Name: **Enrolment No:**	UPES

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

Course: Biomass Conversion Technology **Semester: I**
Program: M.Tech REE
Time: 03 hrs. **Max. Marks: 100**
Instructions:

SECTION A

S. No		Marks	CO
Q 1	Brief the summary of pathways for cellulosic biomass conversion to liquid fuels.	**4**	**CO1**
Q 2	Explain the simplified schematic illustration of bio-refinery concept.	**4**	**CO1**
Q 3	Explain proximate and ultimate analysis of some typical biomass feedstocks.	**4**	**CO2**
Q 4	Discuss the factors affecting the ethanol fermentation.	**4**	**CO3**
Q 5	Calculate the molar rate of air supply required to achieve an air equivalence ratio of 0.3 for a wood mulch/animal waste residue having the following simplified formula of $CH_{1.6}O_{0.62}N_{0.1}S_{0.001}$.	**4**	**CO2**
	SECTION B		
Q 6	Discuss the model of a bio-based product flowchart for biomass feedstocks	**10**	**CO3**
Q 7	Discuss the design, operation and economics of the energy plantation	**10**	**CO4**
Q 8	Discuss the Gasification Chemistry and Reaction Stages with diagram (or) Discuss about the control system for gasification process based on thermal conductivity to optimize the produce gas.	**10**	**CO3**
Q9	Mass of feedstock, Organic dry matter (ODM) and Organic Matter Reduction (OMR) are 50 t/day, 13.5 t/day, 9 t/day respectively, and biogas contain 60% CH_4, volume of digester is 3,000 m^3. Calculate (1) Volume of biogas produced, (2) Specific loading rate (3) Hydraulic retention time (4) Specific biogas production (5) Specific methane production	**10**	**CO4**
	SECTION-C		
Q 10	Discuss the production of different alcohols from Bio-derived Syngas with future scopes. (or)	**20**	**CO5**
Q 10	Discuss the different model types of Anaerobic Digesters to produce biogas from biomass.	**20**	**CO5**
Q 11	Determine Material and heat balance of a gasifier and calculate efficiencies. The analysis of various inputs and outputs are given. Input conditions (wt%) C: 79.1, H: 5, O: 6.4, N: 1.7, H2O: 1.7 A: 6.1, Temp 25°C and ashes = 9wt% of biomass @ 180°C. Output conditions gases (vol%) CO_2: 7, CO: 21, CH_4: 2.5, H_2: 14, N_2: 53, H_2O: 2.5 @ 670°C. Air contain RH: 80%. P_SH_2O = 26 mm Hg (25°C, 740 mm Hg). Steam is blown in at	**20**	**CO5**

	30.8 p_{sig} pressure with blast. Mean specific heat of ashes = 0.21 kcal/kg K (25 – 180°C range).		

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SECTION A

S. No.		Marks	CO
Q 1	Discuss about the comparisons of Petro-refinery Vs. Bio-refinery.	**4**	**CO1**
Q 2	Describe the energy efficiency opportunities in energy sector, importance of energy efficiency and plans for achieving the target.	**4**	**CO1**
Q 3	Explain the biomass composition and list few sample biomass composition.	**4**	**CO2**
Q 4	Calculate the molar rate of air supply required to achieve an air equivalence ratio of 0.7 for a wood mulch/animal waste residue having the following simplified formula of $CH_{1.0}O_{0.32}N_{0.18}S_{0.01}$.	**4**	**CO2**
Q 5	Discuss the types of organic materials produce biogas and how does biogas help reduce effects of climate change.	**4**	**CO3**
	SECTION B		
Q 6	Explain the technology for Bio-diesel Production from Cooking and Waste Cooking Oil by Microwave Irradiation.	**10**	**CO4**
Q 7	Explain the Integration of biomass quality variability in stochastic supply chain for large-scale biofuel production system.	**10**	**CO3**
Q 8	Discuss the comparison of the four main processing technologies used for the production of platform molecules from biomass. (or) Discuss the various reactors for fast pyrolysis with diagrams.	**10**	**CO3**
Q9	A bench-scale digestion plant of mixed wastes produced the following results Reactor volume = 2 L Feedstock COD_{inf} = 97,000 mg/L COD_{eff} = 4,000 mg/L Biogas = 1.13 m^3/m^3-day CH4 = 59% Daily feed rate = 55 mL. Determine the volume of CH_4 produced per kg of waste digested Specific Methane Production (SMP).	**10**	**CO4**
	SECTION-C		
Q 10	Discuss the Comparison of biogas production from an advanced micro-bio-loop and conventional system. (or)	**20**	**CO5**

	Discuss Biogas production from anaerobic co-digestion of cow manure with kitchen waste with schematic diagram.		
Q 11	Determine Material and heat balance of a gasifier and calculate efficiencies. The analysis of various inputs and outputs are given. Input conditions (wt%) C: 25, H: 20, O: 20, N: 20, H2O: 10 A: 5, Temp 25°C and ashes = 20 wt% of biomass @ 180°C. Output conditions gases (vol%) CO_2: 10, CO: 40, CH_4: 5, H_2: 20, N_2: 20, H_2O: 5 @ 670°C. Air contain RH: 80%. P_SH_2O = 26 mm Hg (25°C, 740 mm Hg). Steam is blown in at 25 p_{sig} pressure with blast. Mean specific heat of ashes = 0.21 kcal/kg K (25 – 180°C range).	**20**	**CO5**