

Reg. No.									
----------	--	--	--	--	--	--	--	--	--



MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER, M.TECH. (DEFENCE TECHNOLOGY)

END SEMESTER EXAMINATIONS, APRIL/MAY 2024

Aerospace System Configurations, Design and Simulation [AAE 5275]

Time: 3 Hours

Date: 30/04/2024

Max. Marks: 50

Note:

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

- Q1A.** With a neat sketch, list out the six components of aerodynamic forces and moments acting on a missile. **[2]**
- Q1B.** What is homing guidance? Discuss different categories of Homing Guidance **[3]**
- Q1C.** Define vibration. With neat sketches, derive the relevant relations for amplitude and frequency for 1-DOF undamped vibration system. **[5]**
- Q2A.** Define load factor. An aircraft is flying in a banking turn with a load factor of 3. What is the banking angle? **[2]**
- Q2B.** Draw a simple Collar triangle diagram and discuss the interaction between various aeroelastic forces. **[3]**
- Q2C.** Discuss torsional divergence of a wing and derive the relation for divergence speed. **[5]**
- Q3A.** Describe Newtonian impact theory. Derive the relation for pressure distribution **[3]**
- Q3B.** What is CFD? What are the applications of CFD? **[2]**
- 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. An aircraft flying at 5600 ft/s is climbing steadily at a climb angle of 32 deg. Calculate the rate of climb. **[5]**
- Q4A.** Define **[2]**
- a) Aerodynamic centre
 - b) Static margin
 - c) Elevator power
 - d) Trim condition
- Q4B.** What is a first order system? Derive the homogenous solution of a first order system. **[3]**
- Q4C.** With neat sketches, discuss the static stability and dynamic stability of an aircraft. How does the location of CG affect the static stability? **[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.** With a neat sketch, discuss the salient features of an air to air missiles. List out different components of an air-to-air missile. **[4]**
- Q5C.** What is UAV and UCAV? Enumerate the civilian and military applications of a UAV. **[4]**