

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09]

EVENING

[Total No. of Pages: 2]

Uni. Roll No.

25 JUN 2022

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

Part – A

[Marks: 02 each]

Q1.

- a) Enlist any four differences between steam turbine and gas turbine.
- b) Write any four applications of gas turbine.
- c) What are the losses in axial flow compressor?
- d) State the fundamental differences between jet propulsion and rocket propulsion.
- e) A centrifugal compressor having compression ratio 2.4 compresses the air polytropically according to law $pv^{1.6} = \text{constant}$. Find the polytropic efficiency of the compressor if $c_p = 0.995 \text{ kJ/kg K}$ and $c_v = 0.71 \text{ kJ/kg K}$.
- f) How Impeller blade shape effects on compressor efficiency ?

Part – B

[Marks: 04 each]

- Q2. When multi-stage compression is used for air and also explain the effect of intercooling in multistage reciprocating compressor.
- Q3. State and Explain Daltons 's law of partial pressures applied to the condenser problems.

- Q4. What are the rotary compressor? How rotary compressors are classified?
- Q5. Prove that the symmetrical blades of rotary compressor have 50% degree of reaction.
- Q6. In De Laval turbine steam issue. from the nozzle with velocity of 1200m/s. The nozzle angle is 20° , the mean blade velocity is 4000 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, without clearance. Derive the expression for the workdone when compression is a) isothermal b) isentropic.

Part – C

[Marks: 12 each]

- Q8. Explain the working difference between propeller- jet, turbo-jet and turbo-prop.

OR

Discuss in detail the working of parallel flow type jet condenser with neat diagram

- Q9. Estimate the work done by a two stage reciprocating single acting air compressor to compress 2.8m^3 of air per min at 1.05 bar and 10°C to final pressure of 35 bar. The intermediate receiver cools the air to 30°C and 5.6 bar pressure. For air take $n=1.4$.

OR

An axial flow compressor having eight stages and with 50% reaction design compresses air in the pressure ratio of 4:1. The air enters the compressor at 20°C and flow through it with a constant speed of 90 m/s. The rotating blades of compressor rotate with a mean speed of 180 m/s. Isentropic efficiency of the compressor may be taken as 82%, calculate : i) work done by machine ,ii) blades angles , Assume $\gamma=1.4$ and $c_p=1.005\text{kJ/kgK}$
