Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

Programme Name: B. Tech APE-Gas **Semester : V**

Course Name : Gasification and Gas to Liquid Technology **Time : 03 hrs**

Course Code : CHGS 3008 **Max. Marks : 100**

Nos. of page(s) : 2

SECTION A

S. No.		Marks	CO
Q 1	Show the sketch of transport fuel production from biomass using gasification process.	5	CO1
Q 2	List the kinetic models of syngas to FT fuel based on empirically derived mechanism of Fischer-Tropsch synthesis process.	5	CO5
Q 3	Draw a flow diagram of process description for IGCC without CO_2 capture.	5	CO3
Q 4	Determine the efficiency of converting a tonne of wood waste with a heating value of 20 MJ/kg into pure methanol having a yield of 360 kg for every tonne. The energy content of pure methanol is 19.8 MJ/kg. Also convert all units in the English system.	5	CO4

SECTION B

Q 5	Explain the coal gasification chemistry with reaction stages.	10	CO2
Q 6	Design a downdraft gasifier with a required syngas output of 2.5 m^3/min using a cylindrical cross section. The A/F ratio should be 70% of stoichiometric requirement and sawdust will be used as fuel. The ultimate analysis is as follows (%): C = 49.7, O = 42.53, H = 6.2, N = 0.7, S = 0.17 and ash 0.7. The superficial velocity should be 0.03 m/s and the air density is 1.2 kg/m^3. About the 25 kg, biomass is used every hour. Assume the appropriate values if any requires.	10	CO3
Q 7	Determine the heating value and H_2/CO ratio of syngas produced from China lake process, whose volumetric composition is shown below. Use the heating values (MJ/m^3) of gases as follows H_2 = 12.8, CH_4 = 36.4, CO = 11.6, C2H2 = 53.9, C3H6 = 81.2, C2H4 = 59.5, C4H8 = 107.1 and C2H6 = 60.7. Comment on the properties of this syngas compare with those used in gasification, pyrolysis or for the FT process.	10	CO5

	H_2	CO	C_2H_4	CH_4	CO_2	C_3H_6	C_2H_2	C_4H_8	C_2H_6
Syngas (%V)	16	45.6	12.8	11	7.3	2.1	1.6	1.3	0.9

Q 8	Compare the difference between Co and Fe Fischer-Tropsch process in producing FT fuels. **(OR)** Explain the Cobalt-based Fischer-Tropsch synthesis with upstream water-gas shift process.	**10**	**CO5**
SECTION-C			
Q 9	With help of flowsheet diagram, Explain shell gasification process.	**20**	**CO3**
Q 10	Describe the production FT fuel from syngas produced through coal gasification process with a flow diagram. (OR) Explain the production of methanol from syngas obtained from biomass with a flow diagram.	**20**	**CO4** **CO5**