BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER : II**
BRANCH: SER (AERODYNAMICS) **SESSION : SP/2025**

SUBJECT: SR579 EXPERIMENTAL AERODYNAMICS

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	List down the various components which are necessary to design a supersonic wind tunnel. Describe them individually the importance to their existence in the wind tunnel assembly.	[5]	1	4
Q.1(b)	Describe the importance of diffuser divergence angle and nozzle contraction ratio towards the Energy Ratio for the operation of open circuit subsonic wind tunnel.	[5]	1	4
Q.2(a)	With a simple sketch describe the measuring differences of the shadowgraph, schlieren and interferometry flow visualization techniques.	[5]	2	3
Q.2(b)	What are the key aspects of surface flows which could be obtained from oil flow visualization. How these features could be corroborated using other investigation techniques and methods.	[5]	2	4
Q.3(a)	A pitot static tube whose static orifices are 3.20 diameters from the base of the tip and 8.00 diameters from the centerline of the stem reads 12.05 in. of water on a manometer for a particular setting of the tunnel. The lip and stem errors are described below in the note. Find the dynamic pressure. Note: (i) Lip Error: static orifices located 3.20 diameters from the base of the tip reads 0.5% q too low. (ii) Stem Error: Static orifices located 8.0 diameters from the stem reads 1.13% q too high.	[5]	2	3
Q.3(b)	What are the different components required to have a setup for Particle Image Velocimetry(PIV). Briefly describe the working principle of PIV.	[5]	2	4
Q.4(a)	Describe using suitable figures the different planes, velocities and angles required to be defined for the directional response of hot wire anemometric probe. What are the different laws to gets the effective velocity from these defined parameters.	[5]	3	4
Q.4(b)	Hot wires are research tools which could be utilized based on the following requirements: i) What are the different measuring it could do? ii) What are the different studies it could cater to? iii) What are the different assumptions to be considered before operating? iv) What are the safety norms to be followed while using the probe ?	[5]	3	4
Q.5(a)	Comment on the two very important features of the Analog to Digital convertors, viz. Sampling and Quantisation.	[5]	5	4
Q.5(b)	Define Nyquist sampling theorem and aliasing. Supposing an input signal contains frequencies of 50, 150, 270 and 620 Hz and the sampling frequency is only 100 Hz. Calculate the resulting frequency of aliased signal.	[5]	5	3

::::::02/05/2025::::::E