Combustion in Air-breathing Aero Engines
Assignment No. 8

July 21, 2017

Release Date:

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This assignment contains 8 multiple choice questions with 4 possible answers to each. Only one of the choice is correct and so select the choice that best answers the question. Correct choice rewards you with 1 point for each question. Wrong answers will reward you with 0 points (no negative marking). The questionnaire contains both numerical and concept-based questions. All the best!!!

Q1: According to the eddy-break-up model, chemical reactions are controlled by
Choose the correct answer from the following choices:

(a) Mixing rate

(b) Kinematic viscosity

(c) The cascade process of eddies

(d) Reaction rate

Choose the correct answer from the following choices:

1. All of the above

2. Only (a)

3. Both (a) and (b)

4. Both (a) and (c)

Ans: The correct choice is 4.

Q2: Consider a turbulent round jet diffusion flame. Which of the following functional forms best describe of the reduction in velocity along the central axis of the jet
Choose the correct answer from the following choices:

1. Linear

2. Exponential

3. Gaussian

4. Delta function

Ans: The correct choice is 1.

Q3: Which among the following defines the thickness of the diffusion layer (ℓ_d) of a turbulent non premixed flame in the mixture fraction space (Z).
Choose the correct answer from the following choices:

1. $\Delta \chi_{st} = 1$

2. $\Delta \chi = 1$

3. $\Delta Z_{st} = 1$

4. $\Delta Z = 1$

where χ is scalar dissipation rate
Ans: The correct choice is 4.

Q4: Chemistry model incorporated in "eddy dissipation concept" is based on
Choose the correct answer from the following choices:

1. Single step chemistry

2. Detailed chemistry

3. Reduced Chemistry

4. No chemistry is used

Ans: The correct choice is 2.

Q5: Which of the numerical scheme employed in solving the pdf (probability density function) transport equations
Choose the correct answer from the following choices:

1. Finite volume method

2. Finite difference method

3. Finite element method

4. Monte-Carlo methods

Ans: The correct choice is 4.

Q6: In the regime diagram for turbulent non premixed combustion, the condition that determines the reaction sheet limit is
Choose the correct answer from the following choices:

1. $Da_o = \sqrt{Re_o}$

2. $Da_o = \sqrt{Re_o} Da_L$

3. $Re_o = \sqrt{Da_o}$

4. $Da_L = \sqrt{Re_o}$

Ans: The correct choice is 1.

Q7: Temperature form of energy equation is transformed to the mixture fraction space using the Crocco transformation. A diffusion time scale needs to be chosen in the transformed space. Which among the following variable emerges as the characteristic diffusivity.
Choose the correct answer from the following choices:

1. Dissipation rate

2. Turbulent flux

3. Scalar dissipation rate

4. Kinematic viscosity

Ans: The correct choice is 3.

Q8: In the solution of non premixed turbulent flames using laminar flamelet equations, flame surface is identified at the location where
Choose the correct answer from the following choices:

1. $G = G_0$

2. $\chi = \chi_{st}$

3. $Z = Z_{st}$

4. $\widetilde{\chi} = \widetilde{\chi}_{st}$

Ans: The correct choice is 3.