18 – S2 – Q5

Soution (a)

① overall goal

Selection of a company

Criteria: MP | TR

Decision Alternatives:
MP box: U1, U2, U3
TR box: U1, U2, U3

②

$$\begin{array}{c c} & \begin{matrix} MP & TR \end{matrix} \\ \begin{matrix} MP \\ TR \end{matrix} & \begin{bmatrix} 1 & 0.2 \\ 5 & 1 \end{bmatrix} \end{array}$$

Sum   6   1.2

③ normalized column

$$\begin{array}{c c} & \begin{matrix} MP & TR \end{matrix} \\ \begin{matrix} MP \\ TR \end{matrix} & \begin{bmatrix} 0.167 & 0.167 \\ 0.833 & 0.833 \end{bmatrix} \end{array}$$

④ Priority

$$\begin{array}{c c c} & \begin{matrix} MP & TR \end{matrix} & Priority \\ \begin{matrix} MP \\ TR \end{matrix} & \begin{bmatrix} 0.167 & 0.167 \\ 0.833 & 0.833 \end{bmatrix} & \begin{matrix} 0.167 \\ 0.833 \end{matrix} \end{array}$$

compary the U_1 U_2 U_3

⑤ sum

$$A_{MP} = \begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array} \begin{array}{ccc} U_1 & U_2 & U_3 \\ \left[\begin{array}{ccc} 1 & 0.5 & 0.2 \\ 2 & 1 & 0.5 \\ 5 & 2 & 1 \end{array}\right] \end{array}$$

Sum   8   3.5   1.7

$$A_{TP} = \begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array} \begin{array}{ccc} U_1 & U_2 & U_3 \\ \left[\begin{array}{ccc} 1 & 2 & 3 \\ 0.5 & 1 & 1.5 \\ 0.333 & 0.667 & 1 \end{array}\right] \end{array}$$

1.833   3.667   5.5

⑥ normalized column

$$A_{MP} = \begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array} \begin{array}{ccc} U_1 & U_2 & U_3 \\ \left[\begin{array}{ccc} 0.125 & 0.143 & 0.118 \\ 0.250 & 0.286 & 0.294 \\ 0.625 & 0.571 & 0.588 \end{array}\right] \end{array}$$

$$A_{TP} = \begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array} \begin{array}{ccc} U_1 & U_2 & U_3 \\ \left[\begin{array}{ccc} 0.546 & 0.545 & 0.545 \\ 0.273 & 0.273 & 0.273 \\ 0.182 & 0.182 & 0.182 \end{array}\right] \end{array}$$

⑦ priority

$$A_{MP} = \begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array} \begin{array}{ccc} U_1 & U_2 & U_3 \\ \left[\begin{array}{ccc} 0.125 & 0.143 & 0.118 \\ 0.250 & 0.286 & 0.294 \\ 0.625 & 0.571 & 0.588 \end{array}\right] \end{array} \begin{array}{c} priority \\ 0.129 \\ 0.277 \\ 0.595 \end{array}$$

$$A_{TP} = \begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array} \begin{array}{ccc} U_1 & U_2 & U_3 \\ \left[\begin{array}{ccc} 0.546 & 0.545 & 0.545 \\ 0.273 & 0.273 & 0.273 \\ 0.182 & 0.182 & 0.182 \end{array}\right] \end{array} \begin{array}{c} priority \\ 0.545 \\ 0.273 \\ 0.182 \end{array}$$

⑧ combine

$$\begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array} \begin{array}{cc} MP & TP \\ \left[\begin{array}{cc} 0.129 & 0.545 \\ 0.277 & 0.273 \\ 0.595 & 0.182 \end{array}\right] \end{array}$$

⑨ complexity priority

$$\begin{array}{cc} & \begin{array}{cc} MP & TP \end{array} \end{array}$$

$$\begin{array}{c} U_1 \\ U_2 \\ U_3 \end{array} \begin{bmatrix} 0.129 & 0.545 \\ 0.277 & 0.273 \\ 0.595 & 0.182 \end{bmatrix} \begin{array}{c} Priority \\ \begin{bmatrix} 0.167 \\ 0.833 \end{bmatrix} \end{array}$$

$$= \begin{bmatrix} 0.476 \\ 0.274 \\ 0.251 \end{bmatrix}$$

⑩ rank $0.476 > 0.274 > 0.251$

	company	Priority
1.	U1	0.476
2.	U2	0.274
3.	U3	0.251

⑪ recommendation :

Company should select U1 as the longterm business partner, since U1 has highest overall weight (0.476).

(b) Amp consistency calculate

①
$$\begin{bmatrix} 1 & 0.2 \\ 5 & 1 \end{bmatrix} \begin{bmatrix} 0.167 \\ 0.833 \end{bmatrix}$$

$$= 0.167 \begin{bmatrix} 1 \\ 5 \end{bmatrix} + 0.833 \begin{bmatrix} 0.2 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 0.167 \\ 0.835 \end{bmatrix} + \begin{bmatrix} 0.167 \\ 0.833 \end{bmatrix}$$

$$= \begin{bmatrix} 0.334 \\ 1.668 \end{bmatrix}$$

② get λ

MP $0.334 / 0.167 = 2$

TR $1.668 / 0.833 = 2.002$

③ get λ_{max}

$\lambda_{max} = \frac{1}{2} \times (2 + 2.002)$

$\quad = \frac{1}{2} \times 4.002$

$\quad = 2.001$

④ $C.I. = \dfrac{\lambda_{max} - n}{n - 1}$

$$= \frac{2.001 - 2}{2 - 1}$$

$$= 0.001$$

⑤ $CR = \frac{CI}{RI} = \frac{0.001}{0.58}$ $\qquad$ $n = 3$ $RI = 0.58$

$$= 1.7241 < 0.1$$

unacceptable consistant ratio

(c)

① $\begin{array}{c} \\ U_1 \\ U_2 \\ U_3 \end{array}$ $\begin{array}{cc} MP & TR \\ \begin{bmatrix} 20 & 50 \\ 30 & 20 \\ 50 & 30 \end{bmatrix} \end{array}$ priority $\begin{bmatrix} 0.6 \\ 0.4 \end{bmatrix}$

$$= \begin{bmatrix} 32 \\ 26 \\ 42 \end{bmatrix}$$

② Rank

42 > 32 > 26

U3 > U1 > U2

So choose U3