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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

END TERM EXAMINATION - AUGUST 2024 SUMMER TERM

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| **Semester : Summer Term** | **Date : 05.08.2024** |
| **Course Code : MEC2005** | **Time : 09.30 AM to 12.30 PM** |
| **Course Name : Fundamentals of Aerospace Engineering** | **Max Marks : 100** |
| **Program : B. Tech – Mechanical Engineering** | **Weightage :** 50% |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** | | | |
| **ANSWER ALL QUESTIONS 10Q X 2M=20M** | | | |
| 1 | Differentiate aircraft and space craft | (CO 1) | [Knowledge] |
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| 2 | What are the four forces of flight? | (CO 1) | [Knowledge] |
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| 3 | Name any four components of an aircraft. | (CO 1) | [Knowledge] |
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| 4 | What is Bernoulli’s principle? | (CO 1) | [Knowledge] |
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| 5 | What is meant by Thrust? | (CO 2) | [Knowledge] |
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| 6 | Define Mach Number. | (CO 2) | [Knowledge] |
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| 7 | What is a chord in aero foil? | (CO 2) | [Knowledge] |
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| 8 | What is friction drag? | (CO 2) | [Knowledge] |
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| 9 | What is meant by longitudinal stability of an aircraft? | (CO 3) | [Knowledge] |
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| 10 | When an aircraft is said to be statically stable? | (CO 3) | [Knowledge] |
| 11 | What are the three kinds of static stability? | (CO 3) | [Knowledge] |
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| 12 | What is a space vehicle? | (CO 4) | [Knowledge] |
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| 13 | What do you understand by ‘interplanetary trajectory’? | (CO 4) | [Knowledge] |
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| 14 | What you mean by escape velocity? | (CO 4) | [Knowledge] |

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| **PART B** | | | |
| **ANSWER ALL QUESTIONS 4Q X 10M=40M** | | | |
| 15 | Why are stability and control important to aircraft design? Explain aircraft stability in both static and dynamic environment. | (CO 1) | [Comprehension] |
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| 16 | Draw an aero foil shape and explain various terminologies involved. | (CO 2) | [Comprehension] |
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| 17 | Write about various ways of air speed measurement and also explain the working principle of pitot tube. | (CO 2) | [Comprehension] |
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| 18 | What do you understand by the term ‘drag polar’? Explain the importance of it and also brief various components involved in polar drag. | (CO 3) | [Comprehension] |
| 19 | Explain in detail about various types of orbits with technical information. | (CO 4) | [Comprehension] |
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| 20 | Like Newton’s laws of gravitation, there are laws which are to be understood better while planning for interplanetary missions. List and explain these laws in detail. | (CO 4) | [Comprehension] |

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| **PART C** | | | |
| **ANSWER ALL QUESTIONS 2Q X 20M=40M** | | | |
| 21 | A balloon weighing 100 kg has a capacity of 1400 m3. If it is filled with helium, how great a payload can it support? The density of helium is 0.18 kg/ m3 and the density of air is 1.30 kg/ m3. Express your answer in Newton. | (CO 1) | [Application] |
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| 22 | Assume that an aero plane has a single engine. The plane has following characteristics. Wing span = 12 m, Wing area = 15 m2, Normal Gross Weight = 12000 N, Parasitic drag coefficient. (Cd) = 0.02, Oswald Efficiency = 0.87.  a) Determine the thrust required for a level flight at constant speed of 100m/s.  b) Also determine the percentage change in the required thrust if the plane flies at a constant speed of 70m/s. | (CO 3) | [Application] |
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| 23 | Explain the following aspects in interplanetary mission.   1. Trajectories and Orbits 2. Propulsion System 3. Atmospheric penetration 4. Landing and recovery | (CO 4) | [Application] |