Total No. of Questions : 6] **SEAT No. :**

P482

[Total No. of Pages : 2

TE/Insem/APR - 8
T.E. (Mechanical)
TURBO MACHINES
(2012 Pattern) (Semester - II)

Time : 1 Hour] ***[Max. Marks : 30***

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Figures to the right indicate full marks.***
3) ***Use of steam table and scientific calculator is allowed.***
4) ***Assume data wherever necessary and mention it.***
5) ***Draw neat and suitable figures wherever necessary.***

Q1) a) Derive an expression for maximum efficiency of a Pelton wheel. **[4]**

b) A jet of water of diameter 75 mm strikes a curved plate at its centre with a velocity of 25 m/s. The curved plate is moving with a velocity of 10 m/s along the direction of jet. If the jet gets deflected through 165° in the smooth vane, compute **[6]**

i) Force exerted by the get
ii) Power of jet
iii) Efficiency of jet

OR

Q2) a) Prove that the force exerted by a jet of water on a fixed semi - circular plate in the direction of the jet when the jet strikes at the centre of the semi - circular plate is two times the force exerted by the jet on an fixed vertical plate. **[4]**

b) A pelton wheel is to be designed for a head of 60 m when running at 200 rpm. The pelton wheel develops 95 kW shaft power. The velocity of buckets = 0.45 times the velocity of the jet, overall efficiency = 85% and coefficient of velocity = 0.98. **[6]**

P.T.O.

Q3) a) What are unit quantities? Define the unit quantities for a turbine. Why are they important? **[4]**

b) A conical draft tube having inlet and outlet diameter 1.0 m and 1.5 m discharges water at outlet with a velocity of 2.5 m/s. The total length of draft tube is 6 m and 1.2 m of the length of the draft tube immersed in the water. If the atmospheric pressure head is 10.3 m of water and loss of head due to friction in draft tube is equal to 0.2 × velocity head at outlet of tube determine **[6]**

i) Pressure head at inlet and

ii) Efficiency of draft tube.

OR

Q4) a) What is draft tube? Why it is used in a reaction turbine? Describe with sketch any one type of draft tube. **[4]**

b) A Kaplan turbine operating under a net head of 20 m develops 16 MW with an overall efficiency of 80%. The diameter of the runner is 4.2 m, while the hub diameter is 2 m and the specific speed is 496. If the hydraulic efficiency is 90%, calculate the inlet and exit angles of the runner blades at the mean blade radius if the flow leaving the runner is purely axial. **[6]**

Q5) a) Derive the expression for maximum blade efficiency in a single stage impulse turbine. **[4]**

b) Following data refers to a particular stage of Parson's reaction turbine. Speed of the turbine = 1500 rpm; Mean Diameter of rotor = 1 m; Stage efficiency = 0.8; Blade outlet angle = 20°; Speed ratio = 0.7. Determine the available enthalpy drop in the stage. **[6]**

OR

Q6) a) What are the methods used in reducing the speed of the turbine rotor? Describe any one method. **[4]**

b) In a stage of impulse reaction turbine provided with single row wheel, the mean diameter of the blade is 1 m. It runs at 3000 rpm. The steam issues from the nozzle at a velocity of 350 m/s and the nozzle angle is 20°. The rotor blades are equiangular. The blade friction factor is 0.86. Determine the power developed if the axial thrust on the bearing of the rotor is 188 N. **[6]**

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