

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI				
(END SEM EXAMINATION SP/2022)				
CLASS: M. Tech				SEMESTER :II
BRANCH: Mechanical Engineering(Heat Power)				
SUBJECT: ME574: Advanced Turbomachines				
Duration: 2.00 Hours				FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 10 questions each of 5 marks and all are compulsory.
2. The missing data, if any, may be assumed suitably.

- Q.1(a) Define flow coefficient and head coefficient used in turbomachines. [5]
- Q.1(b) Define free vortex and forced vortex flow used in turbomachines. [5]
- Q.2(a) Distinguish between pressure compounding and velocity compounding in steam turbines. [5]
- Q.2(b) In a reaction turbine, the inlet and outlet blade angles are 50 deg and 20 deg respectively. The steam enters at 18 deg to the plane of the rotor wheel and leaves at 40 deg. The rotor speed is 260 m/s. Determine the (i) speed ratio and (ii) specific work. [5]
- Q.3(a) Draw the enthalpy-entropy diagram of fifty percent reaction stage and low reaction stage for an axial flow compressor. [5]
- Q.3(b) What is meant by a stage? Draw the single-stage velocity triangles for an axial compressor having inlet guide vanes. [5]
- Q.4(a) Draw inlet and outlet velocity triangles for an Pelton turbine. [5]
- Q.4(b) A Pelton wheel is having a mean bucket dia. of 1m and is running at 1000 rpm. The net head on the Pelton wheel is 700m. If the side clearance angle(angle between relative velocity at outlet and tangential velocity at outlet) is 15 deg and discharge through nozzle is 0.1 cu m/sec. Determine(i) power available at the nozzle and (ii) hydraulic efficiency of the turbine. [5]
- Q.5(a) What do you mean by manometric efficiency, mechanical efficiency of a centrifugal pump? [5]
- Q.5(b) A centrifugal pump is to discharge 0.118 cu m/sec at a speed of 1450 rpm against a head of 25m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at outlet. [5]

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