Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3171924 Date:10/06/2022

Subject Name:Principles of 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 turbulent flame speed. Explain the structure of turbulent premixed flames.	**03**
	(b)	Explain adiabatic flame temperature in brief.	**04**
	(c)	Define Equivalence ratio. Prove that equivalence ratio is more meaningful than air-fuel/fuel-air ratio when comparing different fuels.	**07**
Q.2	**(a)**	Define flame stabilization. Enlist various methods for flame stabilization.	**03**
	(b)	Explain wrinkled laminar flame regime with neat sketch.	**04**
	(c)	Explain chain and chain branching reactions with suitable examples in brief.	**07**
		OR	
	(c)	Explain the fundamental one dimensional conservation laws in details.	**07**
Q.3	**(a)**	Define flame length. Enlist various factors affecting the flame length.	**03**
	(b)	Explain the laminar flame structure-temperature and heat release rate profiles based on experiments of Friedman and Burke.	**04**
	(c)	Describe the effect of increasing temperature and pressure on the equilibrium composition of combustion products.	**07**
		OR	
Q.3	**(a)**	Explain soot formation.	**03**
	(b)	Differentiate between Global and elementary reaction.	**04**
	(c)	Explain various factors influencing flame velocity and thickness for laminar flames.	**07**
Q.4	**(a)**	Explain Collision theory.	**03**
	(b)	Differentiate homogeneous and heterogeneous reaction with suitable example.	**04**
	(c)	Write a short note on Droplet and spray evaporation.	**07**
		OR	
Q.4	**(a)**	Explain plug flow reactor.	**03**
	(b)	Write a short note on oxides of nitrogen formation with suitable examples.	**04**
	(c)	Explain the H_2-O_2 system in details.	**07**
Q.5	**(a)**	What three conditions define the standard reference state?	**03**
	(b)	Explain constant volume-fixed mass reactor in details.	**04**
	(c)	Consider the reaction $CH_4+O_2 \rightarrow CH_3+HO_2$, although a CH_4 molecule may collide with an O_2 molecule reaction may not necessarily occur. List two factors important in determining whether or not a reaction occurs during a collision.	**07**

OR

Q.5	**(a)**	Explain explosion limits for stoichiometric hydrogen-oxygen mixture in a spherical vessel.	**03**
	(b)	Explain water-gas equilibrium.	**04**
	(c)	Define Mixture fraction and derive conserved scalar energy equation.	**07**

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