Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 712104 Date: 17-06-2013

Subject Name: Combustion Engineering

Time: 10.30 am – 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.**

Q.1	**(a)**	Explain ignition delay in CI engine. Also explain physical delay and chemical delay.	**07**
	(b)	Derive the Clausius-Clapeyron equation for phase equilibrium	**07**
Q.2	**(a)**	Define adiabatic fame temperature and Explain the factors affecting adiabatic flame temperature	**07**
	(b)	Classify and explain Air blast atomizer in details with neat and proper diagrams	**07**
		OR	
	(b)	Define atomization and spray formation mechanism from liquid sheet break up.	**07**
Q.3	**(a)**	Derive equation for droplet lifetime	**07**
	(b)	Consider a 500 μm diameter liquid n-hexane (C_6H_{14}) droplet evaporating in hot, stagnant nitrogen at 1 atm. The N_2 temperature is 850K. Determine the lifetime of the n-hexane droplet, assuming the droplet temperature is at its boiling point.	**07**
		OR	
Q.3	**(a)**	Define and Explain Stoichiometric mixture and equivalence ratio. Is there any relation among them?	**07**
	(b)	Explain the effect of following parameters on ignition delay period with appropriate justification 1. Injection pressure, 2. Fuel Cetane number, 3. Compression ratio, 4. Fuel temperature, 5. Supercharging, 6. Engine size and 7. Intake temperature.	**07**
Q.4	**(a)**	Classify and explain pressure atomizer in details with neat and proper diagrams	**07**
	(b)	A mixture of 1 mole of N_2 and 0.5 mole of O_2 is heated to 4000K at 1 atm pressure resulting in an equilibrium mixture of N_2, O_2, and NO only. If the O_2 and N_2 were initially at 298.15K and were heated steadily, how much heat was required bring the final mixture to 400K on the basis of initial mole of N_2	**07**
		OR	
Q.4	**(a)**	Explain in details knocking in CI and SI engine.	**07**
	(b)	What are the various parameters that affect knocking in CI and SI engine?	**07**
Q.5	**(a)**	Discuss in detail coal combustion	**07**
	(b)	Define one film and two film model. State assumptions for one film model of solid fuel combustion	**07**
		OR	
Q.5	**(a)**	Discuss with neat sketch cyclone firing	**07**
	(b)	What are major constituents of pollutant emitted by combustion systems and how these emissions affect human health?	**07**