

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

[Turn over

(b) Distinguish between : $5 \times 3 = 15$

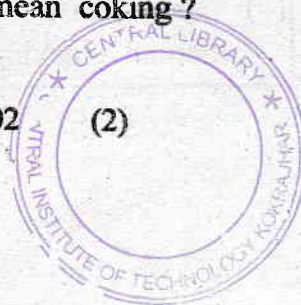
- (i) Liquid phase thermal cracking and vapor phase thermal cracking
- (ii) Low calorific value and net calorific value
- (iii) LTC and HTC.

2. Write short answers on any *ten* : $2 \times 10 = 20$

- (a) Give the definition of fuel.
- (b) What is calorific value ?
- (c) Give two examples of derived fuel.
- (d) $1 \text{ kcal} = \underline{\hspace{1cm}} ? \underline{\hspace{1cm}} \text{ B. Th. U.}$
- (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 ?

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(2)



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

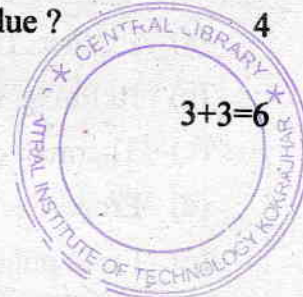
4. (a) Write short notes on :

- (i) Water Gas
(ii) Producer Gas.

3+3=6

- (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.

