MAF: Debt signalling Game: Solution.

a) Normal form game

G\B	d. = 0	d. = D
d. = 0	1, 2	3, 4
d. = D	5, 6	7, 8

b)

$$\Pi_{M.G} = \alpha(\frac{p+q}{2})R \qquad (1)$$

$$\Pi_{M.B} = \alpha(\frac{p+q}{2})R \qquad (2)$$

$$\Pi_{M.G} = \alpha qR \qquad (3)$$

$$\Pi_{M.B} = \alpha pR - (1-q)F \qquad (4)$$

$$\Pi_{M.G} = \alpha pR - (1-p)F \qquad (5)$$

$$\Pi_{M.B} = \alpha qR \qquad (6)$$

$$\Pi_{M.G} = \alpha(\frac{p+q}{2})R - (1-p)F \qquad (7)$$

$$\Pi_{M.B} = \alpha(\frac{p+q}{2})R - (1-q)F \qquad (8)$$

b) If bad manager chooses low debt d = 0, good manager chooses high debt d = D iff (5) > (1); that is, iff

$$\alpha(\frac{p-q}{2})R > (1-p)F.$$

If bad manager chooses high debt, good manager chooses high debt iff (7) > (3); that is, iff

$$\alpha(\frac{p-q}{2})R > (1-p)F.$$

If good manager chooses low debt d = 0, bad manager chooses high debt iff (4) > (2); that is, iff

$$\alpha(\frac{p-q}{2})R > (1-q)F.$$

If good manager chooses high debt d = D, bad manager chooses high debt iff (8) > (6); that is, iff

$$\alpha(\frac{p-q}{2})R > (1-q)F.$$

d) Equilibria:

If $\alpha(\frac{p-q}{2})R > (1-q)F > (1-p)F,$ pooling equilibrium: both managerial types choose high debt.

If $(1-q)F > \alpha(\frac{p-q}{2})R > (1-p)F,$ separating equilibrium: good manager chooses high debt, bad manager chooses low debt.

If $(1-q)F > (1-p)F > \alpha(\frac{p-q}{2})R,$ pooling equilibrium: both managers choose low debt.

e) In the first pooling equilibrium, financial distress costs are sufficiently low for the good manager to issue high debt, and the bad manager to mimic.
In the separating equilibrium, financial distress costs are low enough for the good manager and high enough for the bad manager for the good manager to be able to separate from the bad manager by setting high debt, without the bad manager signalling. The good manager is bale to use debt to signal his quality/ability.
In the second pooling equilibrium, financial distress costs are so high that both managers issue low debt.

Economic Intuition: Debt provides a positive signal of firm quality to the market, as the manager uses it to signal his confidence that future cashflows will be high enough to pay the debtholders (the manager is relatively unworried about financial distress).