Q1 Forward rate $= \frac{0.06 \times 0.75 - 0.05 \times 0.50}{0.25}$

$= 0.8$

$= 8\%$

Since, the FRA rate is 7%, profit can be made by borrowing at 5% for 6 months, then borrowing between 6^{th} and 9^{th} month at 7% by entering into FRA and the lending for 9 months at 6%.

Q2 a) Here, a forward contract would give better outcome compared to a future contract because the company will make losses by hedging. If the company hedges using forward contract, the entire loss will be realized at end whereas, in future contract the company will realize its loss day-by-day which is not very preferable based on present value.

b) Here, a Futures contract would give better outcome compared to a forward contract because the company will make profits by hedging. If the company hedges using forward contract, the profit will be realised at end, which is not very preferable whereas, in future contract, the company will realise it's profit day-by-day which is preferable on the basis of present value.

c) Here the Future contract would have better outcome compared to forward contract because Future contract would have positive cash flows initially & the negative cash flows later.

d) Here the forward contract would have better outcome compared to Future contract because forward contract would have negative cash flows initially and the positive cashflows later.

Q3 The company might want to choose the delivery date least favorable to the bank. The bank might price the product based on this assumption.

If the domestic interest rate is higher than foreign exchange rate then :-

1) The latest delivery date will be assumed when the company has long position.
2) The earliest delivery date will be assumed when the company has short position.

If the domestic interest rate is lower than foreign exchange rate then :-

1) The latest delivery date will be assumed when the company has short position.
2) The earliest delivery date will be assumed when the company has long position.

The bank will make profits if the company chooses a delivery date which is suboptimal, from a financial point of view.

Q4 Contract Value = 10,000 [100 − 0.25(100 − Q)]

= 10,000 [100 − 0.25 (100 − 92)]

= 9,80,000

Number of contracts (N) =

$$\frac{\text{portfolio forward value}}{\text{future contract price}} \times \frac{\text{portfolio Duration}}{\text{futures Duration}}$$

$$\frac{\text{Portfolio Duration}}{\text{futures Duration}} = 2$$ [∵ commercial papers maturity is twice that of future]

$$\therefore N = \frac{\text{portfolio forward value}}{\text{future contract price}} \times 2$$

$$= \frac{48,20,000}{9,80,000} \times 2$$

= 9.84.

Therefore, 10 contracts should be shorted.

Q5 No. of short future contracts required :-

$$\frac{\text{portfolio forward price}}{\text{Future contract price}} \times \frac{\text{portfolio Duration}}{\text{Future Duration}}$$

$$:- \frac{100,000,000}{122,000} \times \frac{4}{9}$$

:- 364.3

∴ 364 short contracts are required.

a No. of contracts should be shorted to :-

$$\frac{100,000,000 \times 4}{1,22,000 \times 7} = 468.4$$

∴ 468 contracts should be shorted.

b Here, the loss on the bond portfolio will probably be more than the profit on the short futures position. It is, because the profit depends on the size of movement in long-term rates whereas the loss depends on the size of movement in medium-term rates. Duration-based hedging assumes that the movements in the two rates are equal

Q6 X has a comparative advantage in yen market and wants to buy dollars.
Y has a comparative advantage in dollar market and wants to buy yen.

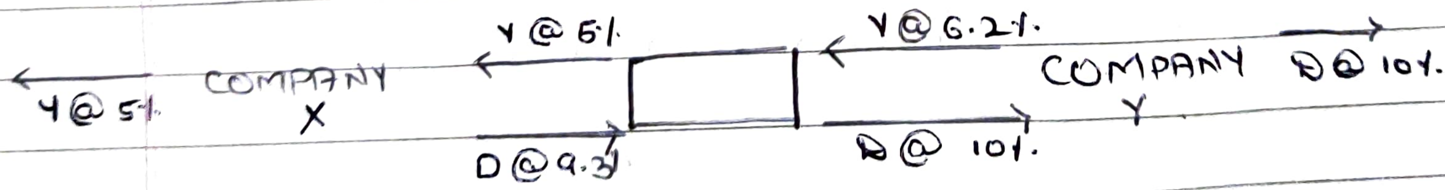
per annum difference
1.5% → yen rates
0.4% → dollar rates.

Total gain from swap = (1.5 - 0.4)%
= 1.1% per annum

Bank → 0.5% per annum
leaving 0.3% for X and Y.

X borrows dollars at → 9.6 - 0.3 = 9.3%
Y borrows yen at → 6.5 - 0.3 = 6.2%

All foreign exchange risk is borne by bank



Y = Yen
D = Dollar.

Q7 The swap rate is the fixed rate that the swap receiver demands in exchange for the uncertainity of having to pay a short-term rate.
At the same time the swap rate for a particular maturity is the swap par yield for the maturity. Here, the par yield is the coupon rate on a fixed income instrument that makes its price equal to the principal at a given maturity.

Q8 The bank can offset the risk by entering into interest rate swaps with other financial institutions in which the banks signs a contract which states to pay fixed rate and receive floating rate.

Q9 Correct Discount rate :-

12 % p.a with quarterly compounding

11.8 % p.a with continuous compounding.

The next floating payment :- $0.118 \times 100 \times 0.25$

:- 2.95

∴ The value of floating rate bond :- $102.95e^{-0.1182 \times 2/12}$

:- 100.941

The value of fixed rate bond :-

$2.5e^{-0.1182 \times 2/12} + 2.5e^{-0.1182 \times 5/12} + 2.5e^{-0.1182 \times 8/12} +$

$2.5e^{-0.1182 \times 11/12} + 102.5e^{-0.1182 \times 14/12}$

:- 98.678

The value of swap = floating rate - fixed r

= 100.941 - 98.678

= $ 2.263 million

Q10 Forward price - 8%

Strike price - 7.6%

Time to maturity - 4 years

Risk free rate - 8%

Volatility - 25%

pay off from swaption = max [0.076 - R, 0]

Value of annuity at the end of 5, 6, 7, 8 & 9 years
is $\sum_{i=5}^{9} e^{-0.078i}$ = 2.972

The value of ~~option~~ swaption in million dollars =
2.914 [0.076 N(-d2) - 0.08 N(d1)]

$$d_1 = \frac{\ln(0.08/0.076) + 0.25^2 \times 2}{0.25\sqrt{4}} = 0.3526$$

$$d_2 = \frac{\ln(0.08/0.076) - 0.25^2 \times 2}{0.25\sqrt{4}} = -0.1474$$

Swaption :- ~~2.914[0.076 N(0.3526)~~

$\therefore$ 2.914 [0.076N(+0.1474) - 0.08N(0.3526)]

= 0.0401

= $40,100

Q11 $S_0 = 1/1.48 = 0.6757$

$K = 1/1.50 = 0.6667$

$r = 0.08$, $\sigma = 0.12$

$q = 0.04$, $T = 1$

Value of derivative = $10{,}000\, N(-d_2)\, e^{-0.08 \times 1}$

Here;

$d2 = \ln(0.6757/0.6667) + (0.8 - 0.04 + (0.12)^2/2)$

$= 0.3852$

$\because N(-d_2) = 0.3501$

$10{,}000 \times 0.3501 \times e^{-0.08}$ = Derivative

$= 3231.$

In dollars, $3231 \times 1.48 = \$4782$

Q12 In an Asian option the payoff becomes more certain as the time passes and the delta always approaches zero as the maturity date is approached. This makes delta hedging easy.

Q13 This is a cash-or-nothing call.

Value is $100 N(d_2) e^{-0.08 \times 0.5}$ where,

$$d_2 = \frac{\ln(960/1000) + (0.08 - 0.03 + 0.2^2/2) \times 0.5}{0.2\sqrt{0.5}}$$

$= 0.1826$

Because $N(d_2) = 0.4276$

Value of Derivative $= 100 \times 0.4276 \times e^{-0.08 \times 0.5}$

$= \$41.08$

Q13 This is a cash-or-nothing call.

Value is $100 N(d_2) e^{-0.08 \times 0.5}$ where,

$$d_2 = \ln(960/1000) + (0.08 - 0.03 + 0.2^2/2) \times 0.5 \Big/ 0.2 \times \sqrt{0.5}$$

$= 0.1826$

Because $N(d_2) = 0.4276$

Value of Derivative $= 100 \times 0.4276 \times e^{-0.08 \times 0.5}$

$= \$41.08$