



II SEMESTER, M. TECH (DEFENCE TECHNOLOGY)
END SEMESTER EXAMINATION JULY 2022
COURSE: AEROSPACE SYSTEM CONFIGURATION, DESIGN & SIMULATION (AAE 5275)

Duration: 3 Hrs

Date: 12/07/2022

MAX. MARKS: 50

Note:

- All questions are compulsory
- Draw a neat diagram wherever necessary
- Stepwise answers carry marks

- Q1A.** List out six components of forces and moments acting on a missile. [2]
- Q1B.** Define specific impulse. A rocket engine produces a thrust of 1,000 kN at sea level with a propellant flow rate of 400 kg/s. Calculate the specific impulse. [3]
- Q1C.** With neat sketches, derive the relevant relations for amplitude and frequency for 1-DOF undamped vibration system. [5]
- Q2A.** Define stiffness and flexibility. [2]
- Q2B.** Discuss aeroelastic flutter? [3]
- Q2C.** Consider an infinitely thin flat plate at an angle of attack of $\alpha = 15^\circ$ in a Mach 8 flow. Assume inviscid flow. Calculate the pressure coefficients on the top and bottom surface of the plate, the lift and drag coefficients, and the lift-to-drag ratio using Newtonian theory. [5]
- Q3A.** Define service ceiling and absolute ceiling? [2]
- Q3B.** A jet aircraft weighing 58860 N has a climbing speed of 128.6 m/s. If the rate of climb is 45.72 m/s and the drag of the aircraft at this condition is 8000 N, find the thrust delivered by the engine. [3]

- Q3C.** Draw a neat sketch of an airplane in steady, unaccelerated, climbing flight. Write the appropriate equations of motion and derive the relation for rate of climb [5]
- Q4A.** What is meant by trim condition? [2]
- Q4B.** Discuss static and dynamic stability. [3]
- Q4C.** What is first order system? Derive the homogenous solution of first order system. [5]
- Q5A.** Name the following Indian missiles/UAV: [2]
- i) Air-to-air missile
 - ii) Surface to air missile
 - iii) Anti-Radiation missile
 - iv) UAV of MALE category
- Q5B.** What is UCAV? Discuss the military applications of UCAV. [3]
- Q5C.** With a neat sketch, discuss the salient features of an air to air missiles. List out the components of an air-to-air missile. [5]