Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 115 /

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

Instructions for Students / Faculty

Mid Term I (Total 60 Marks, 2 HRS. Syllabus from Unit-1)

- Part A: Total number of questions to be given are six (3 from CO1 and 3 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 12 marks.

- Part B: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student has to answer four (2 from CO1 and 2 from CO2). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 4 marks. Total 16 marks.

- Part C: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student has to 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 8 marks. Total 32 marks.

Mid Term II (Total 90 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 3 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 30 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 6 marks. Total 24 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 any 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 9 marks. Total 36 marks.

Mid Term III (Total 90 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 3 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 30 marks

- 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). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 6 marks. Total 24 marks.

- 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). They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 9 marks. Total 36 marks.

*** LIST OF ELABORATIVE THEORY QUESTION SUBJECTS**: 3 MH4 - 07 Manufacturing Process, 4 AN4 - 06 Aircraft Materials and Processes (Cr 3), 5 AN4 - 05 Aircraft System (Cr 3), 6 AN4 - 05 Avionics-I (Cr 3), 6 MH4 - 03 Applied Hydraulics & Pneumatics (Cr 3), 6 MH5 - 11 Principles of Management (Cr 3), 6 MH5 - 13 Aircraft Electronics System (Cr 3), 7 AN5 - 12 Maintenance of Airframe and System (Cr 3), 7 AN5 - 13 Helicopter Theory (Cr 3), 7 AG6 - 60.1 Human Engineering and Safety (Cr 3), 7 ST - 01 Avionics II (Special Theory Subject) (Cr 3), 7 MH5 - 11 Design of Mechatronics Systems (Cr 3), 7 MH5 - 12 Robotics and Machine Vision System (Cr 3), 7 MH6 - 13 Medical Electronics (Cr 3), 7 AN6 - 60.1 Aircraft Avionic System (Cr 3), 8 AN5 - 12 Maintenance of Power Plant and System

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 115 /

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

(Cr 3), 8 AN5 - 13 Unmanned Aerial Vehicles & Systems (UAV) (Cr 3), 8 MH5 - 13 Product Development & Launching (Cr 3), 8 EC6 - 60.2 Robotics and control (Cr 3)

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,**

QUESTION PAPER & STUDENTS DETAILS

Type of Exam	Mid Term 2	**Date of Submission**	23/06/2021
Name of Faculty	Mr. Challa Rudesh	**Date of Examination**	29/06/2021
Course	B.Tech (Aeronautical Engineering)	**Semester**	SEMESTER : 6
Batch	Combined Batches 15, 16, 17, SF 1	**Subject**	6 AN4 - 03 Aircraft Stability and Control (Cr 3)-

COURSE OUTCOMES FOR REFERENCE TO FRAME QUESTION PAPERS

(Faculties are required to mention Course Outcome Number against each part of the question paper)

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 115 /

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

Course Outcome	6 AN4 - 03 Aircraft Stability and Control (credit-3) COURSE OBJECTIVE 1. To familiarize the student, the generalized concepts of stability and control in an aircraft. 2. To gain knowledge in the concept of static longitudinal stability and control derivatives, and criteria for a stable airplane. 3. To estimate the maneuvering stability of an aircraft. 4. To Impart theoretical knowledge on the static lateral and directional stability and control derivatives, and criteria for a stable airplane. 5. To carry out the various dynamic instabilities of an aircraft motion. 6. To get exposure on the need and aspects of aerodynamic balancing. COURSE OUTCOME Upon completion of the course, Students will be able to CO 1. Analyze and investigate the generalized concepts of stability and control in an aircraft. CO 2. Determine the concept of static longitudinal stability and control derivatives, and criteria for a stable airplane. CO 3. Calculate the maneuvering stability of an aircraft. CO 4. Investigate the behavior on the static lateral and directional stability and control derivatives, and criteria for a stable airplane. CO 5. Solve the various dynamic instabilities of an aircraft motion. CO 6. Apply aspects of aerodynamic balancing ideas to solve the practical problems in the society.

Email I'd	prudesh@soaneemrana.org	**Phone No.**	832-860-7582
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.			CO 3
Question : 1	Sketch the variation of static stability level with center of gravity position of an airplane.		
15	LSS	Anderson, J.D., "Introduction to Flight"	
Question : 2	How to prevention of rudder lock.		
20	DSS	Anderson, J.D., "Introduction to Flight"	
Question : 3	Define what is meant by equilibrium condition for an airplane.		
18	LDD	Anderson, J.D., "Introduction to Flight"	
Question : 4	How to overcome adverse yaw.		
19	DSS	Anderson, J.D., "Introduction to Flight"	

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 115 /

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

Question : 5	Define angle of yaw (ψ) and angle of side slip(β).		
21	DSS	Anderson, J.D., "Introduction to Flight"	
2. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			CO 4
Question : 6	Define manoeuver margin.		
16	Manoeuver Stability	Anderson, J.D., "Introduction to Flight"	
Question : 7	Discuss about the advantage of canard wing configuration.		
19	LSS	Anderson, J.D., "Introduction to Flight"	
Question : 8	Show he slide slip angle using diagram. Also show the wind axis and stability axis systems.		
17	DSS	Anderson, J.D., "Introduction to Flight"	
Question : 9	Justify or refute the statement: "The neutral point is the aerodynamic centre of the aircraft with horizontal tail".		
23	Neutral point	Anderson, J.D., "Introduction to Flight"	
Question : 10	Distinguish between angle of attach and angle of slide slip of an aircraft.		
31	DSS	Anderson, J.D., "Introduction to Flight"	

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.			CO 3
Question : 1	Show the variation of hinge moment with angle of attack and sketch the pressure distribution over the airfoil with angle of attack.		
20	LSS	Anderson, J.D., "Introduction to Flight"	
Question : 2	Derive the expression for the stick fixed neutral point and static margin.		
22	stick fixed neutral point	Anderson, J.D., "Introduction to Flight"	

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 115 /

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

Question : 3	Briefly explain the following (a) Adverse Yaw (b) Anti-symmetric power (c) Cross- wind during landing and take-off.		
24	Adverse Yaw	Anderson, J.D., "Introduction to Flight"	
4. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			CO 4
Question : 4	Define directional static stability of an airplane.		
23	DSS	Anderson, J.D., "Introduction to Flight"	
Question : 5	Explain in detail about the elevator control power with sketches.		
21	Elevator control power	Anderson, J.D., "Introduction to Flight"	
Question : 6	Define floating tendency and restoring tendency in the case of stick- free longitudinal. Stability and derive an expression for control surface angle.		
20	Floating tendency	Anderson, J.D., "Introduction to Flight"	
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.			CO 3
Question : 1	If the horizontal tail lift curve slope is 0.08/deg and the ratio of tail surface area to wing area is twice of the ratio of the wing chord length to the tail arm length, elevator effectiveness is 0.5 and tail efficiency is 90%. Determine the elevator power required.		
15	LSS	Anderson, J.D., "Introduction to Flight"	
Question : 2	a) If the pitch stiffness of an aircraft is -0.106/deg., at an angle of attack of the wing of 7deg . Flight elevator power if delta e / dCL = -1.5 deg. b) An aircraft wing has a lift curve slope of 0.1/deg., and pitch stiffness of -0.04/deg., then what is the aircraft's stability margin?		

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 115 /

NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA

16	LSS	Anderson, J.D., "Introduction to Flight"	
Question : 3	Use the data given here for wing-tail combination: Cmac= -0.2, Xac = 0.25, Xcg = 0.188, Cl = 0.5 What contribution is required from the tail to balance the airplane?		
18	Manoeuver Stability	Anderson, J.D., "Introduction to Flight"	
6. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.			CO 4
Question : 4	Find the stick-fixed static margin for CG location of 0.2 and (b) If static margin is 0.2, find the elevator power required for CG location of 0.3. Discuss about longitudinal stability.		
21	LSS	Anderson, J.D., "Introduction to Flight"	
Question : 5	The static margins of an aircraft are observed as 0.8 and 0.85 and 0.9 for CG locations of 0.2, 0.15 and 0.1, respectively. Which CG location(s) gives the maximum stability margin for this aircraft?		
20	LSS	Anderson, J.D., "Introduction to Flight"	
Question : 6	a) If an aircraft has a velocity vector of V =100ˆi + 30ˆj+ 20kˆ , Find the yaw angle for this case. b)An aircraft is flying at a forward speed of 150 m/s and to balance a sideslip angle of 13 deg , what would be the sideslip velocity?		
24	DSS	Anderson, J.D., "Introduction to Flight"	
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.			