Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-III Regular Examination January 2011

Subject code: 731101 Subject Name: I.C.Engine modeling and simulation

Date: 08 /01 /2011 **Time: 02.30 pm – 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.**

Q.1 **(a)** Define: **07**
1) Zero dimensional modeling
2) Multi zone modeling
3) Burned gas fraction

(b) What do you mean by simulation of internal combustion engine? Show step by step approach for simulating Internal Combustion engine. **07**

Q.2 **(a)** How does combustion air swirl affect spray penetration? **07**

(b) State various heat release and heat transfer models for zero- dimensional diesel engine combustion. By wiebe heat release model show **07**
a- Heat release as a function of relative duration of combustion
b- Heat release rate as a function of relative duration of combustion

OR

(b) Generate zero dimensional, single zone models for progressive combustion with burning rate concept. **07**

Q.3 **(a)** Explain diesel fuel spray structure with it's major parameter. **07**

(b) Explain different impingement regimes and droplet transition condition with suitable diagram? **07**

OR

Q.3 **(a)** Considering internal combustion engine as open system, explain combustion efficiency and inefficiency. **07**

(b) Explore the procedure for heat release analysis in direct injection CI engine? **07**

Q.4 **(a)** For what purpose K-ε model method is used? Show its steps. **07**

(b) What is the need of combustion modeling for IC engine? Classify it? **07**

OR

Q.4 **(a)** What basic procedure you follow to generate, fluid mechanics based multidimensional model for engine processes. Which governing equations are required for this? **07**

(b) Explain thin spray and thick spray modeling concept. In what situation, such modeling concepts apply? **07**

Q.5 **(a)** Generate structure of thermodynamic based DI diesel combustion simulation? Also explain the flow chart for it. **07**

(b) Considering internal combustion engine as open system, explain combustion efficiency and inefficiency. **07**

OR

Q.5 **(a)** What is compression generated turbulence and its effect? **07**

(b) What is the aim of engine modeling? State the procedure followed to generate simple model for engine processes? **07**

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