REGULAR QUIZ 05

Form 5

Linear Programming

Part I – MC (@2marks)

1.	A	it attends maximum at $(3,5)$
2.	D	/
3.	C	It attends maximum at $(4,1)$, and hence the maximum is 3.
4.	C	/
5.	B	From the figures, $a>0, b>0, c<0$ and $d<0$

Part II – Long Question

1. (a) $L_2 : x+y-100=0$ 1M

The equation of L_3:

$y=-\frac{2}{3}(x-100)$ 1M

$2x+3y-200=0$

The required system of inequalities is

$\begin{cases} x-y-10\geq 0 \\ x+y-100\leq 0 \\ 2x+3y-200\geq 0 \end{cases}$ 1A +1A +1A

(5)

(b) Since A is at least 10 more than B,

$x\geq y+10$

$x-y-10\geq 0$

Since C is at least 0,

$100-x-y\geq 0$ 1M

$x+y-100\leq 0$

Since B is at least 2 times of C,

$y \geq 2(100 - x - y)$ 1M

$2x + 3y - 200 \geq 0$

The intersection of L_1 and L_3 is $(46, 36)$ 1M

Thus, the minimum value of $x = 46 < 50$

Thus, the claim is not agreed. 1 f.t.

(4)

(c) Consider $P = 0.1x + 0.2y + 0.15(100 - x - y)$ 1M

i.e. $P = -0.05x + 0.05y + 15$

The intersection of L_2 and L_3 is $(100, 0)$

Put $(100, 0)$,

the minimum total amount of donation

$= -0.05(100) + 0.05(0) + 15$

$= 10$ thousand dollars 1A

(2)

2. (a)

$$\begin{cases} 6x + 6y \leq 300 \\ 2x + 4y \leq 120 \\ 5y \leq 100 \\ x, y \text{ are non-negative integers} \end{cases}$$

or

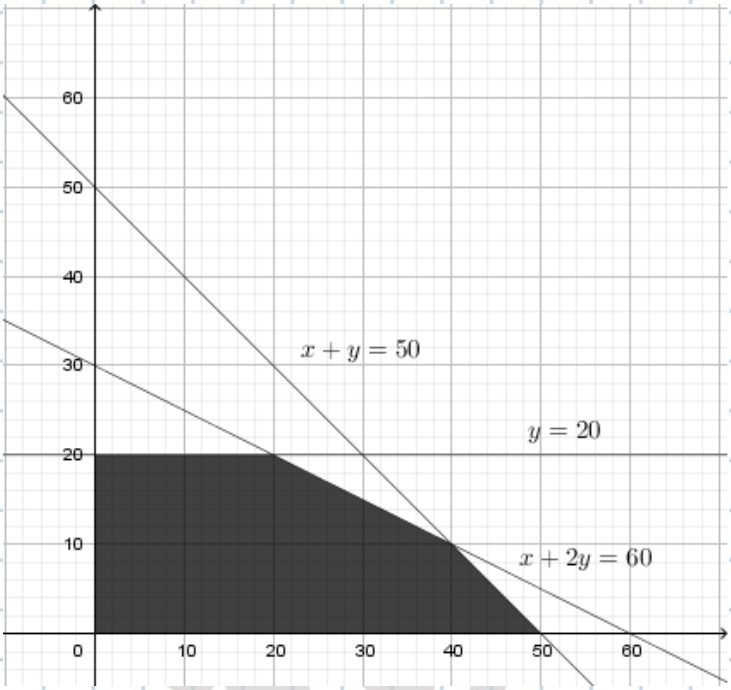
$$\begin{cases} x + y \leq 50 \\ x + 2y \leq 60 \\ y \leq 20 \\ x, y \text{ are non-negative integers} \end{cases}$$

*3A for all correct

**2A only for any three correct constraints

***1A only for any two correct constraints

(b)



3A 1A for correct lines,
1A for correct region,
1A for correct labels.

(c)(i) Let the profit of X and Y be a and b respectively.

$20a + 20b = 40a + 10b$ 1M

$b = 2a$ 1A

(ii) Let \$$P$ be the total profit function.

By (c) (i) ,

we can set $P = x + 2y$. 1M

Let $A(20,20), B(40,10)$.

All the possible combinations must lie on the line segment AB. 1M

i.e. $(20,20),(22,19),(24,18),...,(40,10)$

Thus, there are 11 possible points. 1A f.t.