Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150509 Date:02/06/2022

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.**

Q.1	**(a)**	Cite any three industrial examples of solid, liquid and gaseous fuels.	**03**
	(b)	State the various properties and its measurement techniques for liquid fuels.	**04**
	(c)	What is coal liquefaction? Why it is required? Discuss the direct and indirect process of coal liquefaction.	**07**
Q.2	**(a)**	Compare storage & handling of solid and liquid fuels.	**03**
	(b)	Write a technical note on the properties & testing of petroleum products.	**04**
	(c)	Discuss the different types of coal combustion techniques.	**07**
		OR	
	(c)	What is dewaxing? Discuss the different types of dewaxing processes.	**07**
Q.3	**(a)**	State the storage, handling and safety for acetylene gas.	**03**
	(b)	Differentiate between steam reforming and partial oxidation process for producing hydrogen gas.	**04**
	(c)	What is producer gas? Discuss the different reactions involved in the production of producer gas.	**07**
		OR	
Q.3	**(a)**	Cite any three industrial applications of bio fuels.	**03**
	(b)	What are agro fuels? Explain the storage & handling procedure of agro fuels.	**04**
	(c)	Discuss the production process, technologies and applications of bio fuels.	**07**
Q.4	**(a)**	State the mechanism and kinetics of combustion process.	**03**
	(b)	Derive the equation for constant pressure adiabatic flame temperature.	**04**
	(c)	Gasoline is burned steadily with air in jet engine. Determine the air to fuel ratio and the percentage excess air used for combustion. Assume the complete combustion of gasoline.	**07**
		OR	
Q.4	**(a)**	State the charecteristics of a good combustion process.	**03**
	(b)	What is dew-point temperature? Explain the method to determine the dew-point temperature of the combustion products.	**04**
	(c)	The following is the ultimate analysis of a sample of petrol by weight: Carbon = 85%; Hydrogen = 15%. Calculate the ratio of air to petrol consumption by weight if the volumetric analysis of the dry exhaust gas is: CO_2 = 11.5%; CO = 1.2 percent; O_2 = 0.9%; N_2 = 86%. Also find percentage excess air.	**07**
Q.5	**(a)**	State any three potential applications of oxygen rich combustion.	**03**
	(b)	Briefly explain the working principle of fluidized bed combustion process.	**04**
	(c)	Derive the expression for the first law analysis of reacting system for the steady flow processes.	**07**

OR

Q.5	**(a)**	Define turn down ratio of burner. State the various types of gas burner with their applications.	**03**
	(b)	Name the various types of furnace and explain the working of any one.	**04**
	(c)	With neat sketch discuss about the structure and propagation for laminar premixed flame.	**07**

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