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MADM

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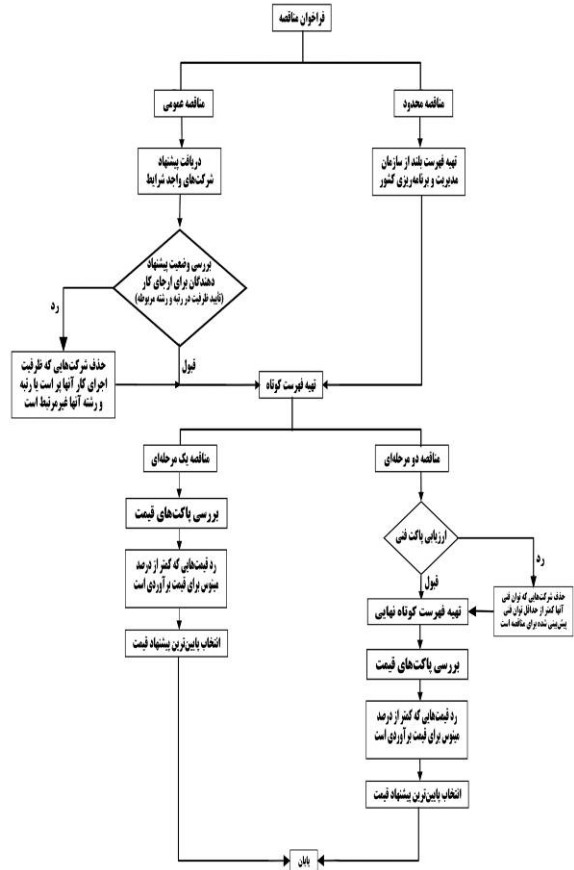
[-]

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[-]

(VP)

(P)



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(P)

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(P)

$$P = 0.5 P_t + 1.5 P_c + P_L$$

()

= P_t

(Plus)

(Minus)

= P_c

= P_L

[]

VP	P	MLP	F	MLS	S	VS	
18-100%	15-18%	12-15%	10-12%	8-10%	5-8%	0-5%	Minus (-)%
13-100%	11-13%	9-11%	7-9%	5-7%	3-5%	0-3%	Plus (+)%

(E) -

()

MADM -

(E) : ()

) . $E = E_p + E_w + E_c$ ()

(: = Ec

MADM MADM = E_w

= E_p

MADM - $E_p \quad E_w \quad E_c$

()

(Q) -

« » (M) -
(... ISO)

(T) -

(D₁, D₂, D₃)

k
m (D₁, D₂, ..., D_k)

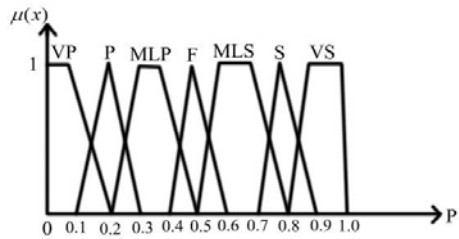
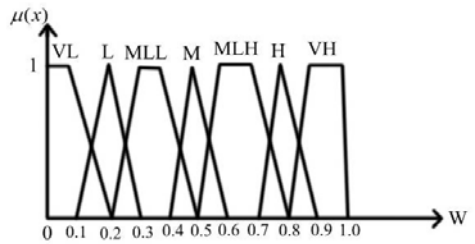
m
(A₁, A₂, ..., A_m)

MADM

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معیار	گزینه	کمیته تصمیم گیران			
		D ₁	D ₂	D _k
C ₁ (BP)	A ₁	S	VS	MLS
	A ₂	VS	VS	S
	⋮	⋮	⋮	⋮
	A _m	MLP	F	P
C ₂ (P)	A ₁	VS	S	VS
	A ₂	F	F	.....	MLP
	⋮	⋮	⋮	⋮
	A _m	S	VS	.....	S
C ₃ (E)	A ₁	MLS	S	.....	S
	A ₂	P	MLP	.....	MLP
	⋮	⋮	⋮	⋮
	A _m	MLS	S	.....	MLS
C ₄ (Q)	A ₁	VS	VS	.....	S
	A ₂	F	MLS	F
	⋮	⋮	⋮	⋮
	A _m	S	S	VS
C ₅ (M)	A ₁	MLS	S	MLS
	A ₂	F	MLP	MLP
	⋮	⋮	⋮	⋮
	A _m	VP	P	P
C ₆ (T)	A ₁	VS	VS	S
	A ₂	MLP	P	MLP
	⋮	⋮	⋮	⋮
	A _m	MLS	S	S

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k

(Very High) VH

m

()

(S)

m

(VS)

()

(MLP)

معیار تصمیم گیری	کمیته تصمیم گیران			
	D ₁	D ₂	D _k
C ₁ (BP)	VH	VH	VH
C ₂ (P)	H	VH	.....	H
C ₃ (E)	MLH	H	.....	H
C ₄ (Q)	MLH	M	.....	MLL
C ₅ (M)	M	MLL	.....	L
C ₆ (T)	VH	H	.....	H

گزینه	معیار تصمیم گیری					
	BP	P	E	Q	M	T
	(a ₁ , b ₁ , c ₁ , d ₁)	(a ₂ , b ₂ , c ₂ , d ₂)	(a ₃ , b ₃ , c ₃ , d ₃)	(a ₄ , b ₄ , c ₄ , d ₄)	(a ₅ , b ₅ , c ₅ , d ₅)	(a ₆ , b ₆ , c ₆ , d ₆)
A ₁	(a ₁₁ , b ₁₁ , c ₁₁ , d ₁₁)	(a ₁₂ , b ₁₂ , c ₁₂ , d ₁₂)	(a ₁₃ , b ₁₃ , c ₁₃ , d ₁₃)	(a ₁₄ , b ₁₄ , c ₁₄ , d ₁₄)	(a ₁₅ , b ₁₅ , c ₁₅ , d ₁₅)	(a ₁₆ , b ₁₆ , c ₁₆ , d ₁₆)
A ₂	(a ₂₁ , b ₂₁ , c ₂₁ , d ₂₁)	(a ₂₂ , b ₂₂ , c ₂₂ , d ₂₂)	(a ₂₃ , b ₂₃ , c ₂₃ , d ₂₃)	(a ₂₄ , b ₂₄ , c ₂₄ , d ₂₄)	(a ₂₅ , b ₂₅ , c ₂₅ , d ₂₅)	(a ₂₆ , b ₂₆ , c ₂₆ , d ₂₆)
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A _m	(a _{m1} , b _{m1} , c _{m1} , d _{m1})	(a _{m2} , b _{m2} , c _{m2} , d _{m2})	(a _{m3} , b _{m3} , c _{m3} , d _{m3})	(a _{m4} , b _{m4} , c _{m4} , d _{m4})	(a _{m5} , b _{m5} , c _{m5} , d _{m5})	(a _{m6} , b _{m6} , c _{m6} , d _{m6})

$$S_L(A) = 1 - \frac{c}{1 + d - c} \quad () \quad :$$

$$S_R(A) = 1 - \frac{1 - b}{1 + b - a} \quad () \quad ()$$

$$S_T(A) = [S_R(A) + 1 - S_L(A)] / 2 \quad () \quad ()$$

()

$$\hat{W}_j = W_j / \sum_{j=1}^n W_j \quad ()$$

$$\hat{R}_{ij} = R_{ij} / \sum_{i=1}^m R_{ij} \quad ()$$

$$\hat{R}_j = \min_i R_{ij} / R_{ij} \quad ()$$

$$\hat{R}_{ij} = R_{ij} / \max_i R_{ij} \quad ()$$

()

$$W_j = \frac{1}{k} \otimes [W_{j1} \oplus W_{j2} \oplus \dots \oplus W_{jk}], j=1,2,\dots,n \quad ()$$

$$R_{ij} = \frac{1}{k} \otimes [R_{ij1} \oplus R_{ij2} \oplus \dots \oplus R_{ijk}] \quad ()$$

(i = 1, 2, 3, ..., m) (j = 1, 2, 3, ..., n)

(a_j, b_j, c_j, d_j)

(a_{ij}, b_{ij}, c_{ij}, d_{ij})

j

i

(i=1,2,3,...,m), (j=1,2,3,4, 5,6)

⋮

(Crisp)

« » (Supp(A) ∈ (0,1))

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()

(0, 1)

A=(a, b, c, d)

⋮

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گزینه	معیار تصمیم گیری					
	BP	P	E	Q	M	T
	W ₁	W ₂	W ₃	W ₄	W ₅	W ₆
A ₁	R ₁₁	R ₁₂	R ₁₃	R ₁₄	R ₁₅	R ₁₆
A ₂	R ₂₁	R ₂₂	R ₂₃	R ₂₄	R ₂₅	R ₂₆
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A _m	R _{m1}	R _{m2}	R _{m3}	R _{m4}	R _{m5}	R _{m6}

W₆ W₁

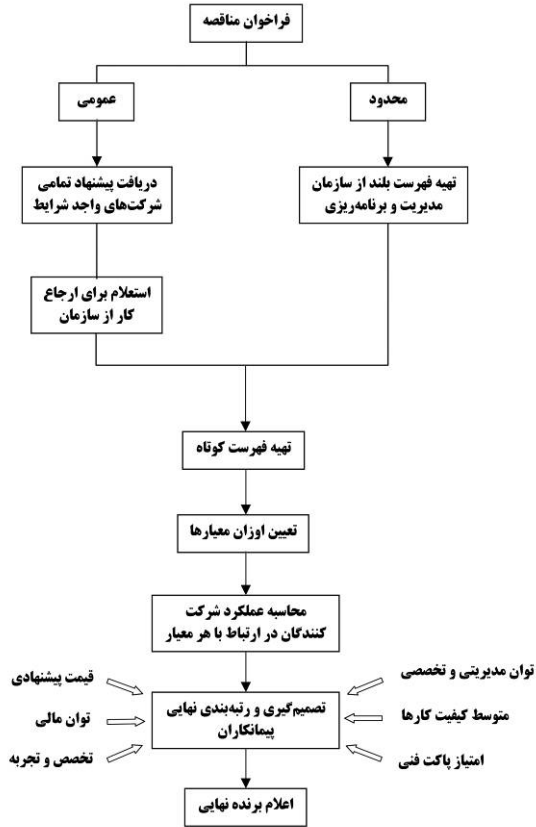
()

R_{ij}

j

i

(i = 1, 2, ..., m), (j = 1, 2, ..., 6) .



SAW

SAW

SAW

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R_{ij}

j

i

j

W_j

()

$$R_i = \sum_{j=1}^n W_j \cdot R_{ij} \quad (i = 1, 2, \dots, m) \quad ()$$

R_i

()

$$R_1 = R_{11}(W_1) + R_{12}(W_2) + R_{13}(W_3) + R_{14}(W_4) + R_{15}(W_5) + R_{16}(W_6)$$

$$R_2 = R_{21}(W_1) + R_{22}(W_2) + R_{23}(W_3) + R_{24}(W_4) + R_{25}(W_5) + R_{26}(W_6)$$

⋮

$$R_n = R_{n1}(W_1) + R_{n2}(W_2) + R_{n3}(W_3) + R_{n4}(W_4) + R_{n5}(W_5) + R_{n6}(W_6)$$

() ()

$$\max \{R_1, R_2, \dots, R_n\}$$

معیار تصمیم گیری	کمیته تصمیم گیران		
	D ₁	D ₂	D ₃
C ₁ (BP)	VH	VH	VH
C ₂ (P)	H	MLH	MLH
C ₃ (E)	MLH	H	MLH
C ₄ (Q)	M	MLH	MLH
C ₅ (M)	MLL	M	M
C ₆ (T)	H	MLH	H

(T)

معیار تصمیم گیری	کمیته تصمیم گیران			میانگین فازی
	D ₁	D ₂	D ₃	
C ₁ (BP)	(0,8,0,9,1,0,1,0)	(0,8,0,9,1,0,1,0)	(0,8,0,9,1,0,1,0)	(0,8,0,9,1,0,1,0)
C ₂ (P)	(0,7,0,8,0,8,0,9)	(0,5,0,6,0,7,0,8)	(0,5,0,6,0,7,0,8)	(0,57,0,67,0,73,0,83)
C ₃ (E)	(0,5,0,6,0,7,0,8)	(0,7,0,8,0,8,0,9)	(0,5,0,6,0,7,0,8)	(0,57,0,67,0,73,0,83)
C ₄ (Q)	(0,4,0,5,0,5,0,6)	(0,5,0,6,0,7,0,8)	(0,5,0,6,0,7,0,8)	(0,47,0,57,0,63,0,73)
C ₅ (M)	(0,2,0,3,0,4,0,5)	(0,4,0,5,0,5,0,6)	(0,4,0,5,0,5,0,6)	(0,33,0,43,0,47,0,57)
C ₆ (T)	(0,7,0,8,0,8,0,9)	(0,5,0,6,0,7,0,8)	(0,7,0,8,0,8,0,9)	(0,63,0,73,0,77,0,87)

معیار	گزینه	کمیته تصمیم گیران			میانگین فازی
		D ₁	D ₂	D ₃	
C ₆ (T)	زالکه	VP	VP	VP	(0,0,0,0,1,0,2)
	پویاراهیر + هیرید نیرو	MLP	MLP	F	(0,27,0,37,0,43,0,53)
	ماشین سازی اراک	S	S	VS	(0,73,0,83,0,87,0,93)
	پتروپارت	VS	VS	VS	(0,77,0,87,0,93,0,97)
	متک	VS	VS	VS	(0,8,0,9,1,0,1,0)
	مهندسی و ساختمان ماشین سازی اراک	VS	VS	VS	(0,8,0,9,1,0,1,0)
	نصب نیرو	VS	VS	VS	(0,8,0,9,1,0,1,0)
	قرارگاه خاتم الانبیا	S	MLS	S	(0,63,0,73,0,77,0,87)
	آسفالت طوس	F	F	F	(0,4,0,5,0,5,0,6)
	سدید جهان صنعت	F	F	F	(0,4,0,5,0,5,0,6)
	آرون آب	P	P	P	(0,1,0,2,0,2,0,3)
	نیروپارس	P	VP	P	(0,07,0,13,0,17,0,27)
	طرح و بازرسی	P	VP	VP	(0,03,0,07,0,13,0,23)
	پایدار فولاد پیشرو	VP	VP	VP	(0,0,0,0,0,1,0,2)
	خوشاوند	VP	VP	VP	(0,0,0,0,0,1,0,2)
	پارس کیهان	VP	VP	VP	(0,0,0,0,0,1,0,2)
	رادیرا	VP	VP	VP	(0,0,0,0,0,1,0,2)
	قادر نصب + خردکاوه	VP	VP	VP	(0,0,0,0,0,1,0,2)
	طیف شیمی	VP	VP	VP	(0,0,0,0,0,1,0,2)

ردیف	نام شرکت	قیمت پیشنهادی
۱	زالکه	۷۹,۳۵۱,۳۲۴,۹۰۴
۲	پویاراهیر + هیرید نیرو	۸۷,۴۸۸,۳۱۳,۱۳۴
۳	ماشین سازی اراک	۹۴,۰۷۲,۷۱۷,۶۷۸
۴	پتروپارت	۹۶,۷۱۸,۴۷۰,۷۴۵
۵	متک	۹۹,۰۰۰,۰۰۰,۰۰۰
۶	مهندسی و ساختمان ماشین سازی اراک	۹۹,۷۱۶,۷۵۶,۵۱۴
۷	نصب نیرو	۱۰۱,۳۵۱,۷۶۱,۷۴۷
۸	قرارگاه خاتم الانبیا	۱۰۵,۲۷۷,۵۶۶,۴۱۷
۹	آسفالت طوس	۱۰۸,۷۶۱,۸۲۸,۳۶۸
۱۰	سدید جهان صنعت	۱۰۹,۰۰۰,۰۰۰,۰۰۰
۱۱	آرون آب	۱۱۳,۱۴۲,۵۱۳,۰۰۰
۱۲	نیروپارس	۱۱۴,۹۳۰,۰۰۰,۰۰۰
۱۳	طرح و بازرسی	۱۱۵,۰۰۰,۰۰۰,۰۰۰
۱۴	پایدار فولاد پیشرو	۱۱۷,۲۴۳,۹۵۳,۱۲۰
۱۵	خوشاوند	۱۲۰,۶۸۳,۰۹۵,۱۹۶
۱۶	پارس کیهان	۱۳۸,۷۱۳,۰۸۷,۶۲۵
۱۷	رادیرا	۱۴۳,۸۰۳,۸۰۹,۹۵۵
۱۸	قادر نصب + خردکاوه	۱۴۸,۴۷۹,۸۱۵,۸۵۵
۱۹	طیف شیمی	۱۵۱,۰۰۰,۰۰۰,۰۰۰

(W_j)(R_{ij})

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ردیف	گزینه	معیار تصمیم گیری					
		BP (0.8,0.9,1.0,1.0)	P (0.57,0.67,0.73,0.83)	E (0.57,0.67,0.73,0.83)	Q (0.47,0.57,0.63,0.73)	M (0.33,0.43,0.47,0.57)	T (0.63,0.73,0.77,0.87)
۱	ژالکه	(0.0,0.0,0.1,0.2)	(0.8,0.9,1.0,1.0)	(0.57,0.67,0.73,0.83)	(0.8,0.9,1.0,1.0)	(0.73,0.83,0.87,0.93)	(0.33,0.43,0.47,0.57)
۲	پویا راهبر + هیوند نیرو	(0.27,0.37,0.43,0.53)	(0.07,0.13,0.17,0.27)	(0.63,0.73,0.77,0.87)	(0.47,0.57,0.63,0.73)	(0.77,0.87,0.93,0.97)	(0.43,0.53,0.57,0.67)
۳	ماشین سازی اراک	(0.73,0.83,0.87,0.93)	(0.8,0.9,1.0,1.0)	(0.63,0.73,0.77,0.87)	(0.73,0.83,0.87,0.93)	(0.63,0.73,0.77,0.87)	(0.63,0.73,0.77,0.87)
۴	پتروپارت	(0.77,0.87,0.93,0.97)	(0.33,0.43,0.47,0.57)	(0.8,0.9,1.0,1.0)	(0.47,0.57,0.63,0.73)	(0.8,0.9,1.0,1.0)	(0.7,0.8,0.8,0.9)
۵	متک	(0.8,0.9,1.0,1.0)	(0.4,0.5,0.5,0.6)	(0.8,0.9,1.0,1.0)	(0.8,0.9,1.0,1.0)	(0.33,0.43,0.47,0.57)	(0.33,0.43,0.47,0.57)
۶	مهندسی و ساختمان ماشین سازی اراک	(0.8,0.9,1.0,1.0)	(0.47,0.57,0.63,0.73)	(0.43,0.53,0.57,0.67)	(0.47,0.57,0.63,0.73)	(0.57,0.67,0.73,0.83)	(0.63,0.73,0.77,0.87)
۷	نصب نیرو	(0.8,0.9,1.0,1.0)	(0.5,0.6,0.7,0.8)	(0.5,0.6,0.7,0.8)	(0.47,0.57,0.63,0.73)	(0.63,0.73,0.77,0.87)	(0.57,0.67,0.73,0.83)
۸	قرارگاه خاتم الانبیا	(0.63,0.73,0.77,0.87)	(0.8,0.9,1.0,1.0)	(0.8,0.9,1.0,1.0)	(0.13,0.23,0.27,0.37)	(0.7,0.8,0.8,0.9)	(0.57,0.67,0.73,0.83)
۹	آسفالت طوس	(0.4,0.5,0.5,0.6)	(0.8,0.9,1.0,1.0)	(0.8,0.9,1.0,1.0)	(0.8,0.9,1.0,1.0)	(0.8,0.9,1.0,1.0)	(0.73,0.83,0.87,0.93)
۱۰	سدید جهان صنعت	(0.4,0.5,0.5,0.6)	(0.0,0.0,0.1,0.2)	(0.8,0.9,1.0,1.0)	(0.8,0.9,1.0,1.0)	(0.77,0.87,0.93,0.97)	(0.47,0.57,0.63,0.73)
۱۱	آرون آب	(0.1,0.2,0.2,0.3)	(0.03,0.07,0.13,0.23)	(0.8,0.9,1.0,1.0)	(0.47,0.57,0.63,0.73)	(0.7,0.8,0.8,0.9)	(0.27,0.37,0.43,0.53)
۱۲	نیوپارس	(0.07,0.13,0.17,0.27)	(0.8,0.9,1.0,1.0)	(0.7,0.8,0.8,0.9)	(0.07,0.13,0.17,0.27)	(0.77,0.87,0.93,0.97)	(0.57,0.67,0.73,0.83)
۱۳	طرح و بازرسی	(0.03,0.07,0.13,0.23)	(0.13,0.23,0.27,0.37)	(0.8,0.9,1.0,1.0)	(0.8,0.9,1.0,1.0)	(0.77,0.87,0.93,0.97)	(0.4,0.5,0.5,0.6)
۱۴	پایدار بولاد پیشرو	(0.0, 0.0, 0.1,0.2)	(0.5,0.6,0.7,0.8)	(0.5,0.6,0.7,0.8)	(0.47,0.57,0.63,0.73)	(0.57,0.67,0.73,0.83)	(0.47,0.57,0.63,0.73)
۱۵	خوشاوند	(0.0, 0.0, 0.1,0.2)	(0.03,0.07,0.13,0.23)	(0.7,0.8,0.8,0.9)	(0.47,0.57,0.63,0.73)	(0.73,0.83,0.87,0.93)	(0.43,0.53,0.57,0.67)
۱۶	پارس کیهان	(0.0, 0.0, 0.1,0.2)	(0.43,0.53,0.57,0.67)	(0.77,0.87,0.93,0.97)	(0.47,0.57,0.63,0.73)	(0.7,0.8,0.8,0.9)	(0.7,0.8,0.8,0.9)
۱۷	رادیرا	(0.0, 0.0, 0.1,0.2)	(0.8,0.9,1.0,1.0)	(0.7,0.8,0.8,0.9)	(0.07,0.13,0.17,0.27)	(0.27,0.37,0.43,0.53)	(0.47,0.57,0.63,0.73)
۱۸	قادر نصب + خردکاوه	(0.0, 0.0, 0.1,0.2)	(0.03,0.07,0.13,0.23)	(0.7,0.8,0.8,0.9)	(0.8,0.9,1.0,1.0)	(0.63,0.73,0.77,0.87)	(0.27,0.37,0.43,0.53)
۱۹	طیف شیمی	(0.0, 0.0, 0.1,0.2)	(0.07,0.13,0.17,0.27)	(0.77,0.87,0.93,0.97)	(0.07,0.13,0.17,0.27)	(0.77,0.87,0.93,0.97)	(0.2,0.3,0.4,0.5)

ALTERNATIVE	WEIGHT	C1(BP)	C2(P)	C3(E)	C4(Q)	C5(M)	C6(T)	R	RANK
		0.23	0.17	0.17	0.14	0.11	0.18		
1	ژالکه	0.00597	1	0.714136	0.079155	0.056498	0.546218	R1: 0.40839	9
2	پویا راهبر	0.05422	0.174869	0.761257	0.048985	0.060228	0.654262	R2: 0.30286	15
3	ماشین سازی اراک	0.11043	1	0.761257	0.069043	0.049308	0.872749	R3: 0.497	3
4	پتروپارت	0.11773	0.47644	1	0.048985	0.064772	0.927971	R4: 0.45909	5
5	متک	0.12661	0.52356	1	0.079155	0.03086	0.546218	R5: 0.40092	10
6	نصب و ساختمان ماشین سازی اراک	0.12661	0.618848	0.570681	0.048985	0.046256	0.872749	R6: 0.40038	11
7	نصب نیرو	0.12661	0.665969	0.665969	0.048985	0.049308	0.818727	R7: 0.4152	8
8	قرارگاه خاتم	0.09638	1	1	0.022627	0.052428	0.818727	R8: 0.51847	2
9	آسفالت طوس	0.06629	1	1	0.079155	0.064772	1	R9: 0.55345	1
10	سدید جهان صنعت	0.06629	0.04712	1	0.079155	0.060228	0.709484	R10: 0.33867	14
11	آرون آب	0.03009	0.117277	1	0.048985	0.052428	0.490996	R11: 0.29786	16
12	نیوپارس	0.02214	1	0.809424	0.013842	0.060228	0.818727	R12: 0.46863	4
13	طرح و بازرسی	0.01485	0.285864	1	0.079155	0.060228	0.60024	R13: 0.34776	13
14	پایدار بولاد پیشرو	0.00597	0.665969	0.665969	0.048985	0.046256	0.709484	R14: 0.36745	12
15	خوشاوند	0.00597	0.117277	0.809424	0.048985	0.056498	0.654262	R15: 0.28975	17
16	پارس کیهان	0.00597	0.570681	0.929843	0.048985	0.052428	0.927971	R16: 0.43612	7
17	رادیرا	0.00597	1	0.809424	0.013842	0.02774	0.709484	R17: 0.44167	6
18	قادر نصب خرد کاوه	0.00597	0.117277	0.809424	0.079155	0.049308	0.490996	R18: 0.2638	19
19	طیف شیمی	0.00597	0.174869	0.929843	0.013842	0.060228	0.436975	R19: 0.27639	18

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() Q () M

(P) (E)

P MLP

P

(0.13,0.23,0.27,0.37)

(F) « »

() Q « » « »

F MLP MLP

(0.27,0.37,0.43,0.53)

()

Q

(T) ()

(VS S S)

(0.73,0.83,0.87,0.93)

(T)

(VS VS S)

بدینوسیله نویسندگان این مقاله از پشتیبانی مالی
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قدردانی می نمایند.

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- 1 - Fuzzy MADM
 - 2 - Ranking
 - 3 - Bespoke Approaches
 - 4 - Multi-Attribute Analysis
 - 5 - Multi-Attribute Utility Theory
 - 6 - Multi Regression
 - 7 - Cluster Analysis
 - 8 - Fuzzy Set Theory
 - 9 - Multivariate Discriminate Analysis
 - 10 - Defuzzifying (Defuzzification)
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