Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- V EXAMINATION-SUMMER 2023

Subject Code: 3150509 Date: 23/06/2023

Subject Name: Fuels and Combustion

Time: 02:30 PM TO 05:00 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)**	Define Fuel and discuss its classification with suitable example.	**03**
	(b)	Define flash point and fire point and explain the significance of both.	**04**
	(c)	Discuss in detail about the scenario of coal reservoirs in India. Also, state the consumption pattern of coal in India	07
Q.2	**(a)**	Explain the storage, handling and safety of gasoline.	03
	(b)	Describe devolatilisation of coal at different temperature range. Also Discuss the composition of volatile matter.	04
	(c)	Enlist the different theories behind the coal forming process. Describe anyone in detail.	07
		OR	
	(c)	Describe briefly MTG process. List out the advantages of ebulated bed reactor over the fixed bed reactor	**07**
Q.3	**(a)**	State the advantages and disadvantages of long-wall mining.	**03**
	(b)	Write a short note on accumulation of petroleum in sediments.	**04**
	(c)	Describe the vaccume distillation process with neat flow diagram	**07**
		OR	
Q.3	**(a)**	State the advantages and disadvantages of short-wall mining.	**03**
	(b)	Describe in brief the Float and Sink test for coal washing with neat sketch.	**04**
	(c)	Describe fluid catalytic cracking process in detail. Discuss the recent development in the catalysts for this process.	**07**
Q.4	**(a)**	Define. Biogas. Enlist the various steps involved in the biogas production.	**03**
	(b)	Explain the oxy-rich combustion and discuss its significance.	**04**
	(c)	Define bio-fuel. Describe in detail about the production processes and technologies available for ethanol production.	**07**
		OR	
Q.4	**(a)**	Define Agro fuels with two examples.	**03**
	(b)	Explain turn down ratio of burner. State the various types of gas burner with their application.	**04**
	(c)	Define producer gas. Discuss the different reactions involved in the production of producer gas.	**07**

Q.5	**(a)**	Define adiabatic flame temperature.	**03**
	(b)	Briefly discuss diffusion flames and premixed flames.	**04**
	(c)	A coal sample on analyzing by weight gave carbon 85%, hydrogen 6%, oxygen 6% and remaining are incombustible gases. Determine minimum weight of air required per kg of coal for chemically correct composition.	**07**

OR

Q.5	**(a)**	Discuss in short about the stoker firing.	**03**
	(b)	List out the various characteristics of an efficient furnace.	**04**
	(c)	An ultimate analysis of gasoline sample gave carbon 85%, hydrogen 15%. Calculate the ratio of air to gasoline consumption by weight if the volumetric analysis of the dry exhaust gas is CO_2 = 11.5%; CO = 1.2%; O_2 = 0.9%; and N_2 = 86%. Also, determine the % of excess air required for complete combustion.	**07**

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