PART A : MCQ ANSWERS

Question : 1 **2 Marks**

a) 1000 Loss

Question : 2 **2 Marks**

a) ₹ 540

Question : 3 **1 Marks**

d) Real options are normally traded in the market and are priced

Question : 4 **1 Marks**

a) 25 basis points

Question : 5 **2 Marks**

a) ₹ 6,30,032

Question : 6 **2 Marks**

c) 214,917

PART B : DESCRIPTIVE SOLUTIONS

Question : 1 **10 Marks**

(i) Given: TIC Ltd. Current Price = ₹415

Exercise rate = 400

Risk free interest rate is = 5% p.a.

SD (Volatility) = 22%

Based on the above bit is calculated value of an option based on Block Scholes Model:

$$d_1 = \frac{\ln\left(\frac{415}{400}\right) + \left[0.05 + \frac{1}{2}(0.22^2)\right]0.25}{0.22\sqrt{0.25}} = \frac{0.03681 + 0.01855}{0.11} = 0.5032727$$

$$d_2 = \frac{\ln\left(\frac{415}{400}\right) + \left[0.05 - \frac{1}{2}(0.22^2)\right]0.25}{0.22\sqrt{0.25}} = \frac{0.03681 + 0.0645}{0.11} = 0.3932727$$

N(d1) = N (.50327) = 1 − .3072 = .6928

N(d2) = N (.39327) = 1 − .3471 = .6529

Value of Option

= 415 (.6928) – [400/$e^{(0.05)(0.25)}$](0.6529)

= Rs. 29.60

NB: N(0.39327) can also be found as under :

Step 1: From table of area under normal curve find the area of variable 0.39 i.e. 0.6517.

Step 2: From table of area under normal curve find the area of variable 0.40.

Step 3: Find out the difference between above two variables and areas under normal curve.

Step 4: Using interpolation method find out the value of 0.00327. Which is as follows:

(0.0037/0.01) x 0.00327 = 0.0012

Step 5: Add this value, computed above to the N(0.39). Thus N (0.39327) = 0.6517 + 0.0012 = 0.6529

Since market price of ₹25 is less than ₹27.60 (Block Scholes Valuation model) indicate that option is underpriced, hence worth buying.

(ii) If the current price is taken as ₹380 the computations are as follows:

$$d_1 = \frac{\ln\left(\frac{380}{400}\right) + \left[0.05 + \frac{1}{2}(0.22^2)\right]0.25}{0.22\sqrt{0.25}} = \frac{-0.05129 + 0.01855}{0.11} = -0.297636$$

$$d_2 = \frac{\ln\left(\frac{380}{400}\right) + \left[0.05 - \frac{1}{2}(0.22^2)\right]0.25}{0.22\sqrt{0.25}} = \frac{-0.05129 + 0.0645}{0.11} = -0.407636$$

$$V_0 = V_s N(d_1) - \frac{E}{e^{rt}} N(d_2)$$

N(d1) = N(-0.297636) = .3830

N(d2) = N(-0.407636) = .3418

Value of Option

$380 \times (.3830) - [400/e^{(0.05)(0.25)}] \times (0.3418)$

= Rs. 10.52

(iii) Value of option = ₹10.52

Current Market Value = ₹415

Present Value of Exercise Price = 400/1.012568 = 395.03

Value of Put Option can be found by using Put Call Parity relationship as follows:

Vp = -Vs + Vc + PV (E)

Vp = -380 + 10.52 + 395.06 = ₹25.58 or

-380 + 10.52 + 395.03 = ₹25.55

(iv) Since dividend is expected to be paid in two months' time, we have to adjust the share price and then use Black Scholes model to value the option: Present Value of Dividend (using continuous discounting) = Dividend × e^{-rt}

= Rs.10 x $e^{-0.5 \times .1666}$ = Rs. 9.917 (Please refer Exponential table)

Adjusted price of shares is ₹408 – 9.917 = ₹398.083

This can be used in Black Scholes model

$$d_1 = \frac{\ln\left(\frac{398.083}{400}\right) + \left[.05 + \frac{1}{2}(.22)^2\right].25}{.22\sqrt{.25}} = \frac{-0.00480 + .01855}{.11} = .125$$

$$d_2 = \frac{\ln\left(\frac{398.083}{400}\right) + \left[.05 - \frac{1}{2}(.22)^2\right].25}{.22\sqrt{.25}} = \frac{-0.00480 + .00645}{.11} = .015$$

N(d1) = N(.125) = .5498

N(d2) = N(.015) = .5060

Value of Option = 398.083 × (.5498) – [400/$e^{(.05)(.25)}$] x (.5060) = Rs. 18.98

Question : 2 **6 Marks**

(i) To compute perfect hedge we shall compute Hedge Ratio (Δ) as follows:

Δ = C1-C2 / S1-S2 = (100 – 0) / (650 – 450) = 0.50

The investor should purchase 0.50 share for every 1 call option Or, the investor should purchase 1 share for every 2 Call Option.

(ii) How the investor will be able to maintain his position if he purchases 0.50 share for 1 call option written.

(a) If price of share goes upto ₹650 then value of purchased share will be:

Sale Proceeds of Investment (0.50 × ₹650) ₹325

Loss on account of short position (₹650-₹550) ₹100

Cash Flow ₹225

(b) If price of share comes down to ₹450 then value of purchased share will be:

Sale Proceeds of Investment (0.50 × ₹450) ₹225

(iii) The Value of Option, say, P at the beginning of the period shall be computed as follows:

(₹250 – P) 1.05 = ₹225

₹262.50 – 1.05P = ₹225

₹37.5 = 1.05P

P = ₹35.71

(iv) Expected Return on the Option

Expected Option Value = (₹650 – ₹550) × 0.70 + ₹0 × 0.30 = ₹70

Expected Rate of Return = [(70 - 35.71) / 35.71] x 100 = 96.02%

Question : 3 **5 Marks**

(i) Contract Size (₹9,170 × 50) = ₹4,58,500

Initial Margin (8% of 4,58,500) = ₹36,680

Maintenance Margin (6% of 4,58,500) = ₹27,510

(1) For investor taken Long position:

Day	Change in Future value (₹)	Margin A/c (₹)	Call Money (₹)
0	-----	36,680	
1	(₹9,380 – ₹9,170) × 50 = 10,500	47,180	
2	(₹9,520 - ₹9,380) × 50 = 7,000	54,180	
3	(₹9,100 - ₹9,520) × 50 = - 21,000	33,180	
4	(₹8,960 - ₹9,100) × 50 = - 7,000	36,680	10,500
5	(₹9,140 - ₹8,960) × 50 = 9,000	45,680	

(2) For investor taken Short position:

Day	Change in Future value (₹)	Margin A/c (₹)	Call Money (₹)
0	-----	36,680	
1	(₹9,170 - ₹9,380) × 50 = -10,500	36,680	10,500
2	(₹9,380 - ₹9,520) × 50 = -7,000	29,680	
3	(₹9,520 - ₹9,100) × 50 = 21,000	50,680	
4	(₹9,100 - ₹8,960) × 50 = 7,000	57,680	
5	(₹8,960 - ₹9,140) × 50 = -9,000	48,680	

(ii) Calculation of Net Profit/Loss

(1) Long Position

	(₹)
Ending margin	45,680
Less: Initial Margin	36,680
Profit	9,000
Less: Margin Call	10,500
Net Loss	1,500

OR, Loss = (9,140 – 9,170) × 50 = (₹1,500)

(2) Short Position

	(₹)
Ending margin	48,680
Less: Initial Margin	36,680
Profit	12,000
Less: Margin Call	10,500
Net Profit	1,500

OR, Profit = (9,170 – 7,040) × 50 = ₹1,500

Question : 4 **5 Marks**

(i) The price of one Future Contract

Let X be the Price of Future Contract.

Accordingly, No. of Contracts = Contract Value / Price of one Future Contract

5 = ₹9,00,000 / X

X (Price of One Future Contract) = ₹1,80,000

(ii) Current Future price of the index = ₹1,80,000/ 75 = 2400

Let Y be the current Nifty Index (on 1st February 2020) then

Accordingly, Y+Y(0.09-0.06) 4/12 = 2400

Y = 2376.24

Hence Nifty Index on 1st February 2020 shall be approximately 2376.

(iii) To determine whether the market is in Contango/ Backwardation first we shall compute Basis as follows:

Basis = Spot Price - Future Price

If Basis is negative the market is said to be in Contango and when it is positive the market is said to be Backwardation.

Since current Spot Price is 2376 and Nifty Futures is 2400, the Basis is negative and hence there is Contango Market and maximum Contango shall be 24 (2400 – 2376).

(iv) Pay off on the Future transaction shall be [(2400 – 2100) × 375] = ₹112500

The Future seller gains if the Spot Price is less than Futures Contract price as position shall be reversed at same Spot price. Therefore, Mr. SG has gained ₹1,12,500/- on the Short position taken.

Question : 5 **8 Marks**

(a) By entering into an FRA, firm shall effectively lock in interest rate for a specified future in the given it is 6 months. Since, the period of 6 months is starting in 3 months, the firm shall opt for 3 × 9 FRA locking borrowing rate at 5.94%.

In the given scenarios, the net outcome shall be as follows:

	If the rate turns out to be 4.50%	If the rate turns out to be 6.50%
FRA Rate	5.94%	5.94%
Actual Interest Rate	4.50%	6.50%
Loss/ (Gain)	1.44%	(0.56%)
FRA Payment / (Receipts)	€50 m × 1.44% × ½ = €360,000	€50 m × 0.56% × ½ = (€140,000)
Interest after 6 months on €50 Million at actual rates	€50m × 4.5% × ½ = €1,125,000	€50m × 6.5% × ½ = €1,625,000
Net Out Flow	€ 1,485,000	€1,485,000

Thus, by entering into FRA, the firm has committed itself to a rate of 5.94% as follows:

$$\frac{€1,485,000}{€5,00,00,000} \times 100 \frac{12}{6} = 5.94\%$$

(b) Since firm is a borrower it would like to off-set interest cost by profit on Future Contract. Accordingly, if interest rate rises it will gain hence it should sell interest rate futures.

$$\text{No. of Contracts} = \frac{\text{Amount of Borrowing}}{\text{Contract Size}} \times \frac{\text{Duration of Loan}}{\text{3 months}}$$

$$= \frac{€50,000,000}{€50,000} \times \frac{6}{3} = 2000 \text{ Contracts}$$

The final outcome in the given two scenarios shall be as follows:

	If the interest rate turns out to be 4.5%	If the interest rate turns out to be 6.5%
Future Course Action:		
Sell to open	94.15	94.15
Buy to close	95.50 (100 - 4.5)	93.50 (100 - 6.5)
Loss/ (Gain)	1.35%	(0.65%)
Cash Payment (Receipt)	€50,000 × 2000 × 1.35% × 3/12 = €337,500	€50,000 × 2000 × 0.65% × 3/12 = (€162,500)
Interest for 6 months on €50 million at actual rates	€50 million × 4.5% × ½ = €11,25,000	€50 million × 6.5% × ½ = €16,25,000
	€1,462,500	€1,462,500

Thus, the firm locked itself in interest rate = $\frac{€1,462,500}{€50,000,000} \times 100 \times \frac{12}{6} = 5.85\%$

Question : 6 **6 Marks**

Though firm IF has an advantage in both the markets but it has comparative more advantage in the INR floating-rate market. Firm SF has a comparative advantage in the SGD fixed interest rate market. However, firm IF wants to borrow in the SGD fixed interest rate market and firm SF wants to borrow in the INR floating-rate market. This gives rise to the swap opportunity.

IF raises INR floating rate at BPLR + 0.50% and SF raises SGD at 3.50%

Total Potential Gain = (INR interest differential) - (SGD rate differential)

= (BPLR + 1.50% - BPLR - 0.50%) + (3% - 3.50%) = 0.50%

Less: Banker's commission (To be shared equally) = *0.20%

Net gain (To be shared as: 0.20% for IF and 0.10% for SF) = 0.30%

*Since, bank's commission is 0.50% which constitutes the entire gain, and it is mentioned that bank will forego a part of its commission to structure the deal. Thus, it will forego the minimum gain required by IF and SF i.e. 0.20% and 0.10% respectively.

(i) Yes, a beneficial swap can be arranged

(ii) Effective cost of borrowing = pays to lenders + pays to other party - receives from other party + banker's commission

IF = BPLR + 0.50% + 2.70%** - (BPLR + 0.50%) + 0.10% = 2.80%

(** has been arrived as 3% - 0.20% - 0.10%)

SF = 3.50% + BPLR + 0.50% - 2.70% + 0.10% = BPLR + 1.40%

Question : 7 **4 Marks**

Day	Principal (₹)	MIBOR (%)	Interest (₹)
Tuesday	10,00,00,000	7.75	21,233
Wednesday	10,00,21,233	8.15	22,334
Thursday	10,00,43,567	8.12	22,256
Friday	10,00,65,823	7.95	21,795
Saturday & Sunday (*)	10,00,87,618	7.98	43,764
Monday	10,01,31,382	8.15	22,358
Total Interest @ Floating			1,53,740
Less: Net Received			317
Expected Interest @ fixed			1,53,423
Thus Fixed Rate of Interest			0.07999914
Approx.			8%

(*) i.e. interest for two days.

Note: Alternatively, answer can also be calculated on the basis of 360 days in a year.

Question : 8 **6 Marks**

(i) Portfolio Beta

$0.35 \times 0.30 + 0.25 \times 1.20 + 0.40 \times 0.50 = 0.605$

(ii) Residual Variance

To determine Residual Variance first of all we shall compute the Systematic Risk as follows:

$\beta^2_A \times \sigma^2_M = (0.30)^2(0.14)^2 = 0.001764$	
$\beta^2_B \times \sigma^2_M = (1.20)^2(0.14)^2 = 0.028224$	
$\beta^2_C \times \sigma^2_M = (0.50)^2(0.14)^2 = 0.0049$	
Residual Variance	
DGS	0.010 – 0.001764 = 0.008236
DV	0.030 – 0.028224 = 0.001776
BP	0.015 – 0.0049 = 0.0101

(iii) Portfolio variance using Sharpe Index Model

Systematic Variance of Portfolio = $(0.14)^2 \times (0.605)^2 = 0.007174$ or 0.0072

Unsystematic Variance of Portfolio = $0.008236 \times (0.35)^2 + 0.001776 \times (0.25)^2 + 0.0101 \times (0.40)^2$

= 0.002736 or 0.0027

Total Variance = 0.007174 + 0.002736 = 0.00991 or 0.0099

(iv) Portfolio variance on the basis of Markowitz Theory

$= (w_A \times w_A \times \sigma^2_A) + (w_A \times w_B \times Cov_{AB}) + (w_A \times w_C \times Cov_{AC}) + (w_B \times w_A \times Cov_{AB}) + (w_B \times w_B \times \sigma^2_B) + (w_B \times w_C \times Cov_{BC}) + (w_C \times w_A \times Cov_{CA}) + (w_C \times w_B \times Cov_{CB}) + (w_C \times w_C \times \sigma^2_C)$

$= (0.35 \times 0.35 \times 0.010) + (0.35 \times 0.25 \times 0.020) + (0.25 \times 0.40 \times 0.050) + (0.40 \times 0.35 \times 0.030) + (0.25 \times 0.35 \times 0.020) + (0.40 \times 0.25 \times 0.050) + (0.35 \times 0.40 \times 0.030) + (0.25 \times 0.25 \times 0.030) + (0.40 \times 0.40 \times 0.015)$ = 0.0274

CA FINAL **P2: ADVANCED FINANCIAL MANAGEMENT** **11.03.2025**

[SYLLABUS : Derivates, Interest Rate Risk Management]

TIME : 1 HR 45 MIN **TOTAL : 60 MARKS**

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