Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

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

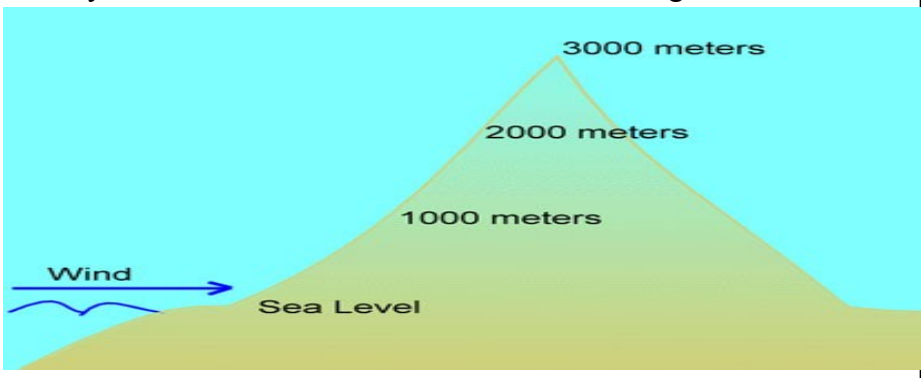
Course/ Program: B.Tech (FSE) **Semester : VI**
Course Code: HSFS 3010 **Time : 03 hrs.**
Subject: Environmental Engineering & Management **Max. Marks: 100**
No. of page/s:4

SECTION A

S. No.	Answer all the question	Marks	CO
Q 1	Gaussian plume model is considered as an important tool to determine spatial the pollutant concentration. Give formula for Gaussian plume model and describe the assumptions made in its derivation and its limitation.	4	CO1,3
Q 2	Explain following with their application. i. Environmental Inversion ii. Windrose	4	CO1,2
Q 3	Discuss briefly about designing aspect of sedimentation tank with standard dimension for wastewater treatment system.	4	CO1,5
Q 4	Explain following: i. Great Smog of London. ii. Eutrophication	4	CO1,2
Q 5	Differentiate the following: i. Stock and fund pollutant ii. Line source & Areal source air pollution	4	CO3

SECTION B

	Answer four questions.		CO
Q 6	Determine the effective stack height for the following given data. The physical height for the stack is 203m tall with 1.07m inside diameter. The wind velocity is 13.32 km/h & the air temperature is 13^{0c}. The barometric pressure is 1000mili bar. Gas velocity is 9.14m/s. Stack gas temperature is 149^{0c}.	10	CO 5
Q 7	Describe the following plume behavior in the following regime with neat a diagram a. Fanning b. Fumigation c. Looping d. Coning	10	CO2
Q 8	A large power plant has a 200 m stack with Outside radius 5m and inside radius 2m. The exit velocity of the stack gas is estimated at 25m/s at the temperature of 140^{0}c. Ambient temperature is equivalent to room temperature and the wind at stack height	10	CO5

	is estimated to be 5m/s and at half of the stack height is 4 m. Estimate the effective height of the stack. If 1. The atmosphere is stable with temperature increasing at the rate of 2^{0C}/km. 2. The temperature is slightly unstable class C		
Q 9	Why environment modeling is required and define it's stages? **OR** Enumerate the following: **a)** Cyclone Separator with diagram **b)** Dry & Wet Scrubber with example	**10**	**CO1,2**
	SECTION-C		
	Answer two questions.		**CO5**
Q 10	Use the diagram of the mountain below to answer the following questions. Assume that: The temperature at sea level is 30 degrees C, The normal lapse rate is 6.5 degrees C/km, The dry adiabatic lapse rate is 10 degrees C/km, The saturated adiabatic lapse rate is 5 degrees C/km, and The dew point is 10 degrees C. All of your answers should be in either meters or degrees C.  a. What will the temperature be of still air at 1000 meters altitude? b. At what altitude will the temperature of still air be 10.5 degrees C? c. If a wind blows onshore and rises up the slope of the mountain, what will the temperature be of the rising air at 1000 meters altitude? d. At what altitude will the temperature of the rising air be 10	**20**	**CO5,4**

	degrees C? e. What will the temperature be of the rising air at 3000 meters altitude? f. At what altitude is the lifting condensation level? g. After reaching the summit of the mountain, the air moves downslope on the leeward side. Assuming that the air is unsaturated and that no evaporation is taking place, what will the temperature be of the subsiding air at 2000 meters altitude? h. Assuming that the air is unsaturated and that no evaporation is taking place, what will the temperature of the subsiding air at sea level on the leeward side of the mountain? **OR** Describe following, a. Sanitary Landfill **(4 Marks)** b. Vermicomposting and termigradation **(4Marks)** c. EIA steps with flow chart **(8 Marks)** d. Fill in the blanks (W.R.T acid rain) **(4Marks)** SO_2+OH=……+…. $HOSO_2+O_2$=……+…. SO_3+H_2O+M=……+…. NO_2+OHM=……. +……		
Q 11	Read the paragraph given below and answer all the questions. The biodegradation process is exothermic and well-operating compost will have a temperature between 55 and 60^{0}C during the period of active degradation. These temperatures are effective in destroying pathogens. The processing cycle for composting is about 20 to 25 days with active degradation taking place over a 10- to 15-day period . One of the major drawbacks of composting is odors. Maintenance of aerobic conditions and a proper cure time minimize odor problems. Compost is useful as a soil conditioner. In this role compost will:(1) improve soil structure, (2) increase moisture-holding capacity, (3) reduce leaching of soluble nitrogen, and (4) increase the buffer capacity of the soil. It should be emphasized that compost is not a valuable fertilizer. It contains only 1 percent or less of the major nutrients, such as nitrogen, phosphorus, and potash. Composting is one of the fastest-growing aspects of ISWM. The driving force is legislation enacted to extend the life of landfills by removing yard waste from the waste stream. According to the EPA, recovery by composting was negligible in 1988.By 1990, EPA estimated that 2 percent of the nation's solid waste was being composted. The 2000 estimate was that 7 percent of the solid waste was	**20**	**CO4,5**

being composted. In1994, over 3,000 composting facilities were operating in the United States. Sludge composting facilities numbered over 180, and municipal solid waste composting was being practiced by 21 cities (Monk, 1994).Methane is produced in sanitary landfills as a result of anaerobic decomposition of the organic fraction of the waste. In addition to gas extraction wells and a collection system, some gas processing equipment is employed. The minimum processing consists of dehydration, gas cooling, and, perhaps, removal of heavy hydrocarbons. The gas produced is a low-Joule gas having heating value of 18.6 MJ/m3. In high-Joule processing systems, carbon dioxide and some hydrocarbons are removed to yield essentially pure methane. The resulting gas is of pipeline quality and has a heating value of approximately 37.3 MJ/m3. The anticipated quantity of landfill gas (LFG) varies between 0.6 and 8.7 liters per kilogram of solid waste present per year (L/kg / y). The average production rate is 5 L/kg/ y. Although landfill sites as small as 11 ha have yielded substantial quantities of recoverable methane, the capital investment and complexity of the gas processing equipment will limit this technique to the larger sites (.65 ha). Otherwise, the technology is readily available and can make use of a resource that otherwise would dissipate into the atmosphere. According to EPA data, in 1999, 360 LFG-recovery projects nationwide produced the equivalent of 1,200 MW of power (Skinner, 1999).In the mid-1970s, under the auspices of the U.S. Environmental Protection Agency and with federal financing; several innovative high technologies for resource recovery were examined. At the end of the decade, a few workable systems and a large number of unworkable systems were identified. Because the successful high technology systems depend, to a large measure, on the recovery of energy for their success, we will consider the worth of solid waste as a fuel. On the other hand, its cost of $0.00/Mg may seem quite attractive. This is especially so when the price of anthracite coal may be $50/Mg and the price of No. 2 fuel oil is $250/Mg.

Answer the following:

a) Why sludge composting facilities and municipal solid waste composting is being practiced by 21 cities?
b) Solid waste management which is being practiced by many cities is one of the major components of sustainable development and it has many applications. Write that application and its impact on sustainable development.
c) Landfill is one of the techniques for management of organic solid waste .What is its advantage and disadvantage.

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SECTION A

S. No.	Answer all the question	Marks	CO
Q 1	Differentiate the following: i. Vermicomposting & Composting ii. Screening & Scoping	4	CO2
Q 2	Explain following with their application. i. Inversion type ii. Windrose	4	CO3
Q 3	Discuss briefly about designing aspect of sedimentation tank with standard dimension for wastewater treatment system.	4	CO5
Q 4	Explain following: i. Rapid & Comprehensive EIA. ii. Eutrophication	4	CO2
Q 5	Gaussian plume model is considered as an important tool to determine spatial the pollutant concentration. Give formula for Gaussian plume model and describe the assumptions made in its derivation and its limitation.	4	CO1,3

SECTION B

	Answer four question.		CO
Q 6	Why environment modeling is required and define it's stages? **OR** Enumerate the following: **a)** Gravity Settler with diagram	10	CO1,5

	b) Dry & Wet Scrubber with example		
Q 7	A large power plant has a 100 m stack with Outside radius 5m and inside radius 2m. The exit velocity of the stack gas is estimated at 25m/s at the temperature of 140^0c. Ambient temperature is equivalent to room temperature and the wind at stack height is estimated to be 5m/s and at half of the stack height is 4 m. Estimate the effective height of the stack. If 1. The atmosphere is stable with temperature increasing at the rate of 3^{0C}/km. 2. The temperature is slightly unstable class C	**10**	**CO5**
Q 8	Determine the effective stack height for the following given data. The physical height for the stack is 200m tall with 2.07m inside diameter. The wind velocity is 13.32 km/h & the air temperature is 15^{0c}. The barometric pressure is 2000mili bar. Gas velocity is 9.14m/s. Stack gas temperature is 150^{0c}.	**10**	**CO5**
Q 9	Describe the following plume behavior in the following regime with neat a diagram a. Fanning b. Fumigation c. Looping d. Coning	**10**	**CO1**
	SECTION-C		
	Answer two questions.		
Q 10	Describe following, i. Designing aspect of sanitary landfill (4 Marks) ii. Termigradation (4Marks) iii. EIA steps with flow chart (8 Marks) iv. Acid rain (4Marks) **OR** Draw a diagram of the mountain with temperature gradiant to answer the following questions. Assuming that: The temperature at sea level is 30 degrees C, The normal lapse rate is 6.5 degrees C/km, The dry adiabatic lapse rate is 10 degrees C/km, The saturated adiabatic lapse rate is 5 degrees C/km, and The dew point is 10 degrees C. All of your answers should be in either meters or degrees C.	**20**	**CO4**

	a. What will the temperature be of still air at 1000 meters altitude? b. At what altitude will the temperature of still air be 10.5 degrees C? c. If a wind blows onshore and rises up the slope of the mountain, what will the temperature be of the rising air at 1000 meters altitude? d. At what altitude will the temperature of the rising air be 10 degrees C? e. What will the temperature be of the rising air at 3000 meters altitude? f. At what altitude is the lifting condensation level? g. After reaching the summit of the mountain, the air moves downslope on the leeward side. Assuming that the air is unsaturated and that no evaporation is taking place, what will the temperature be of the subsiding air at 2000 meters altitude? h. Assuming that the air is unsaturated and that no evaporation is taking place, what will the temperature of the subsiding air at sea level on the leeward side of the mountain?		
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