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(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 140758   Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

(SEM. VII) THEORY EXAMINATION, 2015-16

THERMAL TURBO MACHINE

[Time : 3 hours]   [Total Marks : 100]

1.   Attempt **all** question.   (10*2=20)

a)   What is kinetic energy of fluid?

b)   In detail give classification of hydrodynamic machine?

c)   Express the Euler Equation for machine?

d)   What is impulse-momentum principle express and define?

e)   How energy transfer in turbo machine

f)   What is reheat and preheat factor

g)   Difference between impulse and reaction turbine

h)   Give different types of blades

i) What is cavitation in turbine

j) Give different type coolant used for turbine blade

2. Attempt any five   (5*10=20)

a) Discuss briefly the aerodynamics losses occur in turbo machines

b) Derive relation for a degree of reaction for an axial flow compressor and advantage of 50% reaction stages.

c) For a centrifugal compressor explain following term

   i. Slip factor

   ii. Power input factor

   iii. Effect of prewhirl

d) Show that the discharge through a nozzle is Maximum When there is a sonic condition at its throat.

e) What is the efficiency of centrifugal cascade? How does it vary with inlet flow angle?

f) Discuss the term surging, stalling and rotating stall applied to compressor characteristic with suitable sketch.

g) What is the specific speed of pump derive an expression for specific speed of pump An inward flow reaction turbine has external and internal dia. As 1.08 and .54m .The turbine is running at 200rpm. The width at inlet is 240mm and velocity of flow through the runner is constant and equal to 2.16m/s, the guide blades make an angle of 10° to the tangent of the wheel and discharge at the outlet of the turbine is radial .Draw the inlet and outlet velocity triangles and determine

   i. Absolute velocity of fluid at inlet

   ii. Velocity of whirl at inlet

   iii. Relative velocity at inlet

   iv. Width of runner at outlet

   v. Weight of water flowing through runner per second

   vi. Head at inlet of the turbine

   vii. Power develop

   viii. Hydraulic efficiency of turbine

h) A fan delivers 2m3/s of air at 10mm WG, while running at 1470rpm. Determine a discharge for geometrically similar blowers which runs at 360rpm developing the same head. What is the specific speed of these fans?

3. Attempt any three. (15*2=30)

a) Discuss in detail the enthalpy and entropy for radial flow turbine. And also give the indicator diagram and modification due to piston acceleration

b) What are the different variable involved determining the performance of axial and centrifugal compressor? Develop the dimensionless parameter that are used to describe the performance of these turbomachine. Show graphically the performance curves with these machine

c) Define various techniques for cooling turbine blades? And also discuss in detail the starting ignition system for gas turbine

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