UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Energy Trading Markets and Risk Management   **Semester: III**
Programme: Masters in Energy Economics (MEE)

Time: 03 hrs.   **Max. Marks: 100**
Instructions: Section A and D are compulsory.
Attempt any four questions from Section B and any two questions from Section-C.

SECTION A

S. No.		Marks	CO

Q 1	Find out the payoffs of the following positions on European options on a stock whose price at maturity is Rs 100.
	
	  i. Long call with exercise price of Rs 90
	  ii. Short call with exercise price of Rs 80
	  iii. Long put with exercise price of Rs 110
	  iv. Short put with exercise price of Rs 110
	  v. Long call with exercise price of Rs 100
	  vi. Short put with exercise price of Rs 100
		5*2 = 10	CO 3

Q 2	Give the name of four international commodity indices.	2	CO 2
Q 3	Which exchange has largest share in energy commodity derivative trading in India?	2	CO 1
Q 4	What is the name of the commodity exchange that trades most liquid crude oil futures in Global Market?	2	CO 1

Q 5	A risk manager estimates the daily variance
	    Assume the model parameter values are $\alpha_0 = 0.005, \alpha_1 = 0.04, \beta = 0.94$. The long-run annualized volatility is approximately:
	    A. 25.00%
	    B. 13.54%
	    C. 72.72%
	    D. 7.94%
		2	CO 4

Q 6	A firm is going to buy 10,000 barrels of West Texas Crude Oil. It plans to hedge the purchase using the Brent Crude futures contract. The correlation between the spot and futures price is 0.72. The volatility of the spot price is 0.35 per year. The volatility of the Brent Crude futures price is 0.27 per year. What is the hedge ratio for the firm?
	    A. 0.5554
	    B. 0.9333
	    C. 1.2099
	    D. 0.8198
		2	CO 3

		SECTION B		
Q 7	A Petrochemical Plant needs to process 20,000 barrels of oil in three months' time. To hedge against the rising price, the plants needs to go long on the futures contract of crude oil. The spot price of crude oil is ₹2,925 per barrel, while futures contract expiring three months from now is selling for ₹3,300 per barrel. By going long on the futures the petrochemical plant can lock in the procurement at ₹3,300 per barrel. Assuming the size of one futures contract of 100 barrels, the firm buys 200 futures to cover its exposure of 20,000 barrels. Find out the price that would be payable under two scenarios of rise in price to ₹3,600 or fall in price to ₹2,700 per barrel after three months.		**5**	**CO 2**
Q 8	If a trader has a long position in Brent crude oil at 500 barrels on 1 August for a contract maturing in October. The daily margin requirements on the contract is as follows: 	Margin Date	Expiry Date	SPAN Margin (%)	Exposure Margin (%)	Total Margin (%)
01 Aug 18	15 October 18	7.16	2	9.16 | The future price per barrel for Brent crude oil contract are as follows: | Date	01 August	02 August	03 August	04 August	05 August	06 August	07 August	08 August
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Price	5, 277	5, 318	5, 301	5, 082	5, 005	5, 054	4, 923	4, 822	 Assuming the initial margin of 9.16% and minimum margin requirement of 5%, calculate margin payment requirement by the trader.		**5**	**CO 2 and 3**
Q 9	A farmer is expecting to sell 10000 bushels of soybeans one month hence and in August purchases September expiry put option contracts with a strike price of 950 cents / bushel at a premium of 45 cents / bushel. Draw the profit (loss) profile for the farmer if the put option contract becomes at-the-money, out-of-the-money and in-the-money contract at the time of expiry. 　　　(Note: You can take the standard normal value of 95% = 1.64)		**5**	**CO 3**
Q 10	On September 2016, based on the historical annualized standard deviation of 24.35%, find out VaR for 95% one-day and five-day trading horizon. The trader wants to take position in 2 cotton contracts maturing on October 2016. Each contract trades at ₹16840 for bale. Each contract consists of 25 bales of cotton. No. of trading days in a year is 305.		**5**	**CO 2**
Q 11	Calculate the open interest for the details given below. Also identify the number of contracts owned by the long as well as short futures position holders. Each contract lots size 150 units as underlying. 	Date	Long Futures	Short Futures	No. of contracts traded	Open Interest
22nd Jan 20X1 at 10.00 am	A	B	100	?
22nd Jan 20X1 at 11.00 pm	C	X	700	?			**5**	**CO 2**

	22nd Jan 20X1 4.00 pm	D	E	350	?		
	23rd Jan 20X1 at 11:30 am	X	D	50	?		
	23rd Jan 20X1 at 4.00 pm	X	D	350	?		

SECTION-C

Q 12	Stock A and Stock B have annual volatility of 20% and 30% respectively. You are updating volatility on weekly basis. In the past week the returns of Stock A and Stock B were 3% and – 2% respectively. What is your revised estimate of annual volatility for coming week using EWMA method with 95% decay rate and 52 weeks per annum?	**15**	**CO 2**
Q 13	A crude oil producer and a refiner enter into a contract to swap crude oil price. Duration of the contract is for 3 years. Notional volume of crude oil is 10000 barrel of oil. On every month during the contract period, the refiner pays a fixed price of USD 93 per barrel. The crude oil producer agrees to pay the settlement price of nearby Nymex WTI futures contract prevailing on that day. Comment on who is the buyer and who is the seller of the swap. In the next two months, the Nymex WTI futures contract settlement prices are USD 90.6 and USD 85.35 respectively. Calculate the payoff on these two dates. Also calculate how many times such payoff will happen during the life of the contract.	**15**	**CO 3 and 4**
Q 14	A trader is anticipating strengthening of the crack margin. The trader bought a 3:2:1 crack spread futures on crude oil (3), heating oil (2) and petrol (1) on 5th December 20X1.The crude oil, heating oil and petrol futures matures on January 20X2. On 5th December 20X1, January futures prices of crude oil, heating oil and gasoline per barrel are quoting at USD 82.5 and USD 94.15 and USD 102.70 respectively. Ten days after buying the contract, the trader squared off the contract. The futures prices were quoting at USD 97.6, USD 106.45 and USD 107.95 respectively. Calculate the crack spread margin on both days and also find out the profit/loss of the trader.	**15**	**CO 4**

SECTION-D

Q 15	Refer the document "Amaranth Advisors: Burning Six Billion in Thirty Days" and answer the following questions. i. Identify the factors that led to the collapse of Amaranth Advisors LLC. ii. Explain the rationale and structuring of the long winter, short non-winter trading strategy used by Amaranth. iii. How Amaranth was able to maintain net position sizes above NYMEX position limit guidelines and summarize the implications of this action.	**30**	**CO 5**