Total No. of Questions :6]

SEAT No. :

P5663

[Total No. of Pages :2

TE/INSEM./OCT. - 109

T. E. (Mechanical)

TURBOMACHINES

(2015 Course) (Semester - I)

Time : 1Hour] *[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 scientific calculator is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Draw neat and suitable figures wherever necessary.***

Q1) a) A 2.5 cm diameter jet strikes without shock on a series of vanes. The jet velocity is 60 m/s and the vanes move with velocity of 14 m/s in the same direction as the jet. The Jet is deflected through an angle of 150^0 and the relative velocity reduces by 10% as water flows across the vanes. Calculate Power developed and Efficiency. **[6]**

b) Classify Turbomachines based on any four criteria with examples. **[4]**

OR

Q2) a) A square plate weighing 115 N and of uniform thickness and 30 cm edge is hung so that a horizontal jet 2cm diameter and having a velocity of 15 m/s impinges on the plate. The centerline of the jet is 15 cm below the upper edge of the plate and when the plate is vertical the jet strikes the plate normally and at its centre. Find what force must be applied at the lower edge of the plate in order to keep the plate vertical. If the plate is allowed to swing freely, find the inclination to the vertical. **[6]**

b) Write a note on any four types of losses in Turbomachines. **[4]**

Q3) a) Two jets strike the buckets of a pelton wheel, which generates shaft power of 15450KW. The diameter of each jet is given as 200mm. If the net head on the turbine is 400 m, find the overall efficiency of the turbine. Take Cv=1.0. **[6]**

P.T.O.

b) Derive an expression for Unit Discharge and Unit Power and state their significance. **[4]**

OR

Q4) a) A Pelton wheel is required to develop 6MW when working under a head of 300m. It rotates with a speed of 550 rpm. Assuming jet ratio as 10 and overall efficiency as 85%. Calculate.

i) Diameter of wheel

ii) Quantity of water required

iii) Number of jets.

Assume coefficient of velocity for nozzle = 0.96 & speed ratio = 0.46. **[6]**

b) Compare lmpulse and Reaction Turbines. **[4]**

Q5) a) A reaction (Francis) turbine runs at 450 rpm under head of 120m. Its diameter at inlet is 120cm and flow area is 0.4 m^2. The angles made by the absolute and relative velocities at inlet are 20^0 and 60^0 respectively with the tangential velocity. Determine

i) Volume flow rate

ii) Hydraulic Power developed

iii) Hydraulic efficiency. Assume no whirl at outlet. **[6]**

b) What do you mean by Degree of Reaction. Explain with significance. **[4]**

OR

Q6) a) A Kaplan turbine developing 3250 KW under a head of 6m has a draft tube with inlet diameter 2.8m and is placed 1.5m above the tailrace level. If the vacuum gauge connected at inlet of draft tube reads 5m of water, determine the efficiency of turbine . Assume draft tube efficiency as 76% and take atmospheric pressure 10.3m of water. **[6]**

b) Explain causes and Remedies for Cavitation in Reaction water Turbine. **[4]**

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