



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Gasification and Gas to Liquid Technology

Program: B. Tech APE Gas

Course Code: CHGS3008

Semester: V

Time: 03 hrs.

Max.Marks:100

Instructions:1) Kindly use only black pen

2) Draw diagrams wherever necessary

SECTION A
(Scan and Upload)

(5Qx12M = 60Marks)

		Marks	COs
Q 1	a) The ultimate analysis of a biomass in % on a wet basis is as follows: C-69.8, H-4.6, N-1.4, O-8.5, S-2.5, Moisture-4.5, and Ash-8.7. Calculate the moisture content on dry basis, ash free basis and dry ash free basis. Also calculate the lower heating value given the gross calorific value is 7650 kcal/kg. b) Explain any four different technologies employed for purification of synthesis gas with their advantages and disadvantages.	(4+8) 12M	CO1
Q 2	Illustrate the components in IGCC by a neat block diagram with CO ₂ Sequestration.	12M	CO2
Q 3	India is an agricultural based economy creating waste biomass. Analyze how this waste biomass can be used for small scale gasification plants.	12M	CO3
Q 4	Outline the different processes for direct liquefaction of coal to produce liquid chemicals.	12M	CO4
Q 5	Describe the conventional methanol synthesis from biomass, the catalysts employed and the selection of reactor.	12M	CO5

SECTION B
(Scan and Upload)

(2Qx20M = 40Marks)

Q 1	A certain biomass has the following composition on mass basis. C-45.5%, H-6.8%, O-24.6%, N ₂ -0.30%, S-0.10%, Moisture-18.6%, and Ash-4.1%. Determine the molecular formula. If the above biomass is gasified in a gasifier, what will be the composition of the syngas when biomass to oxygen ratio is maintained as 0.8 mass/mass and steam to biomass ratio is also maintained as 0.1 mass/mass. Assume CO:H ₂ ratio in syngas as 2:1 vol/vol. Ignore the presence of other impurities and consider the molecular weight of the ash is 55. Also calculate the yield of H ₂ and CO. Comment on the content of CO and H ₂ .	20M	CO3
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Q 2	Describe the two mechanisms proposed to explain the initiation and chain growth steps during FTS.	20M	CO5
	(Or)		
	Explain the reactor development in FTS and the manufacture of DME from natural gas.	20M	CO5