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

CLASS: ME **SEMESTER: II**
BRANCH: SER **SESSION: SP/19**

SUBJECT: SR576 COMPRESSIBLE FLOWS

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.

Q.1(a)	Sketch and illustrate the different operations of Convergent-Divergent Nozzles when acted upon by variations in the pressure ratios between reservoirs upstream and downstream.	[5]
Q.1(b)	For an adiabatic frictional supersonic flow in a constant area duct, what will be the effect of adding friction beyond choking. Also predict the mass flow characteristics for such a situation.	[5]
Q.2(a)	Differentiate between a stationary and a moving shock wave. Show that the wave velocity of a moving shock depends on the pressure ratio across the shock.	[5]
Q.2(b)	Relate the perturbation velocity to the density or pressure by taking a simple solution of the acoustic wave running towards right.	[5]
Q.3(a)	Air at Mach 2.0 and pressure 70kPa is forced to turn through a 5 degree ramp. A weak shock appears at the body surface. Compute the wave angle, downstream Mach number and pressure using the exact oblique shock theory and the linearized theory. Compare the results.	[5]
Q.3(b)	Describe the solution process of interaction of shocks of opposite family generated by two different ramp angles mounted inside a 2D channel through pressure-deflection diagram.	[5]
Q.4(a)	Show that for a supersonic wind tunnel operation, the diffuser throat must be larger than the nozzle throat.	[5]
Q.4(b)	Illustrate the inlet performance parameters. Sketch the performance curve of an inlet and describe the inlet operating conditions giving explanation of each performance parameters mentioned above.	[5]
Q.5(a)	Describe the Gothert similarity rule. Describe the advantages of the similarity parameters.	[5]
Q.5(b)	Demonstrate the three different techniques to solve problems of transonic flows.	[5]

:::::29/04/2019 M:::::