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

CLASS: MTECH. **SEMESTER : II**
BRANCH: SER **SESSION : SP/2025**

SUBJECT: SR518 TURBULENCE MODELING IN CFD

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)	What is turbulent flow? Describe the some characteristics of turbulent flow.	[5]	1	II
Q.1(b)	Discuss on the farfield boundary condition.	[5]	1	II
Q.2(a)	Write the RANS equations for incompressible flow. Explain the fundamental problem of turbulence modeling in RANS equations.	[5]	2	III
Q.2(b)	What is Favre (mass) averaging? Why is it important for solving compressible turbulent flows?	[5]	2	II
Q.3(a)	Write down the any two modern variants of mixing length model for wall bounded flows.	[5]	3	II
Q.3(b)	Describe any one algebraic / zero-equation turbulence model.	[5]	3	II
Q.4(a)	Describe the Spalart-Allmaras one-equation turbulence model.	[5]	4	II
Q.4(b)	Discuss on the initial and boundary conditions for Spalart-Allmaras and k-ε turbulence models.	[5]	4	II
Q.5(a)	What is spatial filtering? Write the filtered Navier-Stokes equations for incompressible flow.	[5]	5	II
Q.5(b)	Discuss on the Large Eddy Simulation (LES) and Direct Numerical Simulation (DNS), and advantages and limitations of these methods.	[5]	5	II

::::::29/04/2025::::::E