EVENING

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Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)
Semester: 4th
Name of Subject: Applied Thermodynamics
Subject Code: PCME-107
Paper ID: 16196

Time Allowed: 03 Hours   **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

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Part – A   **[Marks: 02 each]**

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Q1.

   a)   How are the steam turbines classified?

   b)   Enumerate various use of gas turbine.

   c)   Describe briefly an axial flow compressor.

   d)   State the fundamental differences between jet propulsion and rocket propulsion.

   e)   A roots blower compresses $0.08 m^3$ of air from 1.0 bar to 1.5 bar per revolution. Calculate the compressor efficiency.

   f)   How Impeller blade shape effects on compressor efficiency ?

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Part – B   **[Marks: 04 each]**

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Q2. When multi-stage compression is used for air and also explain the effect of intercooling in multistage reciprocating compressor.

Q3. Derive an expression for determining of mass of cooling water.

Q4. What are the reciprocating compressors? How reciprocating compressors are classified?

Q5. Prove that the symmetrical blades of rotary compressor have 50% degree of reaction,

Q6. In De –Laval turbine steam issues from the nozzle with velocity of 1200m/s. The nozzle angle is $20°$, the mean blade velocity is 400 m/s and the inlet and outlet angles of blades are equal. The mass steam flowing through the turbine per hour is 1000 kg. Calculate a). blade angle b). relative velocity of steam entering the blades c) .tangential force on blades d). power developed and blade efficiency.

Q7. Draw p-v and T-s diagram for single stage reciprocating air compressor, with clearance and Drive the expression for work done.

Part – C   [Marks: 12 each]

Q8. Explain the working difference between pulse - jet, turbo-jet and ram jet.

OR

Define steam condenser , classify the condensers and effects of air leakage in a condensors

Q9. A single stage double acting air compressor is required to deliver $14m^3$ of air per minute measured at 1.013bar and $15°C$. The delivery pressure is 7 bar and the speed 300 r.p.m. take the clearance as 5% of the swept volume with the compression and expansion index of $n=1.3$. Calculate: i) swept volume of the cylinder ii) the delivery pressure iii) indicated power.

OR

An axial flow compressor with an overall isentropic efficiency of 85% draws air at $20°C$ and compresses it in the pressure ratio of 4:1. The mean blade speed and flow velocity are constant throughout the compressor. Assuming 50% reaction blading and taking blade velocity as 180 m/s and work input factor as 0.82, calculate: i) Flow velocity ii) Number of stages. Take $\alpha_1=12°, \beta_1=42°$.

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