Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: Carbon Trading (ETEG441) **Semester: VIII**
Program: B tech ET +IPR **Time: 3 hrs.**
Pages: 03 **Max. Marks: 100**

Instructions: Attempt all questions Section-wise; for numerical, data table is given at backside of Question Paper

SECTION A

S. No.		Marks	CO
Q 1	Elaborate on the various aspects of Conventional Economic Development Strategies.	**4**	**CO5**
Q 2	Discuss the importance of developing "Emission Estimates" for Carbon Markets.	**4**	**CO4**
Q 3	Evaluate the various features and challenges of Carbon Market policies in India, and what makes it unique?	**4**	**CO3**
Q 4	What are the various perspectives of policy makers for accounting of GHG emissions?	**4**	**CO2**
Q 5	What do you understand by "Appropriate Technology?" Explain with examples.	**4**	**CO1**
	SECTION B		
Q 6	Calculate the annual emission of Nitrogen Oxides (**NOx**) from a 150 million Btu/hr (MMBtu/hr) natural gas fired large boiler, having low NOX burners and controlled combustion (**CE_{NOX}= 0.3**). The system consumes 3 million standard cubic feet (MMScf) in one year. Comment on the Emission Factor Rating for the same and how it would affect **carbon markets** if the said system is used in Carbon trading. . **Note:** For relevant values, use the **Data table** given at the back of this Question paper.	**10**	**CO3**
Q 7	Discuss the process of converting Offsets to Carbon Credits, and further elaborate on the "GHG Trading Considerations" given that a waste-derived fuel may not always be as efficient as a fossil fuel for Power Generation. Use suitable examples to illustrate your opinion.	**10**	**CO2**
Q 8	What do you understand by "Emission Factor Quality Ratings?"	**10**	**CO4**

	Explain all the five parameters/ ratings that constitute the system and its importance in Carbon Markets for GHG trading considerations.		
Q 9	For a tangential fired boiler with controlled combustion and flue gas recirculation, calculate the annual emissions of Nitrous Oxides (**NOx**) given that the boiler operates at 3.5 million Btu/hr (MMBtu/hr) with fuel consumption at the rate of 4.5 million standard cubic feet (MMScf) in one year. Comment on the Emission Factor Rating for the same and how it would affect **carbon markets** if the said system is used in Carbon trading. Given **CE_{NOX}= 0.3.** **Note:** For relevant values, use the **Data table** given at the back of this Question paper. **OR** With reference to Sector Specific Tools in GHG Emission trading, explain the main features for the following Calculation Tools: a. Iron and Steel Industry b. Cement Industry c. HFC-23 from HCFC-22 production	**10**	**CO3**
	SECTION-C		
Q 10	With the help of a neat flow diagram, explain how Inventory Quality Management System works for Carbon emissions. Further, elaborate on each of the seven parameters that constitute the system. With reference to above, explain the importance of Feedback system for- Data, Methods, Systems, and documentation.	**20**	**CO2**
Q 11	A company uses fuel purchase records to calculate its scope 1 emissions. Last year, the company purchased 714 gallons of gasoline, 212 gallons of diesel fuel and 360 thousand cubic feet of natural gas. What is the company's scope 1 emission this year? Emission Factor for: **a. Gasoline** = 19.37 lb. CO2/ gallons **b. Diesel** = 22.23 lb. CO2/ gallons **c. Natural Gas** = 0.12 lb. CO2/ cubic foot **OR** "While PAT was launched as a program stemming from the 2008 National Action Plan on Climate Change (NAPCC), its structure flows from the Energy Conservation Act of 2001 (ECA-2001), which requires fifteen energy-intensive sectors to	**20**	**CO5**

	implement **energy efficiency measures**. PAT covers eight of these sectors." With reference to above statement from EDF Report from India, answer the following: a. Energy efficiency targets and specific energy consumption, b. Facilities covered in the various sectors for emission trading.		

Table: Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas combustion[a]

Combustor Type (MMBtu/hr Heat Input) [SCC]	NO_x[b]		CO	
	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
Large Wall-Fired Boilers (>100) [1-01-006-01, 1-02-006-01, 1-03-006-01]				
Uncontrolled (Pre-NSPS)[c]	280	A	84	B
Uncontrolled (Post-NSPS)[c]	190	A	84	B
Controlled - Low NO_x burners	140	A	84	B
Controlled - Flue gas recirculation	100	D	84	B
Small Boilers (<100) [1-01-006-02, 1-02-006-02, 1-03-006-02, 1-03-006-03]				
Uncontrolled	100	B	84	B
Controlled - Low NO_x burners	50	D	84	B
Controlled - Low NO_x burners/Flue gas recirculation	32	C	84	B
Tangential-Fired Boilers (All Sizes) [1-01-006-04]				
Uncontrolled	170	A	24	C
Controlled - Flue gas recirculation	76	D	98	D
Residential Furnaces (<0.3) [No SCC]				
Uncontrolled	94	B	40	B

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. To convert from lb/10 6 scf to kg/106 m3, multiply by 16. Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from 1b/10 6 scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value. SCC = Source Classification Code. ND = no data. NA = not applicable.

[b] Expressed as NO2. For large and small wall fired boilers with SNCR control, apply a 24 percent reduction to the appropriate NO X emission factor. For tangential-fired boilers with SNCR control, apply a 13 percent reduction to the appropriate NO X emission factor.

[c] NSPS=New Source Performance Standard as defined in 40 CFR 60 Subparts D and Db. Post-NSPS units are boilers with greater than 250 MMBtu/hr of heat input that commenced construction modification, or reconstruction after August 17, 1971, and units with heat input capacities between 100 and 250 MMBtu/hr that commenced construction modification, or reconstruction after June 19, 1984.

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SECTION A

S. No.		Marks	CO
Q 1	Elaborate on the various issues associated with Western Influence for third world countries for sustainability projects.	**4**	**CO5**
Q 2	Discuss the various application aspects of Emission Factors based on source.	**4**	**CO3**
Q 3	What distinguishes India's PAT (Perform, Achieve & Trade) from traditional cap-and-trade systems?	**4**	**CO5**
Q 4	Evaluate the risk of reversibility for projects in the Carbon Markets, when it should be assessed.	**4**	**CO3**
Q 5	Enumerate the various barriers to Sustainable Development and the potential solution to each of these issues.	**4**	**CO4**
	SECTION B		
Q 6	Calculate the annual emissions of Carbon Monoxide (**CO**) from a 2.5 million Btu/hr (MMBtu/hr) natural gas fired small boiler, which consumes 3.5 million standard cubic feet (MMScf) in one year. Given that, system as such does not have any control mechanism. Comment on the Emission Factor Rating for the same and how it would affect **carbon markets** if the said system is used in Carbon trading. . **Note:** For relevant values, use the **Data table** given at the back of this Question paper.	**10**	**CO3**
Q 7	Illustrate the importance of Emission Factor Ratings, and how are they different from Emission Factor Quality Ratings. Further, with the help of case example, explain how these assessment systems fare in Carbon Markets. **OR**	**10**	**CO2**

	With the help of a neat flow diagram, explain SCOPE 1, SCOPE 2 and SCOPE 3 emissions from a fully functional coal based Thermal Power Plant.		
Q 8	For a large wall fired boiler, post New Source Performance Standard (NSPS), having uncontrolled combustion, calculate the annual emissions of Carbon Monoxide (**CO**). **Data Given:** Boiler Capacity: 4 million Btu/hr (MMBtu/hr) Fuel Consumption: 2.5 million standard cubic feet (MMScf) Comment on the Emission Factor Rating for the same and how it would affect **carbon markets** if the said system is used in Carbon trading. **Note:** For relevant values, use the **Data table** given at the back of this Question paper.	**10**	**CO4**
Q 9	With reference to Cross Sector tools in the Carbon markets, explain the main features of the following Calculation Tools: a. Stationary Combustion b. Mobile Combustion c. HFC from AC and Refrigeration use	**10**	**CO2**
	SECTION-C		
Q 10	The COP24 report is a contribution from the public health community to support the negotiations of the United Nations Framework Convention on Climate Change (UNFCCC). It was written at the request of the President of the 23rd Conference of the Parties to the UNFCCC (COP23), Prime Minister Bainimarama of Fiji, to the World Health Organisation (WHO) to focus a report on health and climate change, keeping the above in mind, answer the following: a. What are the three primary aims of the COP 24 report? b. Why the "Paris Agreement" has been called the strongest health agreement of this century? c. What are the various effects on human health due to Climate change? d. Elaborate on the key recommendations from the report.	**20**	**CO1**
Q 11	Elaborate on the following uncertainty parameters for assessing Inventories for Emission Trading Systems, also explain how the effect of such parameters can be minimized in Carbon Markets: a. Scientific Uncertainty b. Estimation Uncertainty c. Model Uncertainty	**20**	**CO3**

	d. Parameter Uncertainty		

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