Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3150509 Date:25-11-2024

Subject Name:Fuels and Combustion

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Explain Seismic geophysical work in drilling operation.	**03**
	(b)	Discuss various theories suggested by geologists regarding the formation of coal.	**04**
	(c)	Enlist any three properties of solid and liquid fuel. Also, Explain their measurement techniques in detail.	**07**
Q.2	**(a)**	Define coal liquefaction process. Enlist various types of liquefaction process.	**03**
	(b)	Explain float and sink method for coal washing.	**04**
	(c)	Enlist various coal combustion technologies. Explain circulating fluidized bed combustion technique for the combustion of bituminous coal.	**07**
		OR	
	(c)	Define coal mining. Explain Long wall coal mining in detail.	**07**
Q.3	**(a)**	Explain augur mining.	**03**
	(b)	Explain vis-breaking. Also list the various products of vis-breaking unit.	**04**
	(c)	Explain the reforming of naphtha in detail with neat flow diagram.	**07**
		OR	
Q.3	**(a)**	Write short note on improved oil recovery (IOR).	**03**
	(b)	Explain the coal tar distillation process with neat sketch and also name the various products obtained during this process.	**04**
	(c)	Describe delayed coking process used in the petroleum refinery with neat flow sheet.	**07**
Q.4	**(a)**	Define calorific value, gross calorific value and net calorific value of fuel.	**03**
	(b)	State the potential benefits of oxygen enrich combustion over conventional air-fired combustion process.	**04**
	(c)	Describe the synthesis of producer gas with all the chemical reactions involved and flow diagram.	**07**
		OR	
Q.4	**(a)**	State the mechanism and kinetics of combustion process.	**03**
	(b)	Define agro fuels. Explain the storage & handling procedure of agro fuels.	**04**
	(c)	Define water gas. Describe the production of water gas with all reactions involved.	**07**
Q.5	**(a)**	Enlist the various characteristics of an efficient furnace.	**03**

	(b)	State the two advantages and disadvantages of pulverized fuel firing.	**04**
	(c)	A petrol sample on analyzing by weight using an ultimate analysis gave carbon 85%, hydrogen 15%. Calculate the ratio of air to fuel by weight if volumetric analysis of the dry exhaust gas include CO_2;11.5%, CO;1.2%, O_2;0.9% and N_2; 86%. Also find % excess air.	**07**

OR

Q.5	**(a)**	Define adiabatic flame temperature.	**03**
	(b)	Enlist various methods for hydrogen production. Explain any one in detail.	**04**
	(c)	Discuss the working and industrial application of traveling grate stoker boiler.	**07**

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