CBCS SCHEME

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20MBAFM402

Fourth Semester MBA Degree Examination, June/July 2023
Financial Derivatives

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FOUR full questions from Q.No.1 to Q.No.7.***
2. ***Question No. 8 is compulsory.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

1 a. What do you mean by Marking to Market? **(03 Marks)**

b. Explain the types of Financial Derivatives instruments. **(07 Marks)**

c. Using the following data, prepare the margin account of an investor. Assume that if a margin call is made at any time , the investor would deposit the amount called for
Position = Short : Contract size = 500 units. Unit price = Rs 22 ; Number of contracts = 8 ;
Maintenance margin = ¾th of initial margin. Date of contract = June 3 ;
Initial margin = 12%. Closing prices are :

Date	June 4	June 5	June 6	June 7	June 10	June 11	June 12
Price (Rs)	22.30	23.10	22.90	23.00	23.15	22.85	22.95

(10 Marks)

2 a. Differentiate between Exchange traded and over the counter derivatives. **(03 Marks)**

b. A share is currently traded at Rs 78. A 3 – month futures contract on this share is traded at Rs 80.50. The risk free rate of return continuously compounded is 8% p.a. No dividend is expected to the share in the next 3 months. Is there any arbitrage opportunity here? If so, then discuss the outcome. **(07 Marks)**

c. Explain the key differences between Forward and Future contracts. **(10 Marks)**

3 a. What is Covered call and Naked Call? **(03 Marks)**

b. Consider the following data about April 2021 NIFTY options [all values are the opening values of the day].

Exercise Price	1060	1080	1100	1120	1140	1160	1180	1200	1220
Call Premium	-	-	50.00	31.05	17.45	8.00	4.95	2.75	1.00
Put Premium	1.10	1.30	2.60	6.00	12.25	23.40	-	-	-

The index opened at 1,146.05. Classify the options on the basis of their "moneyness" and segregate the intrinsic and time values. **(07 Marks)**

c. Briefly explain the Option trading strategies. **(10 Marks)**

4 a. What is Put – Call Parity? **(03 Marks)**

b. The following information is available on call options involving 1100 shares with two months expirations dates on a stock :

Strike price	Rs. 170	Rs. 180	Rs. 190
Premium	Rs. 21.10	Rs. 14	Rs. 8

Explain how the option can be used to create Butterfly spread. Find the pay – off for the investor at various range of stock price Rs 168 , Rs 176 , Rs 185 , Rs 189 and Rs 198. **(07 Marks)**

c. The current price of a share is Rs 50 and it is believed that at end of one month the price will be either Rs 55 or Rs 45. What will a European call option with an exercise price of Rs 53 on this share be valued at, if the risk free rate of interest is 15% per annum. Also calculate hedge ratio, applying binomial formulation. **(10 Marks)**

5 a. What do you mean by Butterfly Spread? **(03 Marks)**

b. Create a long straddle from the following information :
   * Call strike price = Rs 380 ; Call premium = Rs 15.
   * Put strike price = Rs 380 ; Put premium = Rs 18.
   Closing price as follows = Rs 300 , Rs 350 , Rs 375 , Rs 400 , Rs 425. **(07 Marks)**

c. The share of a Company are currently traded at Rs 120/-. Compute the price of a call option on the share with an exercise price of Rs 115 using Black and Schole model. The time to maturity is three months. The risk free rate of interest continuous compounded is 10% per annum. The standard deviation is 0.6. Also compute the price of a put option on this share with the same exercise price and maturity using put – call parity. The option mentioned is of European nature. **(10 Marks)**

6 a. What do you mean by VaR? **(03 Marks)**

b. Suppose the zero interest rates with continuous compounding are as follows :

Maturity (Yrs)	1	2	3	4	5
Rate (% per annum)	2.0	3.0	3.7	4.2	4.5

Calculate forward interest rates for the second, third, fourth and fifth years. **(07 Marks)**

c. Company ABC and XYZ have offered the following rate on a $ 200 millions for 5 yrs loan.

Firm	Fixed Rate	Floating Rate
ABC	12%	L + 0.1
XYZ	13.4%	L + 0.6

Company ABC requires a floating rate loan. Company XYZ required a fixed rate loan. Design a swap that will net a bank acting as intermediary of 0.1%. **(10 Marks)**

7 a. What do you mean by Forward Rate Agreement? **(03 Marks)**

b. A portfolio consists of Rs 4,00,000 investments in shares of XYZ and Rs 6,00,000 in shares of ABC limited. The annual volatilities of these two assets are 30.4% and 22.4% respectively. The co-efficient of correlation between the return is 0.6. Compute the 15 days 97.5% VaR for the portfolio and interpret the result. Explain by what amount the diversification has reduced the VaR. Assume 256 trading days in a year. **(07 Marks)**

c. Explain the factors contributing to the growth of Derivative markets in India. **(10 Marks)**

8 **CASE STUDY (Compulsory)** :

On 1st of Jan. 2022, an investor has portfolio consisting of 8 securities as shown below :

Security	A	B	C	D	E	F	G	H
Price	29.4	318.7	660.2	5.2	281.9	275.4	514.6	170.5
No. of share	400	800	150	300	400	750	300	900
Beta	0.59	1.32	0.87	0.35	1.16	1.24	1.05	0.76

The cost of capital for the investor is given to be 20% p.a. The investors fears a fall in prices of share in the near future. You are required to calculate :

a. The Beta of the port folio.
b. Calculate the theoretical values of futures contract according to the investors for contract expiring on February and March.
c. Calculate the number of units of SNP CNX Nifty he would have to sell if he desires to hedge until March.
d. Calculate the number of future contracts the investors should trade if he desires to reduce Beta to 0.7.

Additional Information :

a) The current SNP CNX Nifty value is 986.
b) SNP CNX Nifty can be traded in units of 200 only.
c) Feb. Futures are currently quoted at 1010 and March futures are being quoted at 1019. **(20 Marks)**

CMR INSTITUTE OF TECHNOLOGY

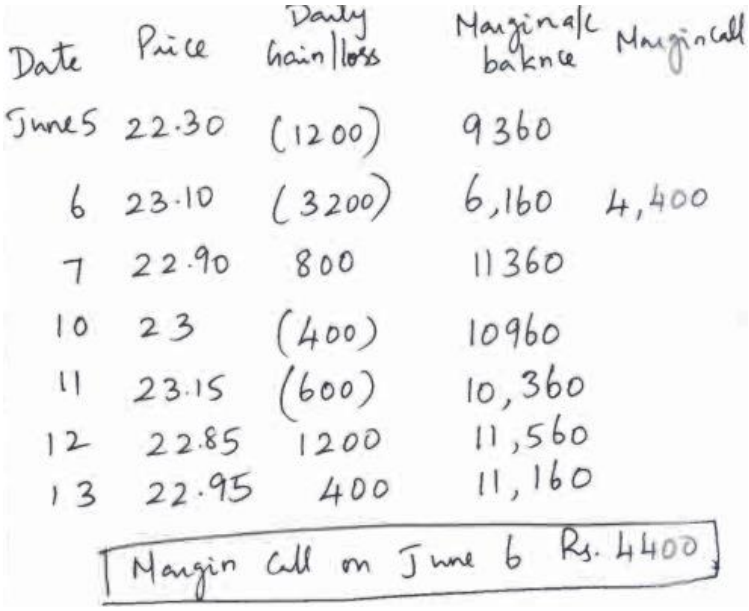
SCHEME OF EVALUATION

VTU QUESTION PAPER FINANCIAL DERIVATIVES JUNE-JULY 2023

Sub:	**FINANCIAL DERIVATIVES – 20MBAFM402**			**Code:**	1CR
Date: 22.09.2023	Duration: 3hrs	Max Marks: 100	**Sem:** I	**Branch:**	MBA

Note: Part A - Answer Any Two Full Questions (20*02=40 Marks)

Part B - Compulsory (01*10= 10marks)

Questions		Description	Marks	Max Marks
1	a)	Mark to market is an accounting practice that involves adjusting the value of an asset to reflect its value as determined by current market conditions. The market value is determined based on what a company would get for the asset if it was sold at that point in time.	3	20 M
	b)	Financial derivatives are financial instruments that are linked to a specific financial instrument or indicator or commodity, and through which specific financial risks can be traded in financial markets in their own right. Transactions in financial derivatives should be treated as separate transactions rather than as integral parts of the value of underlying transactions to which they may be linked. The value of a financial derivative derives from the price of an underlying item, such as an asset or index. Unlike debt instruments, no principal amount is advanced to be repaid and no investment income accrues. Financial derivatives are used for a number of purposes including risk management, hedging, arbitrage between markets, and speculation.	7	
	c)		10	
2	a)	**Market Accessibility** Exchange Traded Derivatives contracts are accessible to both retail and institutional investors. They can be traded on regulated brokerage such as	3	20 M

Orient Futures Singapore. This makes them easily available to a wide range of market participants.

Standardization vs. Customization

Standardization is a key feature of Exchange Traded Derivatives. The contract terms are pre-established and well-defined, ensuring uniformity and ease of trading. This standardization enhances market liquidity and facilitates price discovery.

Counterparty Risk

The biggest reason why Investors find Exchange Traded Derivatives (ETDs) more appealing is because it eliminates the possibility of default risk. ETDs use clearinghouses as intermediaries, guaranteeing that contracts are honoured.

b) $F=S \cdot e(r \cdot T)$

$F= 79.5956$

Since 80.50 80.50 is greater than 79.5956, there seems to be an arbitrage opportunity.

Profit = 1.05

7

c)

Category	Forward Contract	Futures Contract
Meaning	A forward contract is a private agreement between two parties to buy or sell an underlying assets	A futures contract is a standardized contract to buy and sell an asset on a future date at a fixed price.
Standardization	Forward contracts are often customized to suit the parties' needs	Futures contracts have standardized terms for consistency and pre-defined lot sizes.
Liquidity and Transparency	Forward contracts lack transparency and liquidity, being private agreements.	Futures contracts are highly liquid and traded on exchanges, providing transparency.
Regulations	Forward contracts are over-the-counter contracts and therefore have minimum to no regulation.	Futures contracts are strictly regulated by exchanges and relevant authorities.
Risk	Forward contracts have higher counterparty risk.	Future contracts have lower counterparty risks
Settlement	Forward contracts are settled at the maturity date and are settled in cash or physical settlement	Future contracts are settled on a daily basis and are settled in cash as the difference between the spot

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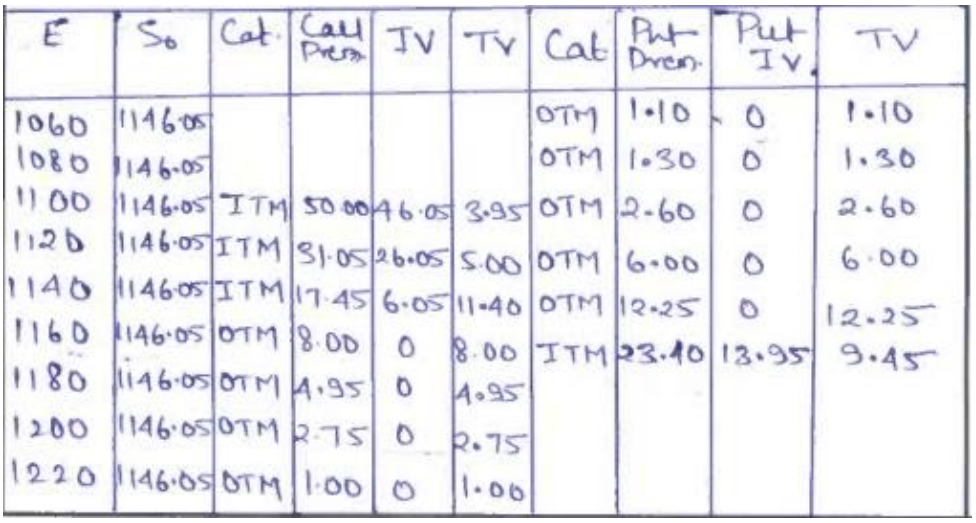
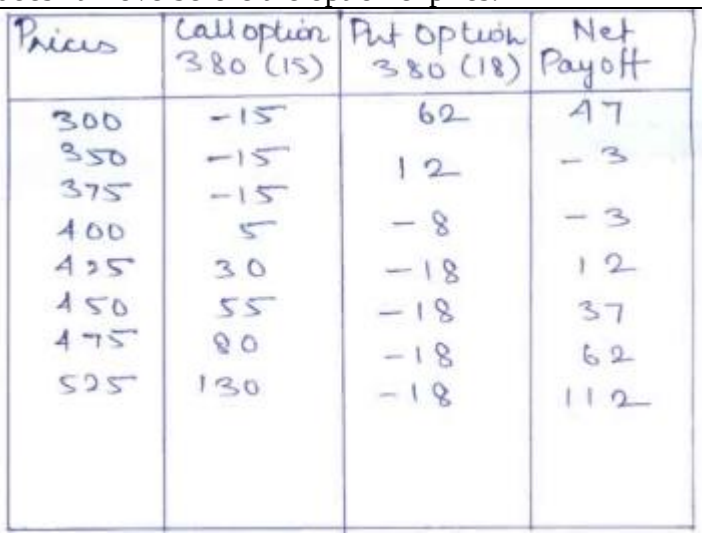
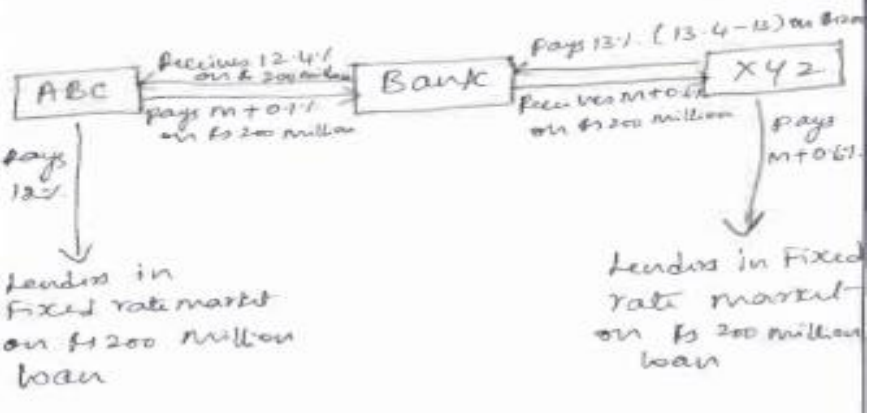
				price and the futures price.		
		Margin	A forward contract has no collateral requirement, as the parties trust each other to honour the contract.	A futures contract has a collateral requirement, as the parties have to deposit an initial margin and maintain a maintenance margin to cover potential losses.		
3	a)	An investor in a naked call position believes that the underlying asset will be neutral to bearish in the short term. A covered call provides downside protection on the stock and generates income for the investor.			3	20 M
	b)				7	
	c)	**Covered Call** With calls, one strategy is simply to buy a naked call option. You can also structure a basic covered call or buy-write.. **Bull Call Spread** In a bull call spread strategy, an investor simultaneously buys calls at a specific strike price while also selling the same number of calls at a higher strike price. Both call options will have the same expiration date and underlying asset. **Bear Put Spread** The bear put spread strategy is another form of vertical spread. In this strategy, the investor simultaneously purchases put options at a specific strike price and also sells the same number of puts at a lower strike price. **Protective Collar** A protective collar strategy is performed by purchasing an out-of-the-			10	

		money (OTM) put option and simultaneously writing an OTM call option (of the same expiration) when you already own the underlying asset. **Long Straddle** A long straddle options strategy occurs when an investor simultaneously purchases a call and put option on the same underlying asset with the same strike price and expiration date.		
4	a)	The term "put-call" parity refers to a principle that defines the relationship between the price of European put and call options of the same class. Put simply, this concept highlights the consistencies of these same classes. Put and call options must have the same underlying asset, strike price, and expiration date in order to be in the same class. The put-call parity, which only applies to European options, can be determined by a set equation.	3	20 M
	b)	Butterfly spread Long call (E_1) Rs. 170 (21.10) 2 short call (E_2) Rs. 180 (14) Long call (E_3) Rs. 190 (8) S_0 | P/L on E_1 170(21.10) | P/L on E_2 180(14) | P/L on E_3 190(8) 168 | (23210) | 30,800 | (8,800) 176 | (16,610) | 30,800 | (8,800) 185 | (6,710) | 19,800 | (8,800) 189 | (2310) | 11,000 | (8,800) 198 | 7590 | (8,800) | 0 Net Profit 1210 5390 4290 (110) (1210)	7	

	c)	$C_u = 55 - 53 = Rs.2$ $C_d = 0 \quad u = 1.1 \quad d = 0.9$ $i = 1 + \frac{0.15}{12} = 1.0125$ $C = \frac{C_u \frac{(i-d)}{(u-d)} + C_d \frac{(u-i)}{(u-d)}}{i}$ $C = \frac{2\frac{(1.0125-0.9)}{(1.1-0.9)} + 0\frac{(1.1-1.0125)}{(1.1-0.9)}}{}$ $= \boxed{Rs.1.11}$ Hedge ratio (α) $= \frac{C_u - C_d}{S_0(u-d)}$ $\alpha = \frac{2-0}{50(1.1-0.9)} = \boxed{0.2}$	10	
5	a)	A butterfly spread is an options strategy that combines both bull and bear spreads. These are neutral strategies that come with a fixed risk and capped profits and losses. Butterfly spreads pay off the most if the underlying asset doesn't move before the option expires.	3	20 M
	b)		7	
	c)	$S_0 = 120, \quad E = 115 \quad T = 3/12 = 0.25 \quad \sigma = 0.6$ $r = 10\%$ call option $\boxed{C = S_0 N(d_1) - E e^{-rt} N(d_2)}$ $d_1 = \frac{\ln(S_0/E) + (r + 0.5\sigma^2)t}{\sigma \times \sqrt{t}}$	10	

Prices	Call option 380 (15)	Put option 380 (18)	Net Payoff
300	-15	62	47
350	-15	12	-3
375	-15		
400	5	-8	-3
425	30	-18	12
450	55	-18	37
475	80	-18	62
525	130	-18	112

		$d_1 = \frac{\ln\left(\frac{120}{115}\right) + \left(0.10 + 0.5 \times 0.6^2\right)0.25}{0.6 \times \sqrt{0.25}}$ $d_1 = 0.3751$ $d_2 = d_1 - \sigma \times \sqrt{t}$ $= 0.3751 - 0.6 \times \sqrt{0.25}$ $= 0.07$ $N(d_1) = 0.6443$ [0.1443+0.5] $N(d_2) = 0.5279$ [0.0279+0.5] $C = S_0 N(d_1) - Ee^{-rt} N(d_2)$ $= 120 \times 0.6443 - 115e^{-0.10 \times 0.25} \times 0.5279$ $C = \text{R}\ 18.107$ Put option $P = Ee^{-rt} N(-d_2) - S_0 N(-d_1)$ $N(-d_1) = 0.3557$ $N(-d_2) = 0.4721$ $P = 115e^{-0.10 \times 0.25} - 0.4721 - 120 \times 0.3557$ $= 52.75 - 42.654$ $P = 10.246$ $N(d_1) = 0.6443$ $N(d_2) = 0.5279$ $N(-d_1) = 0.3557$ $N(-d_2) = 0.4721$ $C = 18.107$ $P = 10.26$		
6	a)	Value at risk (VaR) is a statistic that quantifies the extent of possible financial losses within a firm, portfolio, or position over a specific time frame. This metric is most commonly used by investment and commercial banks to determine the extent and probabilities of potential losses in their institutional portfolios.	3	20M
	b)	*Calculate forward interest rates for the second, third, fourth, and fifth years.* The forward rates with continuous compounding are as follows: to Year 2: 4.0% Year 3: 5.1% Year 4: 5.7% Year 5: 5.7%	7	

	c)	XYZ, Applicable fixed rate 13.5% Total cost of funds without Swap 13.5% (-) Cost of funds with Swaps ABC will borrow from Fixed rate market at 12.00% XYZ will borrow from floating rate at MIBOR + 0.6% Total Cost of funds with SWAP 12.06% Net benefit from the Swap is 0.90% Allocation of Benefit :- Bank 0.10% ABC 0.40% XYZ 0.40% Total 0.90% 	10	
7	a)	An FRA is an agreement between the Bank and a Customer to pay or receive the difference (called settlement money) between an agreed fixed rate (FRA rate) and the interest rate prevailing on stipulated future date (the fixing date) based on a notional amount for an agreed period (the contract period).	3	20M
	b)	XYZ; Daily SD = $\frac{1,00,000 \times 0.3040}{\sqrt{256}}$ = Rs. 7600 ABC; Daily SD = $\frac{6,69,000 \times 0.2940}{\sqrt{256}}$ = Rs. 8,100 15 day 97.5% VaR (XYZ) = 1.96 × 7600 × $\sqrt{15}$ = 57691.95 15 day 97.5% VaR (ABC) = 1.96 × 8100 × $\sqrt{15}$ = 63765	7	

		$\sigma_p = \sqrt{\sigma_{ABC}^2 + \sigma_{XYZ}^2 + 2 \cdot r \cdot \sigma_{ABC} \cdot \sigma_{XYZ}}$ $\sigma_p = \sqrt{(7600)^2 + (8400)^2 + 2(0.6)(7600)(8400)}$ $\sigma_p = 14315/-$ 15 day 97.5%, portfolio VaR = $= 1.96 \times 14315 \times \sqrt{15} = 108,666$ Reduction of VaR due to diversification:- $= (57692 + 63765) - 108666$ $\Rightarrow$ 12,791.		
	c)	**1. Price Volatility** A price is what one pays to acquire or use something of value. The objects having value maybe commodities, local currency or foreign currencies. The concept of price is clear to almost everybody when we discuss commodities. There is a price to be paid for the purchase of food grain, oil, petrol, metal, etc. the price one pays for use of a unit of another persons money is called interest rate. And the price one pays in one's own currency for a unit of another currency is called as an exchange rate. **2. Globalization of the Markets** Earlier, managers had to deal with domestic economic concerns; what happened in other part of the world was mostly irrelevant. Now globalization has increased the size of markets and as greatly enhanced competition .it has benefited consumers who cannot obtain better quality goods at a lower cost. It has also exposed the modern business to significant risks and, in many cases, led to cut profit margins **3. Technological Advances** A significant growth of derivative instruments has been driven by technological break through. Advances in this area include the development of high speed processors, network systems and enhanced method of data entry. Closely related to advances in computer technology are advances in telecommunications. Improvement in communications allow for instantaneous world wide conferencing, Data transmission by satellite. **4. Advances in Financial Theories** Advances in financial theories gave birth to derivatives. Initially forward contracts in its traditional form, was the only hedging tool available. Option pricing models developed by Black and Scholes in 1973 were used to determine prices of call and put options. In late 1970's, work of Lewis Edeington extended the early work of Johnson and started the hedging of financial price risks with financial futures. The work of economic theorists gave rise to new products for risk management which led to the growth of derivatives in financial markets.	10	

8		**Case Study** 		20M

a) The portfolio of Mr. Investor – Beta Value.

Security	Price of 1 share	No. of Shares	Value	Weightage	Beta	Wi·Bi
A	29·40	400	11,760	0·012	0·59	0·0078
B	318·70	800	2,54,960	0·256	1·32	0·33792
C	660·20	150	99030	0·100	0·87	0·08700
D	5·20	300	1,560	0·002	0·35	0·00070
E	281·90	400	1,12,760	0·113	1·16	0·13108
F	275·40	750	2,06,550	0·208	1·24	0·25792
G	514·60	300	1,54,380	0·155	1·05	0·16275
H	170·50	900	1,53,450	0·154	0·76	0·11704
	Total		9,94,450			1·10149

b) Cost of Capital 20%. Compounded $m = (1+0.20) = 0.18232$

February Contract $t = 58/365 = 0.1589$ March $t = 29/365 = 0.2438$

$F = S_0 e^{rt}$

February $F = 986e^{(0.18232)(0.1589)}$ March $F = 986e^{(0.18232)}$

$= 1014.98$ $= 1030.32$

(c) Value of March Contract $= 1019 \times 200 = Rs.\ 203,800$.

(i) When Total Portfolio is Hedged	When 90% of the Portfolio is Hedged	When 120% of the Portfolio is Hedged
$\frac{9,94,450}{2,03,800} \times 1.10149$	$\frac{9,94,450 \times 0.90}{2,03,800} \times 1.10149$	$\frac{9,94,450 \times 1.20}{2,03,800} \times 1.10149$
= 5·39 or 6 Contracts	= 4·84 or 5 Contracts.	= 2·02 or 2 Contracts