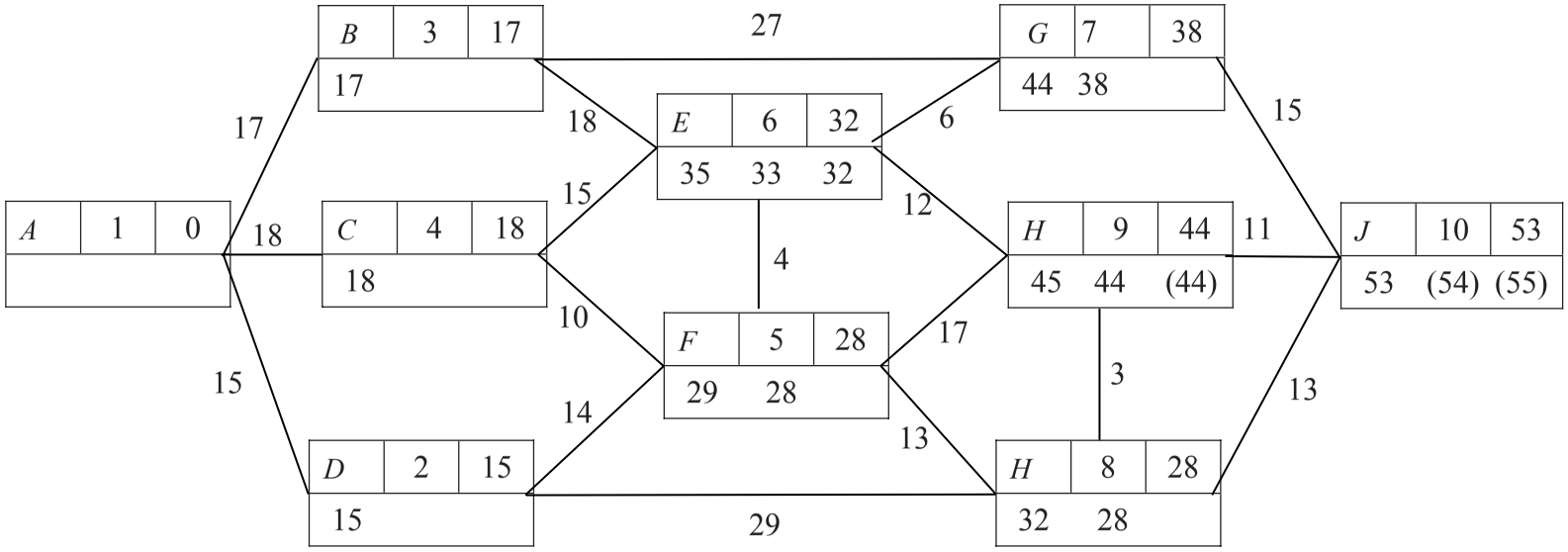
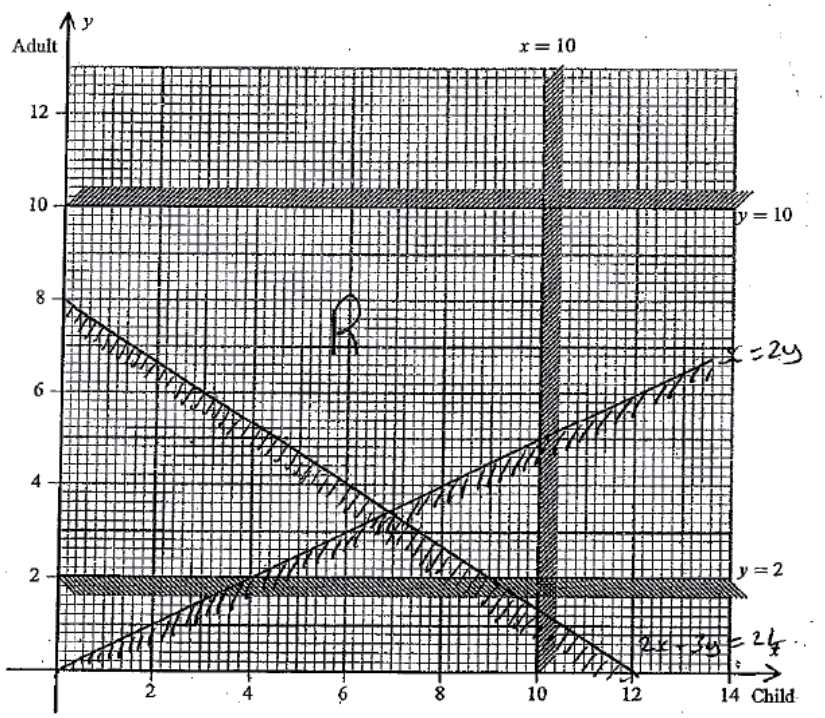
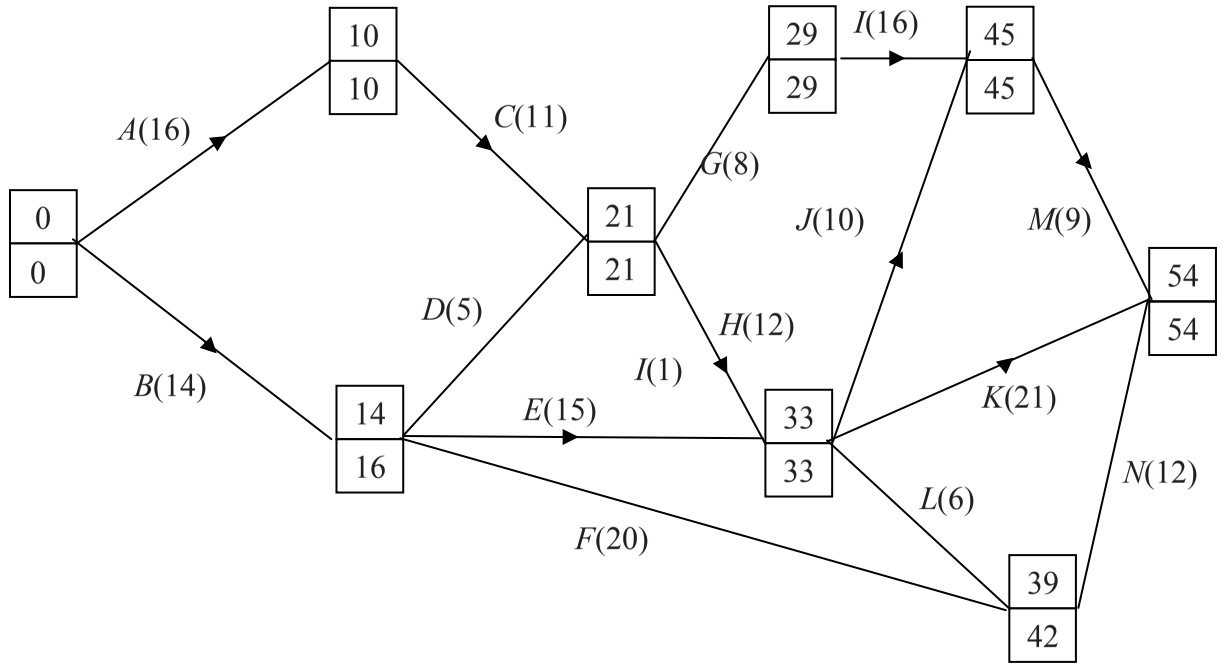
Question Number	Scheme	Marks
1.	$\left[\frac{1+10}{2}\right]$ = 6 Nicky reject top of list	M1
	$\left[\frac{7+10}{2}\right]$ = 9 Trevor reject bottom of list	A1
	$\left[\frac{7+8}{2}\right]$ = 8 Steve reject bottom of list	A1
	[7] = 7 Preety reject Nigel not in list	A1 (4)
2. (a)	G – 3 = J – 4 = L – 5	M1
	Change status: G = 3 – J = 4 – L = 5	A1
	Improved matching: E = 2 G = 3 J = 4 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 G = 2 J = 1 L = 5 Y = 3	A1 (3) **(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) **(8 marks)**

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

Question Number	Scheme	Marks
6. (a)		M1
	Route: *A C F E G J*	A1 ft
	Length: 53 km	A1 ft
		A1 (5)
(b)	General explanation - trace back from *J* - 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* 38 – 6 = 32 *EG* 32 – 4 = 28 *FE* 28 – 10 = 18 *CF* 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 ma

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  	B1 ft ($2x + 3y = 24$) B1 ft ($x = 2y$) B1 ft (shading)
	(e)	Minimum 0 Children 8 Adults - 8 Passengers	B1 (4) M1 A1
		Maximum 9 Children 10 Adults - 19 Passengers	B1 B1 (4)
			(14 marks)

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