R09

Code No: C7602

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I - Semester Examinations, March/April 2011

ENGINEERING ANALYSIS OF FLIGHT VEHICLES

(AEROSPACE ENGINEERING)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

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1. Explain the major factors affecting the configuration of a reusable space transport vehicle. [12]

2. Starting from the six degrees of freedom equations of motion of a rigid body under the effect of moments about X, Y and Z axes, in terms of, *derive the equations in terms of the Inertia tensor.* [12]

3. Derive the equation for flow turning angle in Prandtl -Meyer expansion of a supersonic flow. [12]

4. Starting from the equations of motion of a rigid body acted upon by forces along the three body axes, derive the perturbation equations of motion. [12]

5. Explain *Elevator Hinge Moment and Stick Force to trim.* [12]

6. Derive the equation for acceleration of a rocket in 'field-free space' including the effect of drag. [12]

7. A two stage rocket is launched vertically from a place on the equator under the following conditions. Specific impulse, propellant fractions are 200 seconds and 0.9 respectively for both the stages. Mass of each motor at launch is 1000 kg and the payload mass is 100 kg. Compute the velocity of the rocket, considering the earth rotational velocity. [12]

8. Derive the equation for the flight path angle of a lifting re-entry vehicle. [12]

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