$

$U(LB)= 1.7 - 0.15C - 0.075A - 0.9W - 0.075R=1.7-0.15*60-0.075*10-0.9*15-0.075*40=-24.55$

$U(RR)= 1.5 - 0.25C - 0.095A - 0.6W - 0.025R=1.5-0.25*99-0.095*5-0.6*20-0.025*15=-36.1$

$$P(K)=\frac{e^{uk}}{\sum e^{ux}}$$

$$P(Lcr)=\frac{e^{-39.67}}{e^{-254.76}+e^{-39.76}+e^{-24.55}+e^{-36.1}+e^{33.85}} = \frac{5.9}{10.24} = 0.57$$

$$P(LB)=\frac{2.18}{10.240} = 0.21$$

$$P(LB)=\frac{1.16}{10.240} = 0.11$$

Total per day trips:

$Q(IJ) Lcr=0.57*30000=17100$

$QIJ LB=0.21*30000=5300$

$QI RL=0.11*30000=3300$

$QI Auto=0$

$QLB=0$

$$QBR=0$$

$$QRR=0$$

$$\text{Revenue for LCR}=17100*91=1547000$$

$$\text{Revenue for Local bus}=5300*60=318000$$

$$\text{Revenue for RL}=99*3300=326700$$

C

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

$$U=1.2-0.22*80-.015*4-0.65*5-0.02*10=-19.91$$

$$\text{auto cost}=1.15*300*1.15=396.75$$

$$\text{bike cost}=1.05*45=47.25$$

$$U_{\text{aut}}=-254.765$$

$$U_{\text{LCR}}=-39.67$$

$$U_{\text{RB}}=-7.3$$

$$U_{\text{LB}}=-24.55$$

$$U_{\text{RR}}=-36.1$$

Impedence FROM ZoneA TO OTHER Zones & nodes

Stage N	Link		Compute new path impedence			Compare to tree table Stage N-1	Decision
	i	j					
I	A	1	0	4	4	4 < Infinity	Accepted
II	1	2	4	3	7	7 < Infinity	Accepted
	1	4	4	3	7	7 < Infinity	Accepted
	2	1	7	3	10	10 > 4	Rejected
III	2	3	7	4	11	11 < Infinity	Accepted
	2	5	7	4	11	11 < Infinity	Accepted
	3	B	11	3	14	14 < Infinity	Accepted
	3	6	11	12	23	23 > 18	Rejected
	3	2	11	4	15	15 > 7	Rejected
	4	1	7	3	10	10 > 4	Rejected
	4	5	7	5	12	12 > 11	Rejected
	4	7	7	7	14	14 < Infinity	Accepted
	5	2	11	4	15	15 > 7	Rejected
	5	4	11	5	16	16 > 7	Rejected
	5	6	11	7	18	18 < Infinity	Accepted
	5	8	11	8	19	19 < Infinity	Accepted
	6	3	23	12	35	35 > 11	Rejected
	6	5	23	7	30	30 > 11	Rejected
	6	9	23	9	32	32 > 31	Rejected
	7	4	14	7	21	21 > 7	Accepted
	7	8	14	10	24	24 > 19	Rejected
	7	C	14	5	19	19 < Infinity	Accepted
iv	8	5	19	8	27	27 > 11	Rejected
	8	9	19	12	31	31 < Infinity	Accepted
	8	7	19	10	29	29 > 14	Rejected
	9	D	32	4	36	36 < Infinity	Accepted

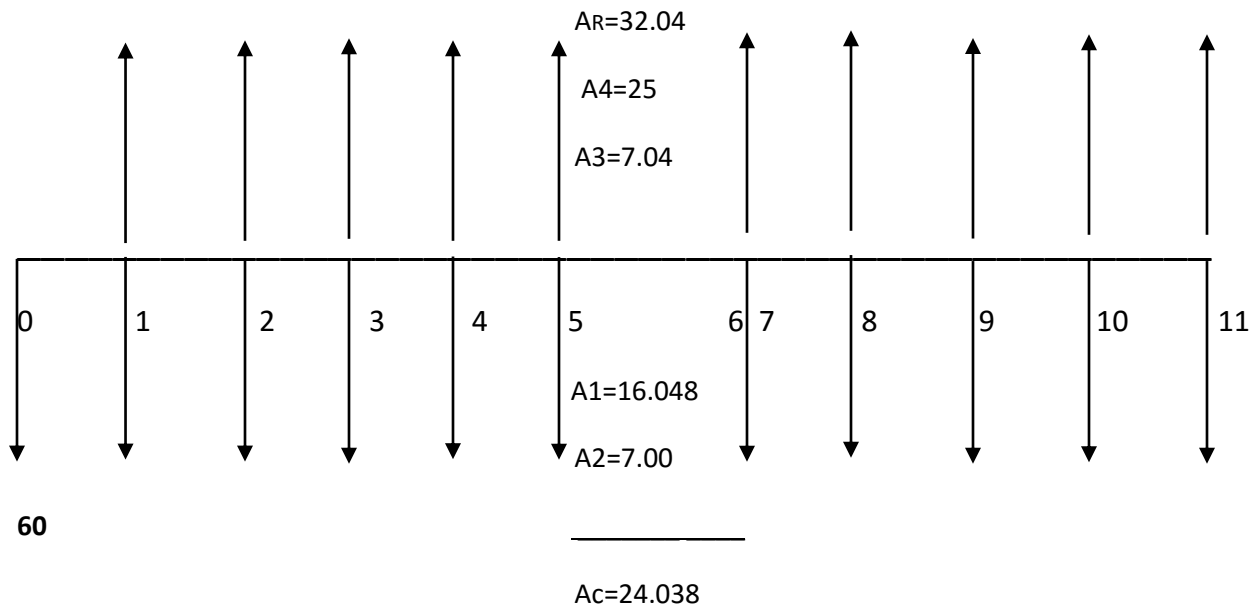
	9	8	32	12	44	44 > 19	Rejected
	9	6	32	9	41	41 > 18	Rejected

Minimum Impedance from Zone-A to all other zones and nodes after removal of rejected links

	Link		Compute new path impedance			Compare to tree table Stage N-1	Decision
	i	j					
I	A	1	0	4	4	4 < Infinity	Accepted
II	1	2	4	3	7	7 < Infinity	Accepted
	1	4	4	3	7	7 < Infinity	Accepted
III	2	3	7	4	11	11 < Infinity	Accepted
	2	5	7	4	11	11 < Infinity	Accepted
	3	B	11	3	14	14 < Infinity	Accepted
	4	7	7	7	14	14 < Infinity	Accepted
	5	6	11	7	18	18 < Infinity	Accepted
	5	8	11	8	19	19 < Infinity	Accepted
	7	4	14	7	21	21 > 7	Accepted
	7	C	14	5	19	19 < Infinity	Accepted
Iv	8	9	19	12	31	31 < Infinity	Accepted
	9	D	32	4	36	36 < Infinity	Accepted

Q 4:

For CNG:



Formula:

$$NPV = \text{initial cost} + A2 (P|A_c 7 \div 11|) - AR (P|AR 7 \div 11|)$$

Putting values

$$NPV = 60 + 180.260 - 240.267$$

$$NPV = 240.26 - 240.26$$

$$NPV = 0 = 0.007$$

For BRT:

$$NPV = 50 + 31.705(7.943) - 38(7.943)$$

$$NPV = 50 + 251.8 - 301.8$$

$$\text{NPV} = 0 = 0.001185$$

For light Rail:

$$\text{NPV} = 66 + 35.554 (8.863) - 43 (8.863)$$

$$\text{NPO} = 0 = 0.006102$$

For fast Train:

$$\text{NPV} = 95 + 50.477(8.244) - 57 (8.244)$$

$$\text{NPV} = 41.22$$

For Metro:

$$\text{NPV} = 70 + 44.535 (10.828) - 51 (10.828)$$

$$\text{NPV} = 0 = 0.00302$$

Conclusion:

According to my observation the fast train is more expensive than the rest of the alternatives.

And the other NPA are zero but I Recommend the BRT.