Total number of printed pages = 4

19/2nd Sem/PGET 2102

2022

FUELS AND COMBUSTION

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) Match the following : 1×5=5

Group A	Group B
(i) Producer gas	(a) Pure mixture CO and H_2
(ii) Low temperature Carbonization	(b) CO and N_2
(iii) Syn gas	(c) Sulphur containing gasoline
(iv) Sour petrol	(d) 500°C-700°C
(v) Vapour-phase thermal cracking	(e) 670°C- 720°C

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(b) Distinguish between : 5×3=15

(i) Liquid phase thermal cracking and vapor phase thermal cracking

(ii) Low calorific value and net calorific value

(iii) LTC and HTC.

2. Write short answers on any *ten* : 2×10=20

(a) Give the definition of fuel.

(b) What is calorific value ?

(c) Give two examples of derived fuel.

(d) 1 kcal = ____ ? _____ B. Th. U.

(e) Define LCV.

(f) What is ash deformation point ?

(g) Whether the formation of water gas reaction is exothermic or endothermic ?

(h) What is coal liquefaction process ?

(i) What is coking of coal ?

(j) Give two examples of charcoal briquettes.

(k) What do you mean coking ?

3. (a) A coal has the following composition by weight :

C = 92%, O = 2.0%, S = 0.5% N = 0.5% and Ash = 1.5%.

Net calorific value of the coal was found to be 9,430 kcal/kg. Calculate the percentage of hydrogen and HCV of coal. 4+4= 8

(b) Give the characteristics of good fuel. 4

(c) Write short notes on ash content in proximate analysis. What are the two classes of ash ? 4

(d) What are the role of fixed carbon for determining calorific value ? 4

4. (a) Write short notes on : 3+3=6

(i) Water Gas

(ii) Producer Gas.

(b) Give the classification of coal. How will you discuss the progressive transformation of wood to anthracite ? 2+4=6

(c) Define the origin of coal on the basis of in Situ theory and drift theory. 4

(d) "All coking coals are caking but all caking coals are not essentially coking coals." Explain the statement. 4

5. (a) Transition metals are used as catalyst in water gas shift reaction. Give the reaction with proper explanation. Give the schematic diagram to explain conversion of solid coal to a burnable gas. 4+4=8

(b) Give a brief explanation about composition of petroleum. 6

(c) What is cracking ? What are the chemical changes involved in cracking of coal. 2+4=6

6. Write short notes on any four : 5×4=20

(a) Fischer Tropsch Process

(b) Refining of gasoline

(c) Thermal cracking

(d) Properties of natural gas

(e) Flash point and Boiling point of gaseous fuel

(f) Catalytic cracking.