School of Aeronautics (Neemrana)

I-04, RIICO Industrial Area, Neemrana, Dist. Alwar, Rajasthan

Approved by Director General of Civil Aviation, Govt. of India, All India Council for Technical Education
Ministry of HRD, Govt of India & Affiliated to Rajasthan Technical University, Kota & BTU, Bikaner Rajasthan

Question Paper For Internal Assessment Examination (Theory) - Credit 3 / 46 /

Instructions For Students / FacultyMid Term I (Total 60 Marks, 2 HRS. Syllabus From Beginning Of Session)
• Part A: Total number of questions to be given are five, 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 15 marks.
• Part B: Total number of questions to be given are six, out of which student has to answer any four. 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 four, out of which student has to answer any three. They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 7 marks. Total 21 marks.
Mid Term II & III (Total 90 Marks, 2.5 HRS. Syllabus From Beginning Of Session)
• Part A: Total number of questions to be given are ten, 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 seven, out of which student has to answer any five. They are long answer type (**Not More Than 50 Words For Question)**, each carrying 6 marks. Total 30 marks.
• Part C: Total number of questions to be given are five, out of which student has to answer any four. They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 10 marks. Total 40 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 (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)

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

Question Paper & Student Details

Mid Term	Mid Term 3	**Date of Submission**	21/09/2020
Name of Faculty	Mr. Bipin Kumar Dwivedi	**Date of Examination**	29/09/2020
Course	B.Tech (Aeronautical Engineering)	**Semester**	SEMESTER : 5
Batch	Combined Batches 15, 16, 17, SF 1	**Subject**	5 AN4 - 02 Aerodynamics-II (Cr 3)

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	COURSE OUTCOME Upon completion of the course, Students will be able to CO1: Interpret the basic concepts & fundamentals of aerodynamics. CO2: Apply the fundamental concepts of mass, momentum, energy conservation equations for aerodynamic applications. CO3: Illustrate the characteristics and impact of Normal Shocks. CO4: Explain the Oblique Shocks characteristics and its impact on Aerodynamic properties. CO5: Analyze the Expansion Waves characteristics. CO6: Solve the problems related to the concepts of vorticity, irrotational and circulation. CO7: Gain insights into thin airfoil theory. CO8: Analyze and determine velocity profiles in the laminar and turbulent boundary layer.

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Student Name		**Student Reg No.**	

Part A			
Question : 1	What is compressible flow?		
1	Basic concepts	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	1

Question : 2	Differentiate between static temperature and dynamic temperature.		
6	Basic concepts	FUNDAMENTAL OF COMPRESSIBLE FLOW BY S. M. YAHYA	2
Question : 3	What is converging-diverging nozzle?		
7	Steady one-dimensional Isentropic flow	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	2
Question : 4	Derive the expression of static temperature ratio in terms of Mach number, Before and after the normal shock wave.		
11	Normal shock wave	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	3
Question : 5	What happened if wedge angle θ is greater than θmax of given Mach number?		
19	Oblique shock waves	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	4
Question : 6	Why stagnation pressure is constant through expansion wave?		
25	Expansion waves	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	5
Question : 7	What is the use of second throat in supersonic wind tunnel?		
37	Experiments in compressible flow	Instrumentation, measurements and Experiments in fluids	8
Question : 8	What is Shock tube?		
38	Experiments in compressible flow	Instrumentation, measurements and Experiments in fluids	8
Question : 9	What is Hot-wire technique?		
39	Experiments in compressible flow	Instrumentation, measurements and Experiments in fluids	8
Question : 10	What is optical flow visualization technique		
40	Experiments in compressible flow	Instrumentation, measurements and Experiments in fluids	8
Part B			
Question : 1	Explain the following (a) Mach angle (b) Mach wave (c) sonic boom		
4	Basic concepts	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	1
Question : 2	Explain the Effect of back pressure in C-D nozzles.		
9	Steady one-dimensional Isentropic flow	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	2
Question : 3	Derive the expression of static temperature ratio in terms of Mach number, Before and after the normal shock wave.		
11	Normal shock wave	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	3
Question : 4	Derive the expression of the Static pressure relation before and after the oblique shock wave.		
19	Oblique shock waves	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	4
Question : 5	Derive the expression to determine Lift and drag over flat plate by using Shock expansion theory.		
25	Expansion waves	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	5
Question : 6	Explain the Variation of Mach number with stagnation temperature due to heat transfer.		
27	Non-Isentropic 1d flow (Rayleigh flow)	FUNDAMENTAL OF COMPRESSIBLE FLOW BY S. M. YAHYA	6
Question : 7	Explain with schematic layout of the Velocity measurements by constant temperature Hot-wire anemometer.		
39	Experiments in compressible flow	Instrumentation, measurements and Experiments in fluids	8
Part C			

Question : 1	The pressure, temperature and Mach number at the entry of the flow Passage are 2.45 bar, 299.5K and 1.4 respectively. If the exit Mach number Is 2.5. Determine for adiabatic flow of a perfect gas (ϒ=1.3, R= 0.469 kJ /kg k) stagnation pressure and temperature.		
6	Steady one-dimensional Isentropic flow	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	2
Question : 2	The ratio of the exit to entry area in a subsonic diffuser 4.0. The Mach Number of a jet of air approaching the diffuser at stagnation pressure 1.013 bar, static temperature T= 290 K is 2.2. there is a standing normal Shock wave just outside of the diffuser entry. Determine the Mach number At the exit of the diffuser.		
10	Normal shock wave	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	3
Question : 3	Consider an oblique shock wave with a wave angle of 30 □. The upstream Flow Mach number is 2.4. Calculate the deflection angle of the flow, Mach Number, the pressure and temperature ratio behind the wave.		
21	Oblique shock waves	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	4
Question : 4	Air stream at Mach 2.0 is isentropically deflected by 5 □ in the clockwise Direction. If the pressure and temperature before deflection are 98kN/m^2 And 300 K, determine the final state after deflection.		
24	Expansion waves	FUNDAMENTAL OF AERODYNAMICS BY JOHN D ANDERSON	5
Question : 5	The data for a gas (ϒ = 1.3, R=466 J/kg K) at the entry of a constant area duct Are P1=0.345 bar, T1= 312 K and velocity is 65.5m/s, if 4592 kJ/kg of heat is added to the gas in the duct between entry and exit sections. What are the pressure and temperature of the gas at sonic conditions?		
27	Non-Isentropic 1d flow (Rayleigh flow)	FUNDAMENTAL OF COMPRESSIBLE FLOW BY S. M. YAHYA	6
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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