



Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 128 /

**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 / 128 /****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**

<b>Type of Exam</b>	Mid Term 3	<b>Date of Submission</b>	22/07/2021
<b>Name of Faculty</b>	Mr. Challa Rudesh	<b>Date of Examination</b>	27/07/2021
<b>Course</b>	B.Tech (Aeronautical Engineering)	<b>Semester</b>	SEMESTER : 6
<b>Batch</b>	Combined Batches 15, 16, 17, SF 1	<b>Subject</b>	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 / 128 /

**NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA**

<b>Course Outcome</b>	6 AN4 - 03 Aircraft Stability and Control (credit-3) COURSE OBJECTIVE
	<ol style="list-style-type: none"> <li>To familiarize the student, the generalized concepts of stability and control in an aircraft.</li> <li>To gain knowledge in the concept of static longitudinal stability and control derivatives, and criteria for a stable airplane.</li> <li>To estimate the maneuvering stability of an aircraft.</li> <li>To Impart theoretical knowledge on the static lateral and directional stability and control derivatives, and criteria for a stable airplane.</li> <li>To carry out the various dynamic instabilities of an aircraft motion.</li> <li>To get exposure on the need and aspects of aerodynamic balancing.</li> </ol>
	<p>COURSE OUTCOME</p> <p>Upon completion of the course, Students will be able to</p> <p>CO 1. Analyze and investigate the generalized concepts of stability and control in an aircraft.</p> <p>CO 2. Determine the concept of static longitudinal stability and control derivatives, and criteria for a stable airplane.</p> <p>CO 3. Calculate the maneuvering stability of an aircraft.</p> <p>CO 4. Investigate the behavior on the static lateral and directional stability and control derivatives, and criteria for a stable airplane.</p> <p>CO 5. Solve the various dynamic instabilities of an aircraft motion.</p> <p>CO 6. Apply aspects of aerodynamic balancing ideas to solve the practical problems in the society.</p>

<b>Email I'd</b>	prudesh@soaneemrana.org	<b>Phone No.</b>	832-860-7582
<b>Student Name</b>		<b>Student Reg No.</b>	

**PART A**

All the questions are compulsory to attend.

<b>1. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.</b>	CO 5		
<b>Question : 1</b>	Why do high wing airplanes are more lateral stable.		
27	<table border="1"> <tr> <td>Lateral stable.</td> <td>Robert C. Nelson , Flight Stability and Automatic Control.</td> </tr> </table>	Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.
Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.		
<b>Question : 2</b>	Define is the significance of inertia and wind axis system.		
28	<table border="1"> <tr> <td>Dynamic stability.</td> <td>Robert C. Nelson , Flight Stability and Automatic Control.</td> </tr> </table>	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.
Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.		
<b>Question : 3</b>	Explain modes of oscillations in longitudinal dynamic stability.		
29	<table border="1"> <tr> <td>Longitudinal dynamic stability.</td> <td>Robert C. Nelson , Flight Stability and Automatic Control.</td> </tr> </table>	Longitudinal dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.
Longitudinal dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.		
<b>Question : 4</b>	Define stability derivatives and what are its significance.		



## Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 128 /

**NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA**

30	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 5</b>	Illustrate Dutch roll mode.		
31	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>2. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.</b>			CO 6
<b>Question : 6</b>	Show graphically 'Phugoid mode' Short period mode' of an airplane.		
32	Short period mode	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 7</b>	State Routh's criteria.		
33	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 8</b>	Sketch that development of slide slip due to bank.		
34	Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 9</b>	Define stability axis system used in dynamic stability.		
35	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 10</b>	Define aileron reversal.		
36	Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.	

**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 5

**Question : 1** Describe the all aerodynamic force and moment on dynamic stability?



## Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 128 /

**NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA**

37	Aerodynamic balancing	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 2</b>	Describe the difference between longitudinal modes and lateral Directional modes?		
38	Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 3</b>	Describe the control process of balancing with the help of trim tab?		
37	Aerodynamic balancing	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>4. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.</b>			CO 6
<b>Question : 4</b>	Describe the wing sweep on lateral stability?		
36	Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 5</b>	Explain Aircraft Dynamic Mode shapes- significance.		
35	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 6</b>	Explain with appropriate sketches, the following: a) Phugoid motion b) Spiral instability c) Dutch Roll motion.		
37	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 7 (Old Pattern)</b>			

**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 5



## Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 128 /

**NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA**

<b>Question : 1</b>	a) Consider three different aircrafts with wing dihedral angles of -5, 10 and 15 degree, respectively. Which aircraft is more stable in lateral sense? b) If an aircraft has a velocity vector of $V = 100i + 30j + 20k$ , Find the yaw angle for this case.		
34	Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 2</b>	a) An aircraft is flying at a forward speed of 150 m/s and to balance a sideslip angle of 13 degree what would be the sideslip velocity? b) Consider the second order system characteristic equation as: $3S^2 + 2S + 5 = 0$ Determine the natural frequency and the damping ratio of the system.		
33	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 3</b>	A) An aircraft has the pitching moment coefficient at zero-lift as 0.1346 and the pitch stiffness of -0.1424. State the stability of the aircraft. B) If the center of gravity of an aircraft is 1% aft of the wing aerodynamic center, what is the slope of the pitching moment curve of this aircraft?		
32	Aerodynamic balancing	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>6. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.</b>			CO 6
<b>Question : 4</b>	For trim with elevator in neutral position, find the lift coefficient of wing for an aircraft, which has the pitching moment coefficient at zero-lift is 0.096 and the pitch stiffness of -0.205.		
36	Lateral stable.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 5</b>	An aircraft has the location of the center of gravity at 0.35c and the stick-fixed neutral point at 0.635c. Find the pitch stiffness of the aircraft and state the stability of the aircraft.		
39	Dynamic stability.	Robert C. Nelson , Flight Stability and Automatic Control.	
<b>Question : 6</b>	The pitching moment coefficient at zero angle of attack of an aircraft model placed in a wind tunnel is -0.097 and the observed stick-fixed static margin is 0.0546. Write the pitching moment coefficient equation of this aircraft a function of lift coefficient. State this aircraft model is stable or not		
34	Aerodynamic balancing	Robert C. Nelson , Flight Stability and Automatic Control.	



School of Aeronautics (Neemrana)

APPROVED BY DIRECTOR GENERAL OF CIVIL AVIATION, MINISTRY OF CIVIL AVIATION, GOVT OF INDIA  
APPROVED BY ALL INDIA COUNCIL FOR TECHNICAL EDUCATION & AFFILIATED TO RAJASTHAN TECHNICAL UNIVERSITY, KOTA  
& BIHARER TECHNICAL UNIVERSITY, BIHARER, RUN & MANAGED BY L N VERMA MEMORIAL SOCIETY

School of Aeronautics



APPROVED BY DIRECTOR GENERAL OF CIVIL AVIATION, MINISTRY OF CIVIL AVIATION, GOVT. OF INDIA  
RUN AND MANAGED BY LAXMI NARAIN VERMA MEMORIAL SOCIETY, REGISTERED,  
DELHI ADMINISTRATION, UNDER SOCIETIES REGISTRATION ACT XXI OF 1980.

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 128 /

**NAME OF STUDY CENTER: SCHOOL OF AERONAUTICS, NEEMRANA**

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.

**Corporate Office: H 974, Palam Extension, Part: 1, Sector: 7, Dwarka, New Delhi**