| Question Number | Scheme | Marks |
|---|---|---|
| **1.** | $\left[\frac{1+10}{2}\right]$ = 6 Nicky reject top of list | M1 |
| | $\left[\frac{7+10}{2}\right]$ = 9 Trevor reject bottom of list | A1 |
| | $\left[\frac{7+8}{2}\right]$ = 8 Steve reject bottom of list | A1 |
| | [7] = 7 Preety reject<br>Nigel not in list | A1<br>(4) |
| **2.** (a) | G – 3 = J – 4 = L – 5 | M1 |
| | Change status: G = 3 – J = 4 – L = 5 | A1 |
| | Improved matching: E = 2<br>G = 3<br>J = 4<br>L = 5 | B1 (3) |
| (b) | e.g George and Yi Wen may both only be assigned to 3 | B1 (1) |
| (c) | Y – 3 = G – 2 = E – 4 = J – 1 | M1 |
| | Change status: Y = 3 – G = 2 – E = 4 –J = 1 | A1 |
| | Complete Matching E = 4<br>G = 2<br>J = 1<br>L = 5<br>Y = 3 | A1 (3)<br>**(7 marks)** |
| **3.** (a) | (i) *FH*, *AD*, *DE*, *CE*, (not *DC*), $\begin{pmatrix} BC \\ EG \end{pmatrix}$, (not *AC*), *CF*, *HI*, (not *FI*), *IJ* | M1 A1 A1 (3) |
| | (ii) *AD*, *DE*, *EC*, $\begin{pmatrix} BC \\ EG \end{pmatrix}$, *CF*, *FH*, *HI*, *IJ* stop | M1 A1 A1 (3) |
| (b) | Start off the tree with *AB* and *FI*, then apply Kruskal | M1 A1 (2)<br>**(8 marks)** |

| Question Number | | Scheme | Marks |
|---|---|---|---|
| **4.** | (a) | E.g:<br>650 431 245 643 **455** 710 234 162 452 **134**<br>650 643 710 **455** 431 245 234 162 452 **134**<br>650 710 643 **455** 431 **245** 452 **234** **162** 134<br>**710** 650 643 455 431 452 **245** 234 162 134<br>**710** 650 643 455 **452** 431 245 234 162 134 | M1 A1<br>A1 ft<br>A1 ft<br>A1<br>(5) |
| | (b) | Bin 1 710 + 245 Bin 3 643 + 162 + 134 Bin 5 431<br>Bin 2 650 + 234 Bin 4 455 + 452 | M1 A1<br>A1 A1(ft) (4) |
| | (c) | $\frac{4116}{1000}$ = 4.116 5 bins needed optimal | M1 A1(ft) (2)<br>**(11 marks)** |
| **5.** | (a) | e.g. Each edge contributes 2 to the sum of degree, hence this sum must be even.<br>Therefore there must be an even (or zero) number of vertices of odd degree<br>Hence there cannot be an odd number of vertices of odd degree | B2, 1, 0<br>(2) |
| | (b) | $CD + FH = 200 + 220 = 420$<br>$CF + DH = 180 + 380 = 560$<br>$CH + DF = 400 + 160 = 560$<br>Repeat $CA$, $AD$ and $FH$ | M1 A1<br>A1<br>A1 (4) |
| | (c) | Length = 4180 + 420 = 4600 m | B1 (ft) (1)<br>**(9 marks)** |

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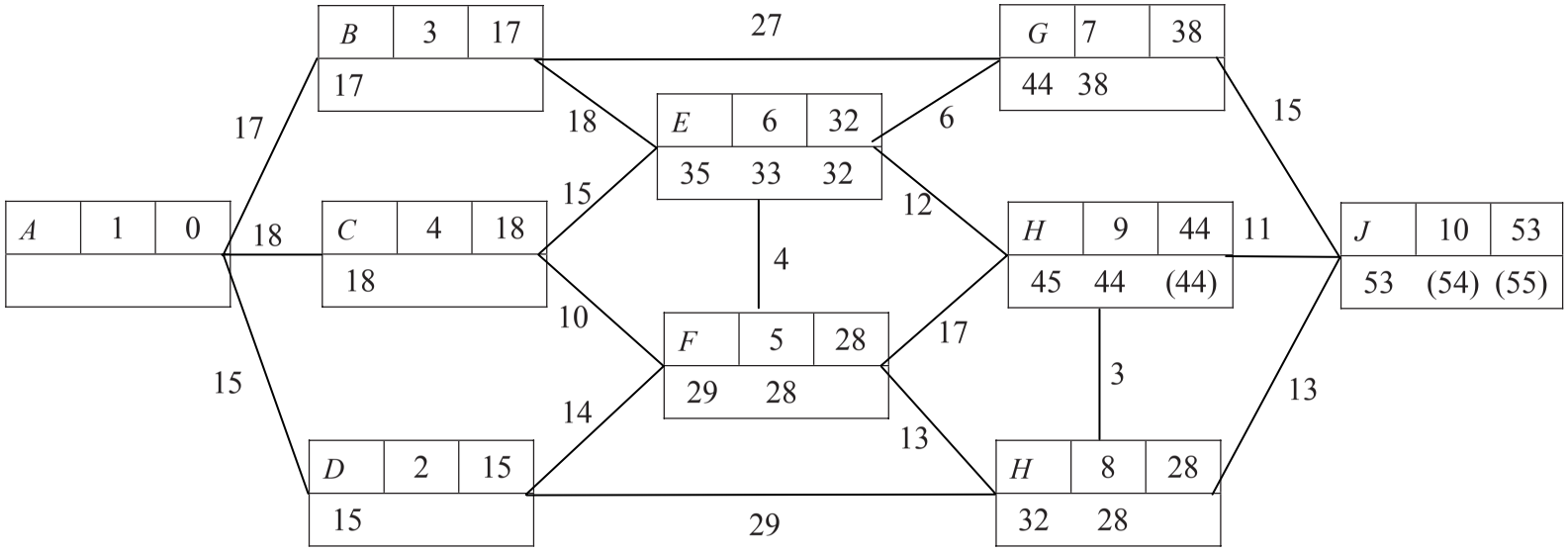
## 6689/01: Decision Mathematics D1

| Question Number | Scheme | Marks |
|---|---|---|
| **6.** (a) |  | M1<br>A1<br>A1 ft<br>A1 ft |
| | Route: *A C F E G J* | |
| | Length: 53 km | A1 (5) |
| (b) | General explanation - trace back from *J*<br>- Include arc *XY* if *Y* is already on path and if difference in trial labels equals length of arc. | |
| | Specific explanation 53 – 15 = 38 *GJ*<br>38 – 6 = 32 *EG*<br>32 – 4 = 28 *FE*<br>28 – 10 = 18 *CF*<br>18 – 18 = 0 *AC* | B 2ft 1ft (2) |
| (c) | Eg *A D F E G J* or *A C E G J*; length 54 km | B1; B1 ft ( 2) |
| | | **(9 marks)** |

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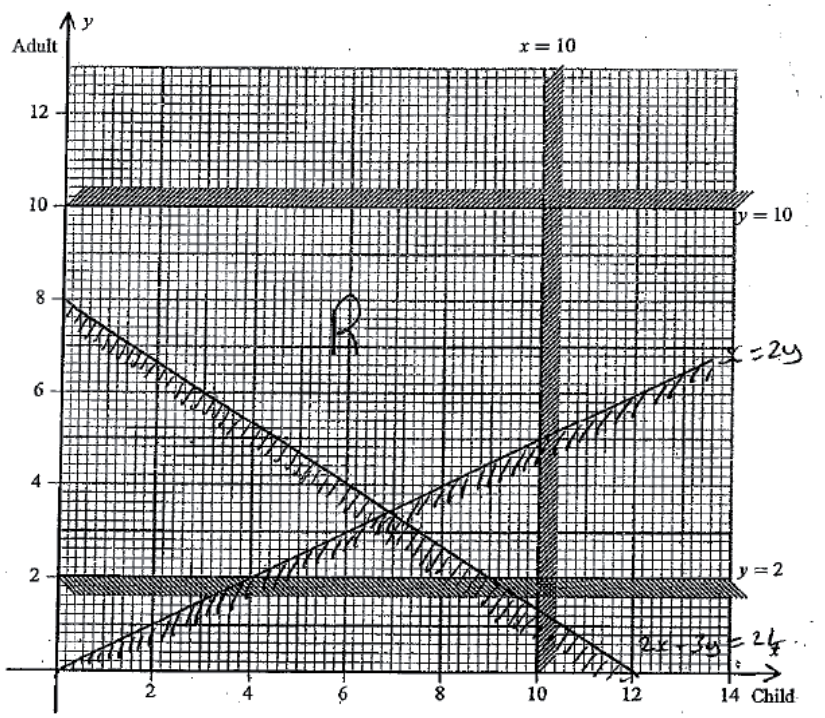
| Question Number | | Scheme | | | | Marks | |
|---|---|---|---|---|---|---|---|
| 7. | (a) | To show a strict inequality | | | | B1 | (1) |
| | (b) | There must be fewer than 10 children | | | | B1 | |
| | | There must be between 2 and 10 adults inclusive | | | | B2, 1, 0 | (3) |
| | (c) | $2x + 3y \geq 24$ | | | | B1 | |
| | | $x \leq 2y$ | | | | B1 | (2) |
| | (d) | Diagram 1<br>  <br> | | | | B1 ft ($2x + 3y = 24$)<br>B1 ft ($x = 2y$)<br>B1 ft (shading) | |
| | (e) | Minimum | 0 Children | 8 Adults | - 8 Passengers | B1<br>M1 A1 | (4) |
| | | Maximum | 9 Children | 10 Adults | - 19 Passengers | B1 B1 | (4) |
| | | | | | | | **(14 marks)** |

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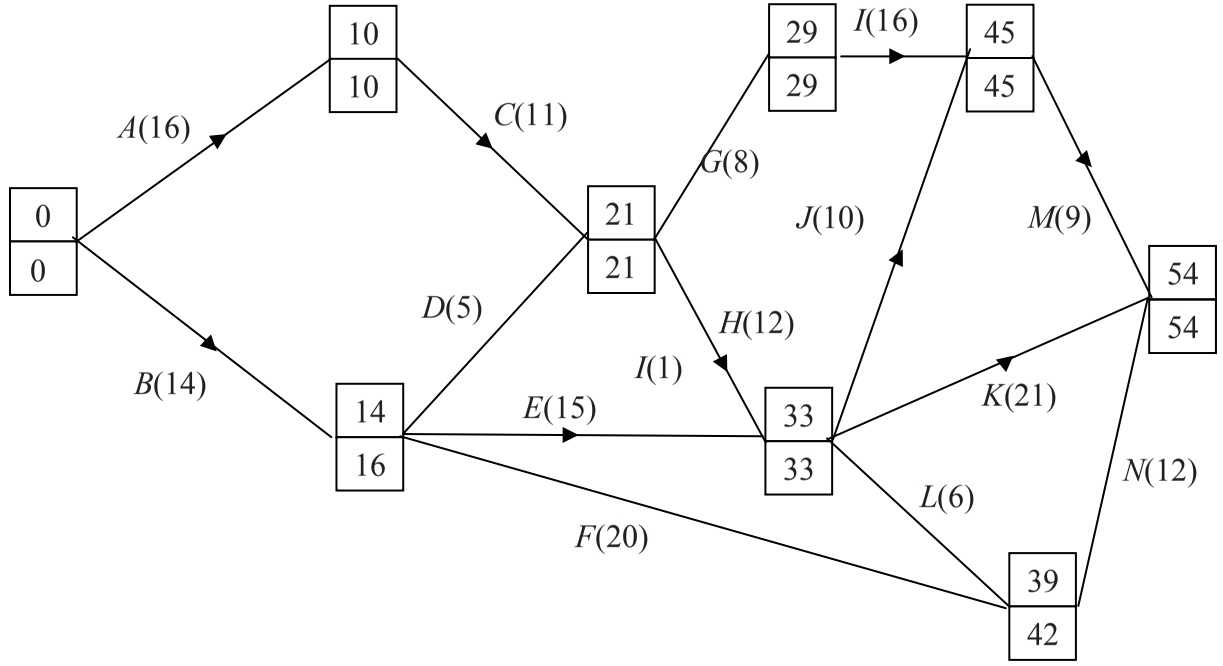
| Question Number | | Scheme | Marks |
|---|---|---|---|
| 8. | (a) |  | M1 A1 (2)<br>M1 A1 (2) |
| | (b) | **A** $G-I-M$, $H-K$<br>**C** | A1 (1) |
| | (c) | Float on $D = 21 - 5 - 14 = 2$<br>Float on $F = 42 - 20 - 14 = 8$ | B1 ft<br>M1 A1 ft (3) |
| | (d) | Gantt Chart | B4 (4) |
| | (e) | Day 15: $C$<br>Day 25: $G, H, E, F$ | B1<br>B2, 1, 0 (3) |
| | | | **(15 marks)** |

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