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

Programme Name: B. Tech ET + IPR　　　　　　　　**Semester　: V**
Course Name　: Combustion Energy and Technology　　**Time　　: 03 hrs**
Course Code　: ETEG303　　　　　　　　　　　　　**Max. Marks : 100**
Nos. of page(s)　: 02

Instructions:　1) Answer the questions section wise in the answer booklet. 2) Assume suitable data wherever necessary. The notations used here have the usual meanings.

SECTION A (Total Marks: 2 x 10 = 20)

➢ Attempt *all* the questions. All questions carry equal marks.

S. No.		Marks	CO
Q 1	Explain the following terms: 　i)　Natural gas 　ii)　Heat of combustion	10	CO1, CO4
Q 2	Explain in detail about atmospheric distillation unit in petroleum refinery with neat sketch.	10	CO3

SECTION B (Total Marks: 4 x 15 = 60)

➢ Attempt *all* the questions. All questions carry equal marks.

S. No.		Marks	CO
Q 3	Explain in detail about the manufacturing of producer gas and discuss about its properties and uses.	15	CO2, CO3
Q 4	Write short notes on the following i) Anthracite coal ii) In-situ theory of coal formation iii) Low temperature oxidation	15	CO1, CO2
Q 5	Explain the following terms: 　a.　Catalytic reforming 　b.　Carbide theory	08 07	CO2, CO3
Q 6	Methane is burned with excess air to ensure complete combustion. If 60 kg of CO_2 and 10 kg of CO are obtained when methane is completely burned with 500 kg air, determine the following: a) The mass of methane burnt (in kilograms) b) The percent excess air	15	CO5

SECTION-C (Total Marks: 1 x 20 = 20)

➢ Attempt *any one* question.

Q 7	Calculate the adiabatic flame temperature for complete combustion of ethyl alcohol with 25% excess air. The alcohol and air are supplies at 298 K and water formed is in the vapour state. The standard heat of combustion of alcohol is -1366.91 kJ/mol and latent heat of vaporization of water is 44 kJ/mol. The mean molar specific heats in kJ/kmol K, where T is in ^0C, are: $\quad\quad\quad$ CO_2 $\quad$: $\quad\quad$ 36.11 + 0.0423T $\quad\quad\quad$ H_2O $\quad$: $\quad\quad$ 33.46 + 0.0069T $\quad\quad\quad$ O_2 $\quad\quad$: $\quad\quad\quad$ 29.10 + 0.0116T $\quad\quad\quad$ N_2 $\quad\quad$: $\quad\quad\quad$ 29.00 + 0.0022T	20	CO5
Q 8	i) $\quad$ The heats of combustion of solid carbon and gaseous CO are -393.51 kJ/mol and -282.99 kJ/mol respectively. Determine the heat of formation of CO. ii) $\quad$ Discuss about the classification of crude oil. iii) $\quad$ Define Air to fuel ratio and equivalence ratio. iv) $\quad$ What are the uses of coal?	05 05 05 05	CO1, CO2, CO4