1 (i) Cash flows:

15/7/01 $\quad -0.98 \times 100\,000 = -£98{,}000$

Jan 02 $\quad 2000 \times \dfrac{112.1}{110.5} = £\,2{,}028.96$

July 02 $\quad 2000 \times \dfrac{115.7}{110.5} = £\,2094.12$

Jan 03 $\quad 2000 \times \dfrac{119.1}{110.5} = £\,2{,}155.66$

July 03 $\quad 2000 \times \dfrac{123.2}{110.5} = £\,2229.86$

+ Capital redeemed:

$$100\,000 \times \frac{123.2}{110.5} = £111493.21$$

[4]

(ii) $$98000 = 2028.92\,v^{\frac{1}{2}} + 2094.12\,v + 2155.66\,v^{1\frac{1}{2}} + 2229.86\,v^{2} + 111493.21\,v^{2}$$

at 11%, RHS $= 97955.85$

≈ 98000

[3]

[7]

② PV of rental income =

$$90000\,\bar{a}_{\overline{5}|}\left(1+(1.04)^5 v^5+\cdots+(1.04)^{45} v^{45}\right)$$

$$=90000 * 1.058867 \times 3.6048 \times \left[\frac{1-\left(\frac{1.04}{1.12}\right)^{50}}{1-\left(\frac{1.04}{1.12}\right)^{5}}\right]$$

[5]

$= £1,082,174.27$

PV of refurbishment cost $= 250000\,v^{\frac{1}{2}}$

[2] $= 236,227.80$

$\Rightarrow$ Price paid $= 1082174.27 - 236227.80$

[1] $= 845,946.47$

[8]

③

[1] Purchase price $= 0.45 \times 1000000$
$= £450,000$

PV of dividends

$$= 50000\left(\left[v^2 + v^{2\frac{1}{2}}\right] + 1.03\left[v^3 + v^{3\frac{1}{2}}\right] + (1.03)^2\left[v^4 + v^{4\frac{1}{2}}\right] + \cdots\right)$$

[3] $* \; 0.80$

$$= 40000\left(v^2 + v^{2\frac{1}{2}}\right)\left[1 + 1.03v + (1.03)^2 v^2 + \cdots\right]$$

$$= 40000 \times 1.68231 \times \left[\frac{1}{1 - \frac{1.03}{1.08}}\right]$$

[3] $= 1{,}453{,}515.84$

[1] $\Rightarrow NPV = £1{,}003{,}515.84$

[8]

(4) Money yield, i, comes from $1+i = 1.02857 \times 1.05$

$= 1.08$

[2] $\Rightarrow i = 8\%$ pa

Check whether CGT is payable : compare $i^{(p)}$ with $(1-t)g$

Here: $(1-t)g = 0.8 * \frac{0.0\cancel{6}}{1.05} = \cancel{0.06093}$ 0.04571

$i^{(2)} = 7.85\% \Rightarrow (1-t)g < i^{(2)}$

[3] $\Rightarrow$ CGT is payable

$$P = \frac{0.8 \times 6\, a^{(2)}_{\overline{10}|} + 0.75 * 105\, V^{10}}{1 - 0.25\, V^{10}} \quad @ 8\%$$

$$= \frac{0.8 \times 6 * 1.019615 * 6.7101 + 0.75 \times 105\, V^{10}}{1 - 0.25 * V^{10}}$$

0.46319

[6] $= £78.39$

[11]

(5)

(i) Compare $i^{(p)}$ with $(1-t)g$:-

$(1-t)g = 0.75 * \frac{0.10}{1.10} = 0.06818 = 6.82\%$

$i^{(4)} = 5.87\%$

$\Rightarrow (1-t)g > i^{(4)}$

[3] $\Rightarrow$ assume redeemed as early as possible

PV of payments

$= 10 * 0.75\, a^{(4)}_{\overline{10}|} + 110\, v^{10}$ at 6%

[5] $= 7.5 * 1.022227 * 7.3601 + 110 * 0.55839$

$= 117.85$

(ii) Price 2 months after issue :

$117.85 * (1.06)^{\frac{2}{12}} - \underbrace{\frac{10}{4} * 0.75\, v^{\frac{1}{12}}}_{\text{P.V. of next net coupon}}$ [@ 6%]

[4] $= £117.134$

[12]

(6) Solution

[3]

(a) $Y_{10} = (.1)(1+e^{-.2(10)})^{-1} = .08808$

The price $= \left(\frac{1}{1+Y_{10}}\right)^{10} \doteq 42.99\%$ #

[4]

(b) $Y_{15} = (.1)(1+e^{-.2(15)})^{-1} = .0952574$

$Y_5 = (.1)(1+e^{-.2(5)})^{-1} = .07310585\,7$

The price $= \frac{(1+Y_5)^5}{(1+Y_{15})^{15}} = 36.35\%$ #

[4]

(c) $(1+f_{5,1})^1 = \frac{(1+Y_6)^6}{(1+Y_5)^5} = 1.09578 \Rightarrow f_{5,1} = 9.58\%$

$(Y_6 = .076852478)$

[5]

(d) $Y_1 = .05498\,3399$, $Y_2 = .059868766$, $Y_3 = .06456563$

$1 = C_{Y_3}(v_{Y_1} + v_{Y_2}^2 + v_{Y_3}^3) + v_{Y_3}^3$

[16]

$C_{Y_3} = \frac{1 - v_{Y_3}^3}{v_{Y_1} + v_{Y_2}^2 + v_{Y_3}^3} = .064169 \Rightarrow C_{Y_3} = 6.42\%$