

Name:	
Enrolment No:	

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**End Semester Examination, May 2021**

**Course: Environmental Management in Power Industry**

**Semester: VI**

**Program: B. Tech- FSE**

**Time 03 hrs.**

**Course Code: HSFS 4010P**

**Max. Marks: 100**

**SECTION A**

**1. Each Question will carry 5 Marks**

**2. Instruction: Complete the statement / Select the correct answer(s)**

S. No.		Marks	CO
Q 1	Explain 'Integrated Gasification and Combined Cycle (IGCC)' power generating technology.	5	CO2
Q 2	a) In a 'Fluidized Bed Combustion Boiler', _____ is used to maintain the ignition temperature & effective mixing of fuel. b) In a Run-off, the river (High Velocity & Low Volume), type Hydroelectric Power Plant, _____ type of turbine is more commonly used. c) A 'Pressurized Water Reactor' based Nuclear Power Plants comprises of _____ cycle. d) For a Wind Turbine to operate under wind flowing from various direction _____ Axis type of Wind Turbine is preferable. e) In a 'Fluidized Bed Combustion Boiler', to capture _____, limestone & dolomite is used during combustion process.	5	CO1
Q 3	Name the various types of 'Green House Gases' (at least 5 major gases) identified under 'Kyoto protocol'.	5	CO1
Q 4	Identify the 5 common 'Air Emissions' from a Coal fired Thermal Power Plant along with their respective 'Reduction Techniques'.	5	CO2
Q 5	Compare 'Emission Trading' with 'Joint Implementation'.	5	CO3
Q 6	Name the three most important 20/20/20 targets set under the 'Paris Agreement'.	5	CO1

**SECTION B**

**1. Each question will carry 10 marks**

**2. Instruction: Write short / brief notes**

Q 7	Evaluate the various types of Boiler Ash evacuation systems associated with a coal fired Thermal Power Plant & justify their respective application from the Environmental Impact Assessment aspect.	10	CO4
Q 8	Compare & contrast between 'Bio-mass fired Thermal Power Plant' and 'Coal fired Thermal Power Plant' along with their respective environmental advantages & disadvantages.	10	CO3
Q 9	Differentiate between 'Solar Thermal Power Generation technology' and 'Solar Photo-Voltaic technology' along with their respective 'Environmental Impact Assessments'	10	CO3

Q 10	Identify the Environmental impacts a Hydroelectric Power Plant has during: 1) Construction phase 2) Ponding (Dam) during normal operation 3) Operation of the Hydroelectric Power Plant at Base load condition 4) Operation of the Hydroelectric Power Plant at Peak load condition	10	CO2
Q 11	Describe the following three types of 'Geo-thermal Power' generating systems along with their respective environmental impact(s): a. Dry Steam Open System b. Flash Steam Open System c. Hot Water Closed (Binary) System	10	CO2

**SECTION-C**

**1. Each Question carries 20 Marks.**

**2. Instruction: Write long answer.**

Q 12	<p>Love Canal was an unfinished canal constructed in the 1890s for hydroelectric power generation. The ditch was abandoned before it actually generated any power and went mostly unused for decades. From 1930 to 1950, the place was used as a chemical waste dump by the US army.</p> <p>Hooker Chemical purchased the land in 1942 and lined it with clay. Then, the company put into Love Canal an estimated 21,000 tons of hazardous chemical waste.</p> <p>In 1953, Hooker sold the land to the 'Niagara Falls school board' for \$1, and included a clause in the sales contract that both described the land use (filled with chemical waste) and absolved them from any future damage claims from the buried waste. However, after purchasing the land, the school board promptly built a public school on the site &amp; some housing projects were also built along the canal banks.</p> <p>During construction, the canal's clay cap and walls were breached, damaging some of the metal barrels. Eventually, the chemical waste seeped into the neighborhood. Residents repeatedly complained of strange odors and substances that surfaced in their yards.</p> <p>City officials investigated the area, but did not act to solve the problem. Local residents allegedly experienced major health problems including high rates of miscarriages, birth defects, and chromosome damage, but studies by the New York State Health Department disputed that.</p> <p>Finally, in 1978 the US government took the initiative for the cleaning up of Love Canal, which was funded by Superfund and completely finished in 2004, involved removing contaminated soil, installing drainage pipes to capture contaminated groundwater for treatment, and covering it with clay and plastic. In 1995, Occidental Chemical (the modern name for Hooker Chemical) paid \$102 million to Superfund for cleanup and \$27 million to Federal Emergency Management Association for the relocation of more than 1,000 families. New York State paid \$98 million to EPA and</p>	20	CO4
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the US government paid \$8 million for pollution by the Army. The total clean up cost was estimated to be \$275 million.

**Questions:**

- 1) Examine the above case & develop the protocol from the perspective of 'Environmental Management Plan' that should have been adopted by the Niagara Falls school board prior to initiating their project.
- 2) Design & suggest the technology 'Hooker Chemical' could have adopted for the management of their chemical wastes before dumping them in the wasteland.

**OR**

The Bhopal disaster or Bhopal gas tragedy was an industrial accident. It happened at a Union Carbide subsidiary pesticide plant in the city of Bhopal, India. On the night of 2-3 December 1984, the plant released approximately 40 tons of toxic methyl isocyanate (MIC) gas, exposing more than 500,000 people to toxic gases.

A mixture of poisonous gases flooded the city, causing great panic as people woke up with a burning sensation in their lungs. Thousands died immediately from the effects of the gas. Many were trampled in the panic that followed. The first official immediate death toll was 3,598 in 1989. Another estimate is that 8,000 died within two weeks, that an additional 8,000 have since died from gas-related diseases.

The disaster happened because water entered a tank containing Methyl isocyanate. This caused a chemical reaction which resulted in the buildup of much Carbon dioxide, among other things. The resulting reaction increased the temperature inside the tank to reach over 200 °C (392 °F). The pressure was more than the tank was built to withstand. The tank had valves to control the pressure. These were triggered in an emergency, which reduced the pressure. As a result, large amounts of toxic gases (like MIC) were released into the environment. The pipes were rusty. The rust in the iron pipes made the reaction faster. All the contents of the tank were released within a period of about two hours. The water had entered the tank because of a sequence of events. The tank had been maintained badly. When cleaning work was done, water entered the tank.

Factors leading to this huge gas leak include:

- The use of hazardous chemicals (MIC) instead of less dangerous ones
- Storing these chemicals in large tanks instead of over 200 steel drums.
- Possible corroding material in pipelines
- Poor maintenance after the plant ceased production in the early 1980s
- Failure of several safety systems (due to poor maintenance and regulations).

	<ul style="list-style-type: none"><li>• Safety systems shut down to save money - including the MIC tank refrigeration system which alone would have prevented the disaster.</li><li>• Plant design modifications by Indian engineers to abide by government regulations and economic pressures to reduce expenses.</li></ul> <p><b>Questions:</b></p> <ol style="list-style-type: none"><li>1) Design 'Environmental Impact Assessment' strategies required to be adopted during the 'Design &amp; Construction' phase for the above plant.</li><li>2) Examine the above case &amp; develop the protocol from the perspective of 'Environmental Management Plan' that should have been adopted by Union Carbide during the operation of the plant.</li></ol>		
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