Formazione IFEL
per i Comuni

Offerta economicamente più vantaggiosa: modalità applicative ed esempi

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iFEL
Fondazione ANCI

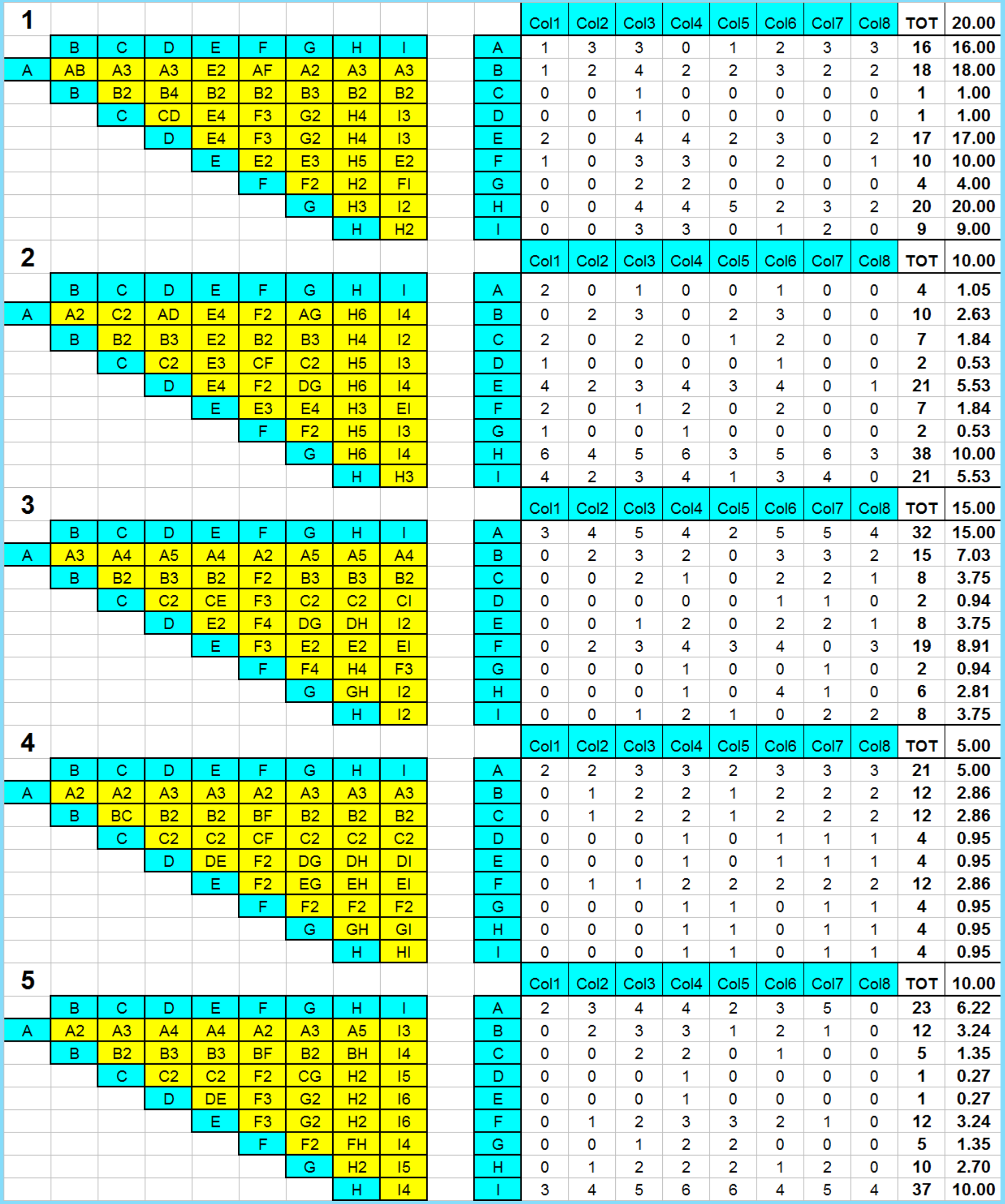
LAVORI DI MANUTENZIONE SULLE AREE A VERDE DEL TERRITORIO COMUNALE

- 5 Criteri qualitativi
- 1 Criterio quantitativo
- 1 Offerta economica in ribasso %

Metodi applicati

- Confronto a coppie somma dei coefficienti e doppia parametrizzazione Offerta economica lineare
- Confronto a coppie somma dei coefficienti e doppia parametrizzazione Offerta economica bi-lineare
- Confronto a coppie Autovettore Offerta economica lineare
- Confronto a coppie Autovettore Offerta economica bi-lineare
- Electre
- Topsis

Confronto a Coppie



1

	B	C	D	E	F	G	H	I
A	AB	A3	A3	E2	AF	A2	A3	A3
	B	B2	B4	B2	B2	B3	B2	B2
		C	CD	E4	F3	G2	H4	I3
			D	E4	F3	G2	H4	I3
				E	E2	E3	H5	E2
					F	F2	H2	FI
						G	H3	I2
							H	H2

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	TOT	20.00
A	1	3	3	0	1	2	3	3	**16**	**16.00**
B	1	2	4	2	2	3	2	2	**18**	**18.00**
C	0	0	1	0	0	0	0	0	**1**	**1.00**
D	0	0	1	0	0	0	0	0	**1**	**1.00**
E	2	0	4	4	2	3	0	2	**17**	**17.00**
F	1	0	3	3	0	2	0	1	**10**	**10.00**
G	0	0	2	2	0	0	0	0	**4**	**4.00**
H	0	0	4	4	5	2	3	2	**20**	**20.00**
I	0	0	3	3	0	1	2	0	**9**	**9.00**

2

	B	C	D	E	F	G	H	I
A	A2	C2	AD	E4	F2	AG	H6	I4
	B	B2	B3	E2	B2	B3	H4	I2
		C	C2	E3	CF	C2	H5	I3
			D	E4	F2	DG	H6	I4
				E	E3	E4	H3	EI
					F	F2	H5	I3
						G	H6	I4
							H	H3

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	TOT	10.00
A	2	0	1	0	0	1	0	0	**4**	**1.05**
B	0	2	3	0	2	3	0	0	**10**	**2.63**
C	2	0	2	0	1	2	0	0	**7**	**1.84**
D	1	0	0	0	0	1	0	0	**2**	**0.53**
E	4	2	3	4	3	4	0	1	**21**	**5.53**
F	2	0	1	2	0	2	0	0	**7**	**1.84**
G	1	0	0	1	0	0	0	0	**2**	**0.53**
H	6	4	5	6	3	5	6	3	**38**	**10.00**
I	4	2	3	4	1	3	4	0	**21**	**5.53**

3

	B	C	D	E	F	G	H	I
A	A3	A4	A5	A4	A2	A5	A5	A4
	B	B2	B3	B2	F2	B3	B3	B2
		C	C2	CE	F3	C2	C2	CI
			D	E2	F4	DG	DH	I2
				E	F3	E2	E2	EI
					F	F4	H4	F3
						G	GH	I2
							H	I2

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	TOT	15.00
A	3	4	5	4	2	5	5	4	**32**	**15.00**
B	0	2	3	2	0	3	3	2	**15**	**7.03**
C	0	0	2	1	0	2	2	1	**8**	**3.75**
D	0	0	0	0	0	1	1	0	**2**	**0.94**
E	0	0	1	2	0	2	2	1	**8**	**3.75**
F	0	2	3	4	3	4	0	3	**19**	**8.91**
G	0	0	0	1	0	0	1	0	**2**	**0.94**
H	0	0	0	1	0	4	1	0	**6**	**2.81**
I	0	0	1	2	1	0	2	2	**8**	**3.75**

4

	B	C	D	E	F	G	H	I
A	A2	A2	A3	A3	A2	A3	A3	A3
	B	BC	B2	B2	BF	B2	B2	B2
		C	C2	C2	CF	C2	C2	C2
			D	DE	F2	DG	DH	DI
				E	F2	EG	EH	EI
					F	F2	F2	F2
						G	GH	GI
							H	HI

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	TOT	5.00
A	2	2	3	3	2	3	3	3	**21**	**5.00**
B	0	1	2	2	1	2	2	2	**12**	**2.86**
C	0	1	2	2	1	2	2	2	**12**	**2.86**
D	0	0	0	1	0	1	1	1	**4**	**0.95**
E	0	0	0	1	0	1	1	1	**4**	**0.95**
F	0	1	1	2	2	2	2	2	**12**	**2.86**
G	0	0	0	1	1	0	1	1	**4**	**0.95**
H	0	0	0	1	1	0	1	1	**4**	**0.95**
I	0	0	0	1	1	0	1	1	**4**	**0.95**

5

	B	C	D	E	F	G	H	I
A	A2	A3	A4	A4	A2	A3	A5	I3
	B	B2	B3	B3	BF	B2	BH	I4
		C	C2	C2	F2	CG	H2	I5
			D	DE	F3	G2	H2	I6
				E	F3	G2	H2	I6
					F	F2	FH	I4
						G	H2	I5
							H	I4

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	TOT	10.00
A	2	3	4	4	2	3	5	0	**23**	**6.22**
B	0	2	3	3	1	2	1	0	**12**	**3.24**
C	0	0	2	2	0	1	0	0	**5**	**1.35**
D	0	0	0	1	0	0	0	0	**1**	**0.27**
E	0	0	0	1	0	0	0	0	**1**	**0.27**
F	0	1	2	3	3	2	1	0	**12**	**3.24**
G	0	0	1	2	2	0	0	0	**5**	**1.35**
H	0	1	2	2	2	1	2	0	**10**	**2.70**
I	3	4	5	6	6	4	5	4	**37**	**10.00**

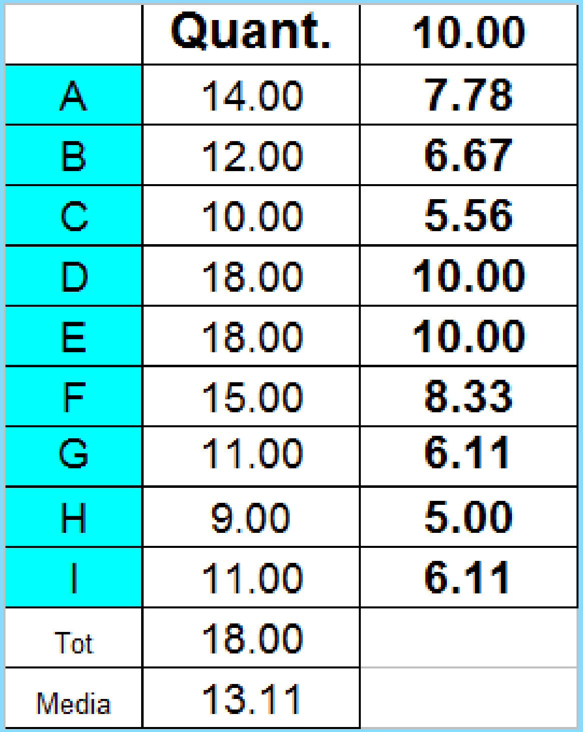
Confronto a Coppie

1								
	B	C	D	E	F	G	H	I
A	AB	A3	A3	E2	AF	A2	A3	A3
	B	B2	B4	B2	B2	B3	B2	B2
		C	CD	E4	F3	G2	H4	I3
			D	E4	F3	G2	H4	I3
				E	E2	E3	H5	E2
					F	F2	H2	FI
						G	H3	I2
							H	H2

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	**TOT**	**20.00**
A	1	3	3	0	1	2	3	3	**16**	**16.00**
B	1	2	4	2	2	3	2	2	**18**	**18.00**
C	0	0	1	0	0	0	0	0	**1**	**1.00**
D	0	0	1	0	0	0	0	0	**1**	**1.00**
E	2	0	4	4	2	3	0	2	**17**	**17.00**
F	1	0	3	3	0	2	0	1	**10**	**10.00**
G	0	0	2	2	0	0	0	0	**4**	**4.00**
H	0	0	4	4	5	2	3	2	**20**	**20.00**
I	0	0	3	3	0	1	2	0	**9**	**9.00**

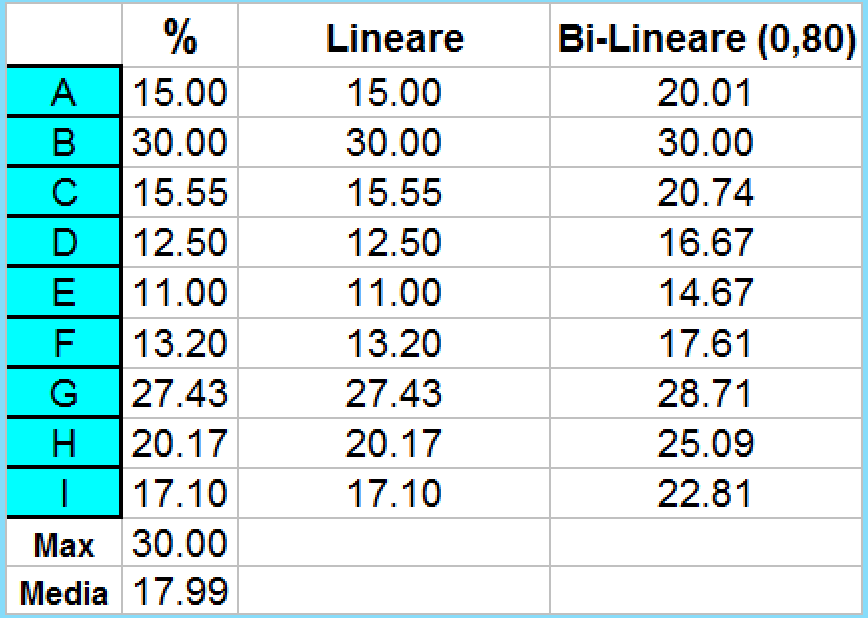
	TOT	**60.00**
A	**43.27**	**60.00**
B	**33.76**	**46.82**
C	**10.80**	**14.98**
D	**3.69**	**5.11**
E	**27.50**	**38.13**
F	**26.85**	**37.23**
G	**7.77**	**10.77**
H	**36.47**	**50.57**
I	**29.23**	**40.53**

Criterio Quantitativo



	Quant.	10.00
A	14.00	**7.78**
B	12.00	**6.67**
C	10.00	**5.56**
D	18.00	**10.00**
E	18.00	**10.00**
F	15.00	**8.33**
G	11.00	**6.11**
H	9.00	**5.00**
I	11.00	**6.11**
Tot	18.00	
Media	13.11	

Offerta Economica



	%	Lineare	Bi-Lineare (0,80)
A	15.00	15.00	20.01
B	30.00	30.00	30.00
C	15.55	15.55	20.74
D	12.50	12.50	16.67
E	11.00	11.00	14.67
F	13.20	13.20	17.61
G	27.43	27.43	28.71
H	20.17	20.17	25.09
I	17.10	17.10	22.81
Max	30.00		
Media	17.99		

Lineare

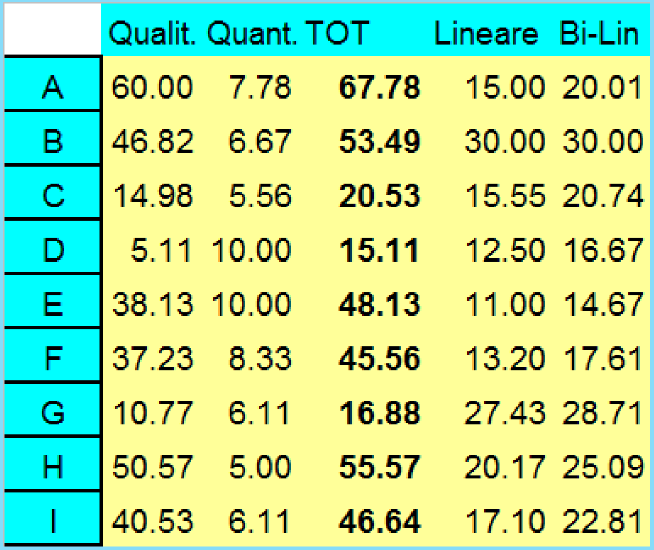
$$P_i = Punt * \frac{R_i}{R_{MAX}}$$

Bi-Lineare con X=0,80

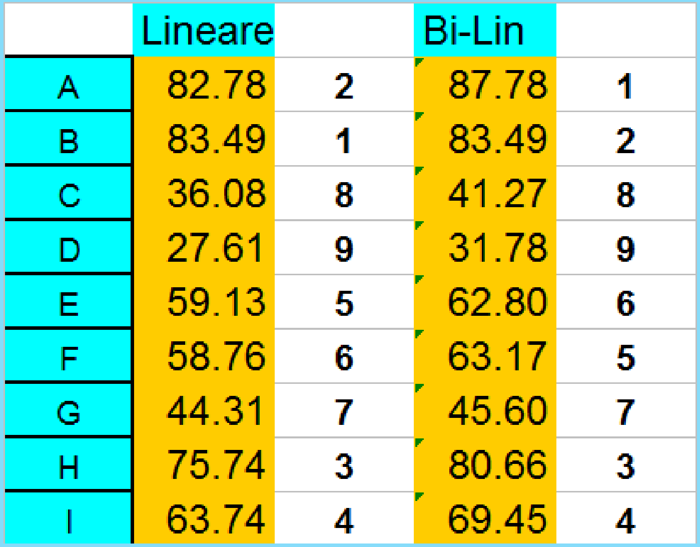
$$R_i <= R_{Media} \qquad P_i = Punt * X * \frac{R_i}{R_{MAX}}$$

$$R_i > R_{Media} \qquad P_i = Punt * (X + (1 - X) * \frac{R_i - R_{Media}}{R_{MAX} - R_{Media}})$$

Punteggio Finale

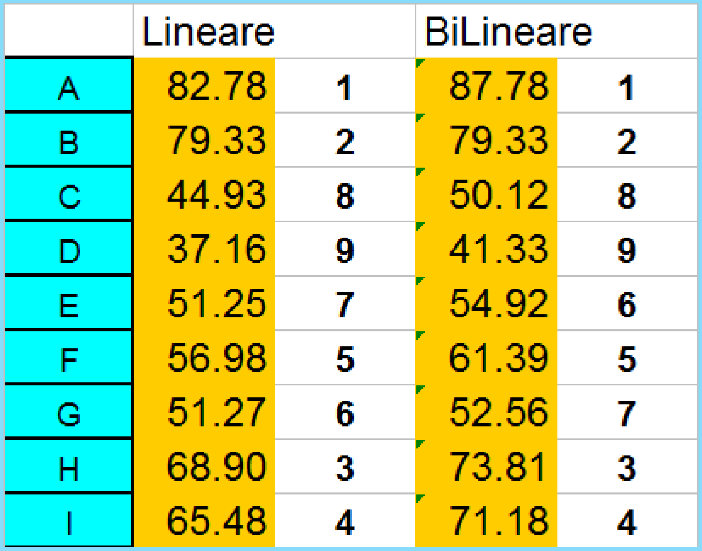


	Qualit.	Quant.	TOT	Lineare	Bi-Lin
A	60.00	7.78	**67.78**	15.00	20.01
B	46.82	6.67	**53.49**	30.00	30.00
C	14.98	5.56	**20.53**	15.55	20.74
D	5.11	10.00	**15.11**	12.50	16.67
E	38.13	10.00	**48.13**	11.00	14.67
F	37.23	8.33	**45.56**	13.20	17.61
G	10.77	6.11	**16.88**	27.43	28.71
H	50.57	5.00	**55.57**	20.17	25.09
I	40.53	6.11	**46.64**	17.10	22.81



	Lineare		Bi-Lin	
A	82.78	**2**	87.78	**1**
B	83.49	**1**	83.49	**2**
C	36.08	**8**	41.27	**8**
D	27.61	**9**	31.78	**9**
E	59.13	**5**	62.80	**6**
F	58.76	**6**	63.17	**5**
G	44.31	**7**	45.60	**7**
H	75.74	**3**	80.66	**3**
I	63.74	**4**	69.45	**4**

Autovettore



	Lineare		BiLineare	
A	82.78	**1**	87.78	**1**
B	79.33	**2**	79.33	**2**
C	44.93	**8**	50.12	**8**
D	37.16	**9**	41.33	**9**
E	51.25	**7**	54.92	**6**
F	56.98	**5**	61.39	**5**
G	51.27	**6**	52.56	**7**
H	68.90	**3**	73.81	**3**
I	65.48	**4**	71.18	**4**

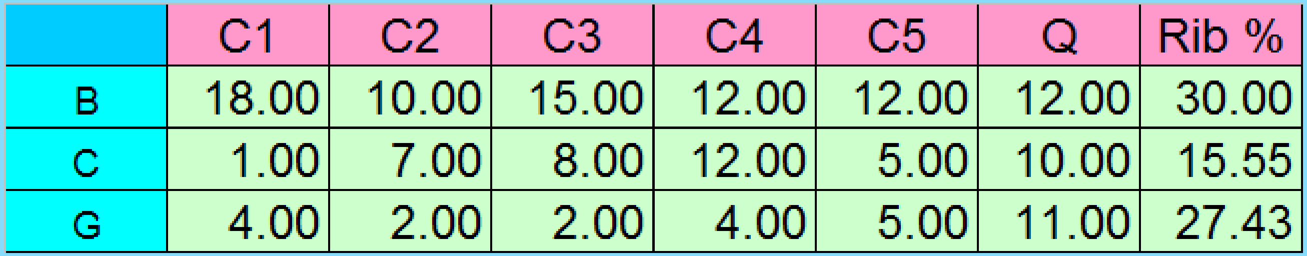
Electre e Topsis

	C1	C2	C3	C4	C5	Q	Rib %
A	16.00	4.00	32.00	21.00	23.00	14.00	15.00
B	18.00	10.00	15.00	12.00	12.00	12.00	30.00
C	1.00	7.00	8.00	12.00	5.00	10.00	15.55
D	1.00	2.00	2.00	4.00	1.00	18.00	12.50
E	17.00	21.00	8.00	4.00	1.00	18.00	11.00
F	10.00	7.00	19.00	12.00	12.00	15.00	13.20
G	4.00	2.00	2.00	4.00	5.00	11.00	27.43
H	20.00	38.00	6.00	4.00	10.00	9.00	20.17
I	9.00	21.00	8.00	4.00	37.00	11.00	17.10
Peso (P)	20	10	15	5	10	10	30
Max Diff (S)	19.00	36.00	30.00	17.00	36.00	9.00	19.00

Electre

Il metodo matematico consiste nel costruire, sulla base dei giudizi dei commissari 2 matrici dette di Concordanza e Discordanza.

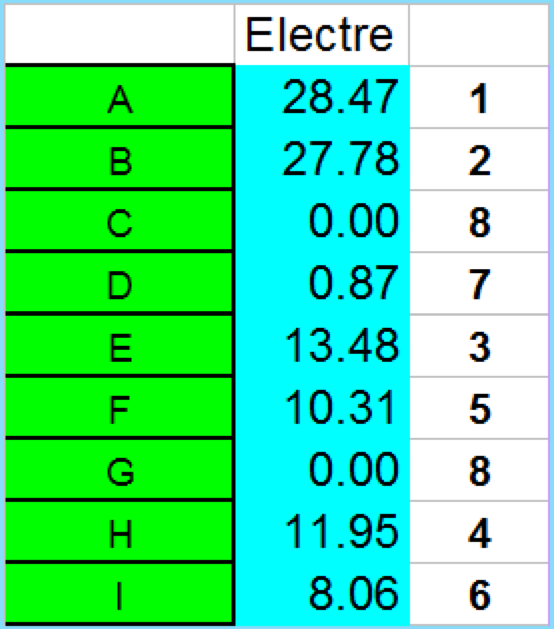
Da queste viene dedotto l’indice di dominanza che determina la classifica finale.



	C1	C2	C3	C4	C5	Q	Rib %
B	18.00	10.00	15.00	12.00	12.00	12.00	30.00
C	1.00	7.00	8.00	12.00	5.00	10.00	15.55
G	4.00	2.00	2.00	4.00	5.00	11.00	27.43

B domina sia C che G

Electre



	Electre	
A	28.47	**1**
B	27.78	**2**
C	0.00	**8**
D	0.87	**7**
E	13.48	**3**
F	10.31	**5**
G	0.00	**8**
H	11.95	**4**
I	8.06	**6**

Topsis

	C1
A	16.00
B	18.00
C	1.00
D	1.00
E	17.00
F	10.00
G	4.00
H	20.00
I	9.00
Peso (P)	20

$$P_B = \frac{C_B * 20}{\sqrt{C_A^2 + C_B^2 + C_C^2 + C_D^2 + C_E^2 + C_F^2 + C_G^2 + C_H^2 + C_I^2}}$$

	C1	C2	C3	C4	C5	Q	Prezzo
A	8.35	0.79	11.17	3.40	4.76	3.46	7.87
B	9.40	1.98	5.24	1.94	2.48	2.97	15.74
C	0.52	1.39	2.79	1.94	1.03	2.47	8.16
D	0.52	0.40	0.70	0.65	0.21	4.45	6.56
E	8.87	4.16	2.79	0.65	0.21	4.45	5.77
F	5.22	1.39	6.63	1.94	2.48	3.71	6.93
G	2.09	0.40	0.70	0.65	1.03	2.72	14.39
H	10.44	7.53	2.09	0.65	2.07	2.23	10.58
I	4.70	4.16	2.79	0.65	7.65	2.72	8.97

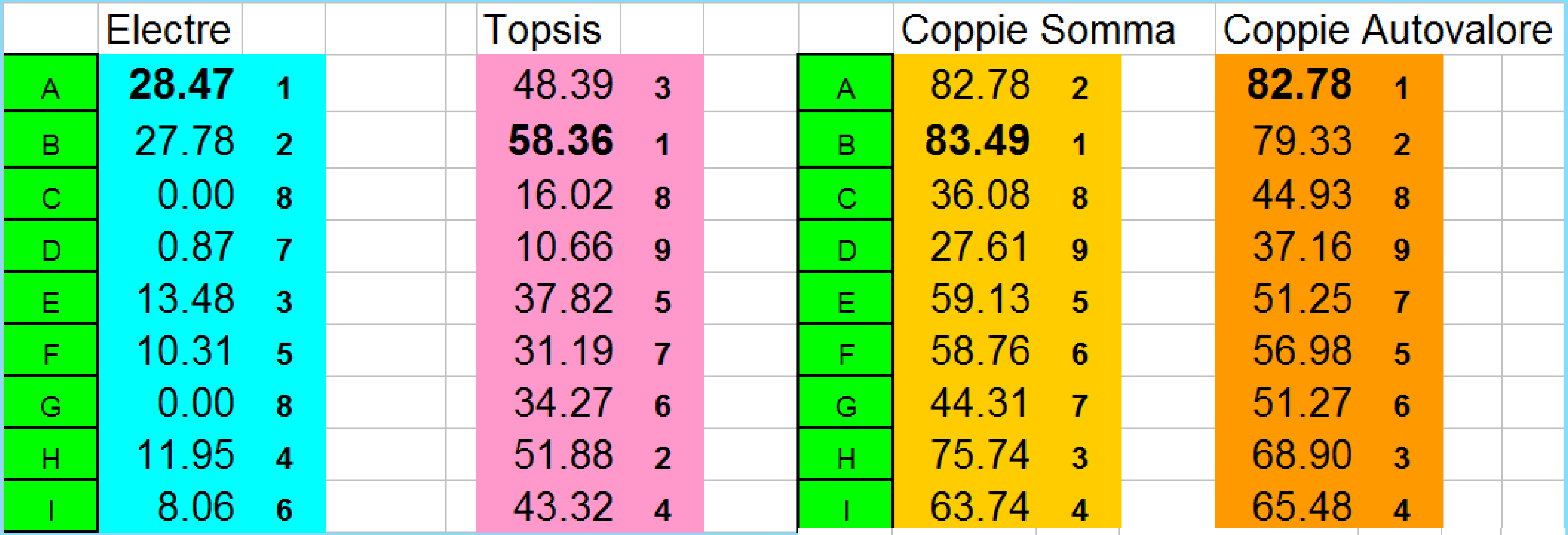
Topsis

	C1	C2	C3	C4	C5	Q	Prezzo
Ideale	10.44	7.53	11.17	3.40	7.65	4.45	15.74
Non Ideale	0.52	0.40	0.70	0.65	0.21	2.23	5.77

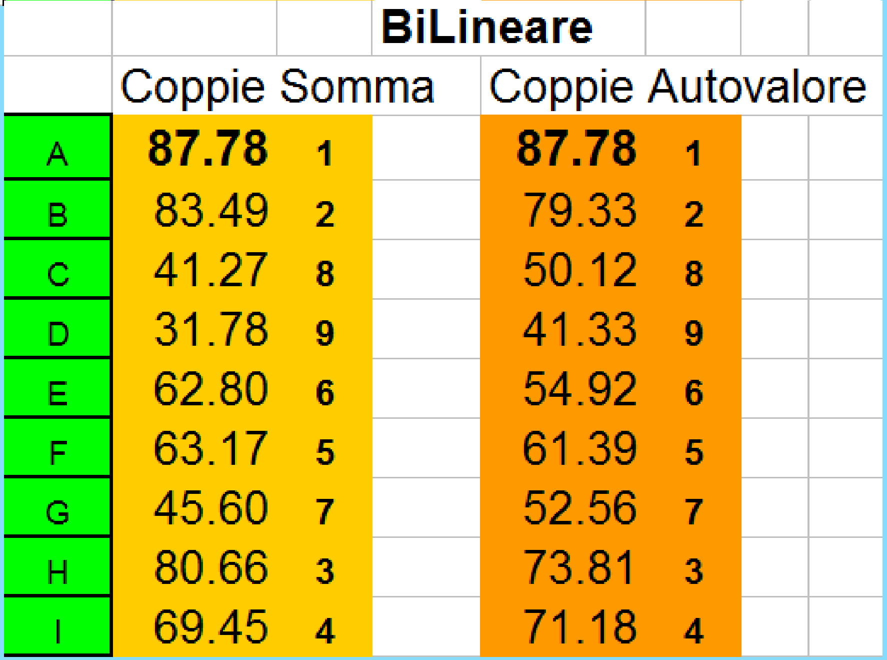
	Distanza dalla Sol. Ideale	Sol. NON Ideale
A	11.00	10.31
B	9.91	13.88
C	17.71	3.38
D	20.16	2.40
E	15.70	9.55
F	13.88	6.29
G	16.93	8.82
H	12.36	13.32
I	13.07	9.99

	Vicinanza alla soluzione Ideale
A	0.48
B	0.58
C	0.16
D	0.11
E	0.38
F	0.31
G	0.34
H	0.52
I	0.43

Soluzioni a confronto



	Electre		Topsis			Coppie Somma		Coppie Autovalore	
A	**28.47**	1	48.39	3	A	82.78	2	**82.78**	1
B	27.78	2	**58.36**	1	B	**83.49**	1	79.33	2
C	0.00	8	16.02	8	C	36.08	8	44.93	8
D	0.87	7	10.66	9	D	27.61	9	37.16	9
E	13.48	3	37.82	5	E	59.13	5	51.25	7
F	10.31	5	31.19	7	F	58.76	6	56.98	5
G	0.00	8	34.27	6	G	44.31	7	51.27	6
H	11.95	4	51.88	2	H	75.74	3	68.90	3
I	8.06	6	43.32	4	I	63.74	4	65.48	4



BiLineare

	Coppie Somma		Coppie Autovalore	
A	**87.78**	1	**87.78**	1
B	83.49	2	79.33	2
C	41.27	8	50.12	8
D	31.78	9	41.33	9
E	62.80	6	54.92	6
F	63.17	5	61.39	5
G	45.60	7	52.56	7
H	80.66	3	73.81	3
I	69.45	4	71.18	4

Formazione IFEL
per i Comuni

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Alessandro Antonini
Antonio Bertelli

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