

SUBJECT CODE NO:- P-73
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E.(MECH/PROD) Examination May/June 2017
Thermodynamics-I
(Revised)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

- i) Q.No.1 and Q.No.6 are compulsory.
- ii) Solve any two questions from remaining questions in each section.
- iii) Use of steam table/mollier diagram allowed.
- iv) Assume suitable data, if required.

Section A

- Q.1 Solve any five 10
- a) Draw isochoric process on P.V & T.S diagram.
 - b) Draw isentropic process on P.V & T.S diagram
 - c) State limitations of 1st law of thermodynamics.
 - d) Explain pmm-I
 - e) Explain unavailable energy
 - f) Write Kelvin-plank statement
 - g) A heat engine working on Carnot cycle operates between temp limits of 600k & 300k. calculate least rate of heat rejection per KW of power output.
- Q.2 Air. Enter at 15^oc through a heat exchanger at a velocity of 30 m/s where its temperature is raised to 750^oc.IT then enters a turbine with same velocity of 30 m/s & expands until the temperature falls to 650^oc on leaving the turbine, air is taken at a velocity of 60 m/s to a nozzle where it expands until the temperature has falls 500^oc.If the air flow rate is 2 kg/s calculate, 15
- a) Rate of heat transfer to air in heat exchanger.
 - b) Power output of turbine assuming no heat loss.
 - c) Velocity of air at the ext from nozzle, assuming no heat loss.
- Q.3 a) Prove the equivalence of Kelvin plank & clausius statement. 07
a) b) A reversed Carnot cycle operates as refrigerator has capacity of 100 kJ/s while operating between temperature limits of -20^oc & 35^oC Determine power input & COP. if the system is used for heating purpose only, find its COP 08
- Q.4 a) State & prove clausius inequality. 07
b) State & prove Carnot theorem. 08
- Q.5 Write short note on (any 3) 15
- a) Available and unavailable energy.
 - b) Statements of Second law of thermodynamics.
 - c) pmm-I & pmm-II
 - d) SFEE

Section B

- Q.6 Solve any five. 10
- What is critical point
 - Define latent heat & sensible heat
 - What do you mean by HCV & LCV.
 - Draw Atkinson cycle on P-V & T-S diagram
 - Define (I) dryness fraction (II) Dry steam.
 - Define mean effective pressure.
 - Explain triple point.
- Q.7 07
- Derive the expression for ideal efficiency of Diesel cycle.
 - Calculate the % loss in air standard efficiency of Diesel engine with compression ratio of 14 & fuel cut off is delayed from 5 % to 8 % 08
- Q.8 06
- With neat sketch. Explain construction & working of separating- Throttling calorimeter.
 - Calculate volume , density, enthalpy & entropy of 1.5kg of steam at 20 bar & having dryness fraction of 0.95 09
- Q.9 A fuel has mass composition as. 15
 C=85%, H₂=13%, O₂=2 % The dry exhaust gases have the following volumetric composition, CO₂=9%, CO=1.5 %, O₂=7%, N₂=82.5%
- Determine :
- Mass of air supplied per kg of fuel
 - % of excess air supplied.
- Q.10 Write short note on(Any three) 15
- Or sat apparatus
 - Mollier diagram
 - Brayton cycle
 - Compare Otto & Diesel cycle for same compression ration & same heat addition.