7E4062

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B. Tech. VII Semester (Main) Examination 2015

MECHANICAL ENGINEERING # ⑦ME④# MODEL PAPER

TURBOMACHINES

Time : 3 Hours | Min. Passing Marks : 24 | Maximum Marks : 80

Instruction to Candidates :

*Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit–'I'

1. How does the following laws and governing equations are applied to the turbomachines:
   (*i*) Steady flow energy equation.
   (*ii*) Second law of thermodynamics.
   (*iii*) Newton's Second law of motion.
   (*iv*) Continuity Equation. **[16]**

OR

1. Derive an equation of moment of momentum applicable to turbomachines for the calculation of theoretical energy transfer. Transform the equation into the form which consists of centrifugal and other effects. Explain the physical significance of each term and discuss the term degree of reaction. **[16]**

Unit–'II'

2. (*a*) Define fluid slip and slip factor and its effect on centrifugal compressor. **[8]**
   (*b*) How is the degree of reaction of a centrifugal compressor stage defined? **[8]**

OR

2. (*a*) Draw a sketch of an axial flow compressor with inlet guide vanes and explain the working principle of the compressor. **[8]**
   (*b*) Draw a neat sketch showing guide vanes and impeller blades and draw velocity diagram at shround and at hub. **[8]**

Unit–'III'

3. (*a*) An axial flow pump is to be designed for 1.75 m^3/s and 7.5 m head, while running at 750 rpm. Assuming hub to runner diameter ratio as 0.45 and through velocity as 0.35 times the peripheral velocity, what will be the diameter, minimum speed ratio and pressure coefficient. **[8]**
   (*b*) Explain the term Variation of Pump Diameter? **[8]**

OR

3. (*a*) A centrifugal pump delivers salt water against a net head of 15m at a speed of 1000rpm. The vanes are curved backward at 30° with the periphery. Obtain the discharge for an impeller diameter of 30 cm and outlet width of 5 cm at a manometric efficiency of 90%. **[10]**
   (*b*) Develop an expression for cavitation number for axial flow pump. What are the causes of cavitation in axial flow pump. ? How will you prevent cavitation in pump. **[6]**

Unit–'IV'

4. (*a*) Explain about the turbofan configurations. **[8]**
   (*b*) Explain about the turbo jet engine. **[8]**

OR

4. (*a*) Write all the advantages and disadvantages of ram jet engine. **[8]**
   (*b*) Explain about the pulse jet engine. **[8]**

Unit–'V'

5. (*a*) Classified the gas turbine. **[8]**
   (*b*) Explain the compression between Impulse and reaction turbine. **[8]**

OR

5. (*a*) How is a turbine works? **[8]**
   (*b*) Explain about the Impulse Hydraulic Turbine. **[8]**