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

CLASS: BTECH **SEMESTER : 5th**
BRANCH: ME **SESSION : MO/2025**

SUBJECT: ME349 TURBOMACHINERY

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1	Define the following: Reynold's number, specific speed of turbine and pump, Power coefficient, and impulse steam turbine.	[5]	1	1
Q.2(a)	Explain the Euler turbine equation.	[1]	2	2
Q.2(b)	In a pump, the inlet velocity of whirl is 16 m/s, the inlet velocity of flow is 10 m/s, the inlet blade speed is 33 m/s, and the outlet blade speed is 8 m/s. Discharge is radial with an absolute velocity of 16 m/s. If water is the working fluid flowing at the rate of 1000 kg/s. Calculate the power required to run the pump and the head developed by the pump.	[4]	3	4
Q.3	A pump with a rotor diameter of 30 cm handles liquid water at the rate of 2.7 m^3/min while operating at 1500 rpm. The corresponding energy input is 125 J/kg. If a second geometrically similar pump with a diameter of 20 cm operates at 3000 rpm, find (a) its flow rate, (b) power input and (c) ratio of heads.	[5]	4	3
Q.4	Prove that the blade efficiency of an impulse turbine is $\eta_b = 2\phi\left(\cos\alpha_1 - \phi\right)\left(1 + K\frac{\cos\beta_2}{\cos\beta_1}\right)$, where ϕ and K are the speed ratio and blade velocity coefficient.	[5]	4	3
Q.5	Explain the pressure-compounded impulse steam turbine and plot pressure and velocity variations across the nozzle and blades.	[5]	3	2

:::::23/09/2025 :::::M