Question Paper For Internal Assessment Examination (Theory) - Credit 4 / 37 /

Instructions for Students/FacultyMid Term I (Total 80 Marks, 2 HRS. Syllabus from Unit-1)

- Part A: Total number of questions to be given are ten (5 from CO1 and 5 from CO2), each carrying 2 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 20 marks.
- Part B: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 5 marks. Total 20 marks.
- Part C: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2). They are numerical answer type / fully elaborative type (**Not More Than 70 Words for Question)** *, each carrying 10 marks. Total 40 marks.

Mid Term II (Total 120 Marks, 2.5 HRS., Syllabus from Unit-2)

- Part A: Total number of questions to be given are ten (5 from CO3 and 5 from CO4), each carrying 4 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 40 marks.
- Part B: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student has to answer four (2 from CO3 and 2 from CO4). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 7 marks. Total 28 marks.
- Part C: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student has to answer four (2 from CO3 and 2 from CO4). They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)** *, each carrying 13 marks. Total 52 marks.

Mid Term III (Total 120 Marks, 2.5 HRS., Syllabus from Unit-3)

- Part A: Total number of questions to be given are ten (5 from CO5 and 5 from CO6), each carrying 4 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 40 marks.
- Part B: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student must answer four (2 from CO5 and 2 from CO6). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 7 marks. Total 28 marks.
- Part C: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student must answer four (2 from CO5 and 2 from CO6). They are numerical answer type / fully elaborative type (**Not More Than 70 Words for Question)** *, each carrying 13 marks. Total 52 marks.

*** LIST OF ELABORATIVE THEORY QUESTION SUBJECTS**: NO SUBJECT UNDER CREDIT FOUR

Instructions For Faculties:

There should be total 6 Course Outcomes (COs) for each subject.

- Mid Term Question Papers are to be submitted as per Course Outcomes (COs) which should be divided equally in Part A, Part B and Part C according to Mid Term Examination and Credit Point.
- In Mid Term-1, the questions are to be given from CO1 and CO2. In Mid Term-2, the questions are to be given from CO3 and CO4. Similarly, in Mid Term-3, the questions are to be given from CO5 and CO6.

- **FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORITICAL ELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'C' OF QUESTION PAPER**

INSTRUCTION FOR STUDENTS

- **STUDENT IS ALLOWED TO ENTER LATE NOT MORE THAN 15 MIN AFTER STARTING OF EXAM, AND MAY LEAVE THE EXAM HALL ON EXPIRY OF ATLEAST OF 1 Hr FROM THE STARTING TIME OF EXAMINATION.**

QUESTION PAPER AND STUDENTS DETAILS

Type of Exam	Mid Term 1	**Date of Submission**	24/06/2021
Name of Faculty	Mr. Maris Brightson	**Date of Examination**	29/06/2021
Course	B.Tech (Aeronautical Engineering)	**Semester**	SEMESTER : 4
Batch	Combined Batches 18, 19, SF 2	**Subject**	4 AN4 - 04 Aerodynamics-I (Cr 4)

COURSE OUTCOMES FOR REFERENCE TO FRAME QUESTION PAPER

(Faculties are required to mention relevant Course Outcome number against the respective question in QP)

Course Outcome	CO1: Distinguish different types of fluid, properties, and potential flow theory in various conditions. CO2: Apply scientific method strategies to analyze the Two-dimensional In-viscid Incompressible flow qualitatively and quantitatively.		
Email I'd	marisbrightson@soaneemrana.org	**Phone No.**	805-667-7643
Student Name		**Student Reg No.**	

Part A

All the questions are compulsory to attend.

1. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			1
Question : 1	Define boundary layer.		
4	Structure of boundary layer	Fundamentals of Aerodynamics - J D Anderson	
Question : 2	Define shape parameter.		
5	Momentum Equation for boundary layers	Fundamentals of Aerodynamics - J D Anderson	
Question : 3	Define streamline. Write its equation.		

6	Streamlines & Stream function	Fundamentals of Aerodynamics - J D Anderson	
Question : 4	Define stream function. Write its equation.		
6	Streamlines & Stream function	Fundamentals of Aerodynamics - J D Anderson	
Question : 5	Define velocity potential function. Write its equation.		
7	Potential function	Fundamentals of Aerodynamics - J D Anderson	
2. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			2
Question : 6	Define vorticity. Write its equation.		
8	Circulation	Fundamentals of Aerodynamics - J D Anderson	
Question : 7	Define circulation. Write its SI unit.		
8	Circulation	Fundamentals of Aerodynamics - J D Anderson	
Question : 8	Define doublet flow.		
10	Doublet flow	Fundamentals of Aerodynamics - J D Anderson	
Question : 9	Define half-oval rankine body.		
11	Half-oval rankine body.	Fundamentals of Aerodynamics - J D Anderson	
Question : 10	Define D'Alembert's paradox.		
12	D'Alembert's paradox	Fundamentals of Aerodynamics - J D Anderson	

Part B

FOR MIDTERM 1 - Part B: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2).
FOR MIDTERM 2 - Part B: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student must answer four (2 from CO3 and 2 from CO4).
FOR MIDTERM 3 - Part B: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student has to answer four (2 from CO5 and 2 from CO6).

3. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			1
Question : 1	Derive the continuity equation of the fluid flow in integral and differential form.		
2	Continuity Equation (Integral and differential form)	Fundamentals of Aerodynamics - J D Anderson	
Question : 2	Derive the momentum equation of fluid flow in integral form and deduce it to differential form.		
3	Momentum Equation (Integral and differential form)	Fundamentals of Aerodynamics - J D Anderson	
Question : 3	Explain the following with neat illustrative diagrams (1) Boundary layer thickness (2) Displacement thickness (3) Momentum thickness		
4	Structure of boundary layer	Fundamentals of Aerodynamics - J D Anderson	
4. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			2
Question : 4	Derive the general equation of stream function.		
6	Streamlines & Stream function	Fundamentals of Aerodynamics - J D Anderson	
Question : 5	Derive the relationship between stream function and velocity potential function.		
7	Velocity potential function & Equipotential lines	Fundamentals of Aerodynamics - J D Anderson	
Question : 6	Derive the stream function and velocity potential function for the source flow.		
9	Source flow, Sink flow, Combination of source and sink flow	Fundamentals of Aerodynamics - J D Anderson	
Question : 7 (Old Pattern)			

Part C

FOR MIDTERM 1 - Part C: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2).
FOR MIDTERM 2 - Part C: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student must answer four (2 from CO3 and 2 from CO4).
FOR MIDTERM 3 - Part C: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student has to answer four (2 from CO5 and 2 from CO6).

5. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			1
Question : 1	Derive the momentum integral equation for the boundary layer.		
5	Momentum Equation for boundary layers	Fundamentals of Aerodynamics - J D Anderson	
Question : 2	In a 2D incompressible flow the fluid velocity components are given by u = x-4y and v = -y-4x. Show that velocity potential function exists and determine its form. Find the equation of stream function.		
8	Governing equation for potential flow theory	Fundamentals of Aerodynamics - J D Anderson	
Question : 3	A source and sink of strength 4 sq.m/s and 8 sq.m/s is located at (-1,0) and (1,0) respectively. Determine the velocity and stream function at a point (1,1) which is lying on the flow field of resultant streamline.		
10	Superposition of elementary flows	Fundamentals of Aerodynamics - J D Anderson	
6. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			2
Question : 4	Imagine that you are standing at a location 6 m from the center of the vortex, and you are feeling 160 km/hr wind. Determine the strength of the vortex.		
11	Vortex flow	Fundamentals of Aerodynamics - J D Anderson	
Question : 5	Derive the expression of pressure coefficient, lift and drag for flow over a non-rotating cylinder.		
12	Flow over a non-rotating circular cylinder	Fundamentals of Aerodynamics - J D Anderson	
Question : 6	Derive the expression of pressure coefficient, lift and drag for flow over a rotating cylinder.		
13	Flow over a rotating circular cylinder	Fundamentals of Aerodynamics - J D Anderson	

Upload Scanned Document In Case of Numerical or Diagram For Any of The Above Questions. *(Mention question number with relevant fig / numerical / equations. Max 150 KB)*	
I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.	

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