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Total No. of Questions : 09]

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Paper ID [ME209]

(Please fill this Paper ID in OMR Sheet)

B. Tech. (Sem. - 3rd)

MAY-08

APPLIED THERMODYNAMICS - I (ME - 207/209)

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Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Explain the difference between Impulse & Reaction turbines.
- b) Define stage efficiency and overall efficiency.
- c) Define Dalton's law of partial pressure. How it is applicable on steam condensers.
- d) Write note on Labyrinth packing, why it is used in steam turbines.
- e) Discuss the effects of air leakage in condensers.
- f) Write note on Isothermal and polytropic efficiency of reciprocating compressors.
- g) Differentiate between water tube and fire tube boilers.
- h) What is reheat cycle discuss?
- i) What is function of economiser in boiler?
- j) What is Degree of Reaction? Explain?

Section - B

(4 × 5 = 20)

Q2) What is difference of water tube and fire tube Boilers? Which of these is used in high pressure boilers and why?

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P.T.O.

- Q3)** A single stage compressor with double acting draws in $17\text{m}^3/\text{min}$ of air at 01 bar and 15°C . The pressure and temperature at the end of suction are 0.98 bar and 30°C . Delivery pressure is maintained at 6.5 bar. Assuming a clearance factor of 5% and expansion and compression to follow the law $PV^{1.31} = C$. Calculate the stroke volume of compressor neglect the effect of rod.
- Q4)** Compare the Jet Condensers with surface condensers.
- Q5)** A steam power plant has the range of operation from 40 bar dry saturated to 0.05 bar. Determine
 (a) The Cycle efficiency.
 (b) Work ratio and specific fuel consumption for (i) Carnot's cycle (ii) Rankine cycle.
- Q6)** Derive an expression for critical pressure ratio for adiabatic friction less expansion of steam from a given initial velocity.

Section - C

(2 × 10 = 20)

- Q7)** Steam at a pressure of 10 bar and dryness fraction of 0.98 is discharged through a convergent divergent nozzle to a back pressure of 0.1 bar. The mass flow rate is 10 kg/kw-hr. If the power developed is 200 kW determine.
 (a) Pressure at throat.
 (b) Number of nozzels required if each nozzle has a throat of rectangular cross section of 5 mm × 10 mm if 10% of overall isentropic enthalpy drop reheat by friction in the divergent portion.
- Q8)** What is degree of Reaction in Reaction turbines. Derive an expression for it and show that for 50% degree of Reaction the power output is maximum.
- Q9)** Write short notes on the followings :-
 (a) Effect of friction on the performance of nozzle.
 (b) Explain Reheat factor.
 (c) Lamont Boiler.
 (d) Boiler Efficiency.
