# The Lists of Candidate Train and Ship Services for the Numerical Example

Table S1: The candidate train services.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Service number | Service path | Service time (hours) | Fixed cost(US$) | Variable cost (US$/TEU) |
| 1 | $$Xian\rightarrow Houma\rightarrow Taiyuan$$$\rightarrow Shijiazhuang\rightarrow Bazhou\rightarrow Tianjin$  | 13.9 | 33420 | 317 |
| 2 | $$Xian\rightarrow Houma\rightarrow Taiyuan$$ | 6.6 | 7950 | 140 |
| 3 | $Taiyuan\rightarrow Shijiazhuang\rightarrow Bazhou\rightarrow Tianjin$  | 7.3 | 8760 | 177 |
| 4 | $$Xian\rightarrow Houma\rightarrow Taiyuan\rightarrow Shijiazhuang$$ | 9.8 | 11715 | 207 |
| 5 | $$Shijiazhuang\rightarrow Bazhou\rightarrow Tianjin$$ | 4.2 | 4995 | 110 |
| 6 | $$Xian\rightarrow Houma\rightarrow Xinxiang$$$\rightarrow Shijiazhuang\rightarrow Bazhou\rightarrow Tianjin$  | 16.0 | 38580 | 343 |
| 7 | $$Xian\rightarrow Houma\rightarrow Xinxiang\rightarrow Shijiazhuang$$ | 11.9 | 14295 | 233 |
| 8 | $$Xian\rightarrow Houma\rightarrow Xinxiang\rightarrow Heze$$$\rightarrow Yanzhou\rightarrow Linyi\rightarrow Jiaozhou\rightarrow Qingdao$  | 18.1 | 43530 | 428 |
| 9 | $$Xian\rightarrow Houma\rightarrow Xinxiang\rightarrow Heze$$$\rightarrow Yanzhou\rightarrow Jinan\rightarrow Jiaozhou\rightarrow Qingdao$  | 18.5 | 44340 | 431 |
| 10 | $$Xian\rightarrow Houma\rightarrow Xinxiang\rightarrow Heze$$$$\rightarrow Yanzhou\rightarrow Jinan$$ | 13.7 | 16440 | 314 |
| 11 | $$Jinan\rightarrow Jiaozhou\rightarrow Qingdao$$ | 4.8 | 5730 | 117 |
| 12 | $$Taiyuan\rightarrow Shijiazhuang$$ | 3.1 | 3765 | 68 |
| 13 | $$Xian\rightarrow Louyang\rightarrow Houma\rightarrow Taiyuan$$ | 13.4 | 32070 | 250 |
| 14 | $$Taiyuan\rightarrow Shijiazhuang\rightarrow Hengshui$$$\rightarrow Bazhou\rightarrow Tianjin$  | 8.3 | 19890 | 219 |
| 15 | $$Shijiazhuang\rightarrow Hengshui$$$$\rightarrow Bazhou\rightarrow Tianjin$$ | 5.2 | 6180 | 152 |
| 16 | $$Taiyuan\rightarrow Shijiazhuang\rightarrow Hengshui$$$$\rightarrow Dezhou\rightarrow Jinan\rightarrow Jiaozhou\rightarrow Qingdao$$ | 11.5 | 27540 | 318 |
| 17 | $$Shijiazhuang\rightarrow Hengshui$$$\rightarrow Dezhou\rightarrow Jinan\rightarrow Jiaozhou\rightarrow Qingdao$  | 8.3 | 10005 | 250 |
| 18 | $$Taiyuan\rightarrow Shijiazhuang\rightarrow Hengshui$$$\rightarrow Dezhou\rightarrow Jinan$  | 6.7 | 8040 | 200 |
| 19 | $$Taiyuan\rightarrow Shijiazhuang\rightarrow Bazhou$$$$\rightarrow Hengshui\rightarrow Dezhou\rightarrow Jinan$$$\rightarrow Jiaozhou\rightarrow Qingdao$  | 15.7 | 37650 | 398 |
| 20 | $$Shijiazhuang\rightarrow Bazhou\rightarrow Hengshui$$$\rightarrow Dezhou\rightarrow Jinan\rightarrow Jiaozhou\rightarrow Qingdao$  | 12.6 | 15060 | 330 |
| 21 | $$Taiyuan\rightarrow Shijiazhuang\rightarrow Bazhou$$$\rightarrow Hengshui\rightarrow Dezhou\rightarrow Jinan$  | 10.9 | 13095 | 281 |
| 22 | $$Taiyuan\rightarrow Houma$$$\rightarrow Xinxiang\rightarrow Shijiazhuang$  | 11.3 | 27210 | 226 |
| 23 | $$Shijiazhuang\rightarrow Hengshui\rightarrow Dezhou\rightarrow Jinan$$ | 3.6 | 4275 | 133 |
| 24 | $$Shijiazhuang\rightarrow Bazhou$$$\rightarrow Hengshui\rightarrow Dezhou\rightarrow Jinan$  | 7.8 | 9330 | 213 |
| 25 | $$Zhengzhou\rightarrow Xinxiang\rightarrow Shijiazhuang$$$$\rightarrow Bazhou\rightarrow Tianjin$$ | 9.3 | 22200 | 231 |
| 26 | $$Zhengzhou\rightarrow Xinxiang\rightarrow Shijiazhuang$$ | 5.1 | 6105 | 121 |
| 27 | $$Zhengzhou\rightarrow Xinxiang\rightarrow Shijiazhuang$$$\rightarrow Hengshui\rightarrow Bazhou\rightarrow Tianjin$  | 10.2 | 24570 | 273 |
| 28 | $$Zhengzhou\rightarrow Xinxiang\rightarrow Heze$$$\rightarrow Yanzhou\rightarrow Linyi\rightarrow Jiaozhou\rightarrow Qingdao$  | 11.3 | 27150 | 316 |
| 29 | $$Zhengzhou\rightarrow Xinxiang\rightarrow Heze$$$\rightarrow Yanzhou\rightarrow Jinan\rightarrow Jiaozhou\rightarrow Qingdao$  | 11.7 | 27960 | 320 |
| 30 | $$Zhengzhou\rightarrow Xinxiang\rightarrow Heze$$$\rightarrow Yanzhou\rightarrow Jinan$  | 6.9 | 8250 | 203 |
| 31 | $$Zhengzhou\rightarrow Shangqiu\rightarrow Heze$$$\rightarrow Yanzhou\rightarrow Jinan$  | 7.7 | 18390 | 212 |
| 32 | $$Zhengzhou\rightarrow Shangqiu\rightarrow Xuzhou$$ | 4.7 | 11250 | 116 |
| 33 | $Zhengzhou\rightarrow Xinxiang\rightarrow Heze\rightarrow Shangqiu\rightarrow Xuzhou$  | 6.3 | 15120 | 196 |
| 34 | $$Xuzhou\rightarrow Yanzhou\rightarrow Jinan$$$$\rightarrow Dezhou\rightarrow Tianjin$$ | 8.7 | 20970 | 225 |
| 35 | $$Xuzhou\rightarrow Yanzhou\rightarrow Jinan$$ | 4.4 | 5325 | 113 |
| 36 | $Jinan\rightarrow Dezhou\rightarrow Tianjin$  | 4.3 | 5160 | 112 |
| 37 | $$Xuzhou\rightarrow Shangqiu\rightarrow Heze$$$\rightarrow Hengshui\rightarrow Bazhou\rightarrow Tianjin$  | 11.6 | 27840 | 289 |
| 38 | $$Xuzhou\rightarrow Yanzhou\rightarrow Linyi$$$\rightarrow Jiaozhou\rightarrow Qingdao$  | 8.9 | 21300 | 227 |
| 39 | $$Xuzhou\rightarrow Yanzhou\rightarrow Jinan$$$\rightarrow Jiaozhou\rightarrow Qingdao$  | 9.2 | 22110 | 231 |
| 40 | $$Xuzhou\rightarrow Shangqiu\rightarrow Heze$$$$\rightarrow Yanzhou\rightarrow Jinan$$ | 7 | 16680 | 203 |
| 41 | $$Xuzhou\rightarrow Dezhou$$$\rightarrow Hengshui\rightarrow Bazhou\rightarrow Tianjin$  | 5.8 | 13890 | 189 |
| 42 | $$Jinan\rightarrow Yanzhou\rightarrow Linyi$$$\rightarrow Jiaozhou\rightarrow Qingdao$  | 8.5 | 20370 | 222 |

Table S2: The candidate ship services.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ship service | Origin | Destination | Travel time (days) | Fixed cost (US$) | Variable cost (US$/TEU) |
| *Ship* 1 | *Tianjin* | *Singapore* | 11 | 10000 | 175 |
| *Ship* 2 | *Tianjin* | *Singapore* | 10 | 10000 | 185 |
| *Ship* 3 | *Tianjin* | *Singapore* | 12 | 10000 | 170 |
| *Ship* 4 | *Qingdao* | *Singapore* | 12 | 10000 | 165 |
| *Ship* 5 | *Qingdao* | *Singapore* | 11 | 10000 | 170 |
| *Ship* 6 | *Qingdao* | *Singapore* | 10 | 10000 | 185 |