

School of Aeronautics (Neemrana)

Question Paper For Back / Re-back Internal Assessment Examination (Theory) - Old Scheme i.e 2012 Syllabus

Instructions For Students / Faculty

Back / Re-back Internal Examination (Total 60 Marks, 2 Hrs, Syllabus From Beginning of The Session)

Total number of questions to be given are 10, each carrying 10 marks and it is compulsory to attend 2 questions from Part A and 4 questions from Part B. There is a choice of two questions out of four in part A and 4 questions out of 6 in Part B. Part A will be theoretical or derivation type (**Not More Than 70 Words For Question**). Part B will be fully numerically oriented questions (**Not More Than 70 Words For Question**), except for the list of subjects given below. No objective type or fill in the blanks shall be given, but subpart of question can be given for both Part A & B.

* **LIST OF ELABORATIVE THEORY QUESTION SUBJECTS:** Aircraft Materials, Aircraft System, Aircraft Rules & Regulation-I, Mechanics of Composite Materials, Aircraft Design, Aircraft Rules & Regulation-II, Avionics-I, Helicopter Theory, Maintenance of Airframe and System Design, Avionics-II, Airlines and Airport Management, Maintenance of Power Plant & Systems

FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORETICAL ELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'B' OF QUESTION PAPER

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 & Student Details

Name of Faculty*	<input type="text" value="BIPIN DWIVEDI"/>	Date of Submission of QP	<input type="text" value="16/03/2021"/>
Subject*	<input type="text" value="7AN3 – Aerodynamics II (Old)"/>	Date of Examination*	<input type="text" value="17/03/2021"/>
Email Id of Faculty:*	<input type="text" value="bipinkumardwivedi@soanemrana.org"/>	Course*	<input type="text" value="B.Tech (Aeronautical Engineering)"/>
Phone Number of Faculty*	<input type="text" value="931 400 9035"/>	Semester*	<input type="text" value="Semester : 6"/>

Student Name	<input type="text"/>	Student Reg No.	<input type="text"/>
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Part A

Question : 1*

Define the stagnation pressure, stagnation Temperature, Stagnation velocity of sound.

Lesson Plan*

Topic*

Source*

Question : 2*

Define the area ratio (A/A^*) as fraction of Mach number.

Lesson Plan*

6

Topic*

1-D compressible flow

Source*

"FUNDAMENTAL OF AER

Question : 3*

Define the Rankine-Hugoniot equation.

Lesson Plan*

14

Topic*

Normal shock wave

Source*

"FUNDAMENTAL OF AER

Question : 4*

Derive Mach number relation before and after oblique shock wave.

Lesson Plan*

20

Topic*

Oblique shock wave

Source*

"FUNDAMENTAL OF AER

Part B

Question : 1*

The pressure, temperature & Mach number at the entry of a flow passage are 2.45 bar, 26.50C & 1.4 respectively. If the exit Mach number is 2.5 determine for adiabatic flow of a perfect gas ($\gamma = 1.3$, $R = 0.469 \text{ kJ/ kg K}$)

- Stagnation temperature
- Temperature and velocity of gas at exit
- The flow rate per square meter of the inlet cross-section.

Lesson Plan*

3

Topic*

1-D compressible flow

Source*

"FUNDAMENTAL OF AER

Question : 2*

An aircraft flies at 800 km/hr at an altitude of 10,000 meters ($t = 223.15 \text{ K}$, $p = 0.264 \text{ bar}$) The air is reversibly compressed in an inlet diffuser. If the Mach number at the exit of the diffuser is 0.36 determine (a) entry Mach number and (b) velocity, pressure and temperature of air at the diffuser exit.

Lesson Plan*

6

Topic*

1-D compressible flow

Source*

"FUNDAMENTAL OF AER

Question : 3*

The state of a gas ($\gamma = 1.3$, $R = 0.469 \text{ kJ/kg K}$) upstream of a normal shock wave is given by the following data.
 $M_x = 2.5$, $P_x = 2 \text{ bar}$, $T_x = 275 \text{ K}$
Calculate the Mach number, pressure, temperature and velocity of the gas downstream of the normal shock wave.

Lesson Plan*

13

Topic*

Normal shock wave

Source*

"FUNDAMENTAL OF AER

Question : 4*

Air approaches a symmetrical wedge angle $= 15^\circ$ at a Mach number of 2.0. Determine for the strong and weak waves (a) wave angle, (b) pressure ratio, (c) temperature ratio and downstream Mach number of oblique shock wave.

Lesson Plan*

18

Topic*

Oblique shock wave

Source*

"FUNDAMENTAL OF AER

Question : 5

A supersonic flow at $M_1 = 1.58$ and $p_1 = 1 \text{ atm}$ expands around a sharp corner. If the pressure downstream of the corner is 0.1306 atm , calculate the deflection Angle of the corner.

Lesson Plan

24

Topic

Expansion wave

Source

"FUNDAMENTAL OF AER

Question : 6

Consider an infinitely thin flat at an angle of attack at 10° in a Mach 3 flow. Calculate the lift and wave-drag coefficients.

Lesson Plan

28

Topic

Shock wave

Source

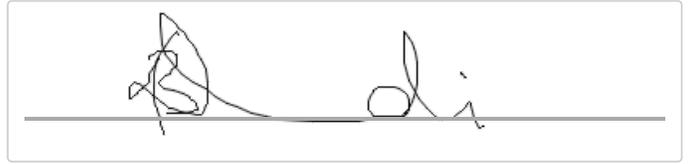
"FUNDAMENTAL OF AER

Upload Scanned Document In Case of Numerical or Diagram for any of the above question

Mention question number with relevant fig / numerical / equations.
Max 150 KB

Choose files or drag here

I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.

A handwritten signature, appearing to be 'Sadi', is written in black ink on a horizontal line. The signature is enclosed within a rectangular border.