B. Tech. Sem - III (Mechanical Engg.) (2014 COURSE) (CBCS) :
WINTER - 2018

SUBJECT: ENGINEERING THERMODYNAMICS

Day: Friday
Date: 30/11/2018

Time: 10.00 AM TO 01.00 PM
Max Marks: 60

W-2018-2313

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate Full marks.
3) Use of non- programmable **CALCULATOR** is allowed.
4) Use of steam table is allowed.
5) Assume suitable data if necessary.

Q.1 State Kelvin-Plack and clausius statement of the second law of thermodynamics and prove that the violation of Kelvin-Plack statement result into violation of clausius statement. **(10)**

OR

Q.1 A reversible engine is supplied with heat from two constant temperature sources at 900K of 6000K and rejects heat to a constant temperature sink at 300K. The engine develops work equivalent to 90KJ/S and rejects heat at the rate of 56 KJ/S. Calculate **(10)**

i) Heat supplied by each source.
ii) Thermal efficiency of the engine.

Q.2 Explain how it is a advantageous using an economizer, air-preneater and superheater in steam power plant. **(10)**

OR

Q.2 In a boiler test 1250 Kg of coal consumed in 24 hrs. Mass of water evaporated is 13000 Kg and mean effective pressure is 7 bar. Feed water temperature was 40^0C and heating value of coal is 30,000 KJ/Kg. Taking enthalpy of 1 kg of steam at 7 bar as 2570. Find equivalent evaporation per kg of coal and boiler efficiency. **(10)**

Q.3 Sketch and explain the construction and working of a separating and throttling calorimeter used for determining the dryness fraction of steam in a boiler. **(10)**

OR

Q.3 Steam at 20 bar and 400^0C expands in a steam turbine to 0.05 bar. It is then condensed in condenser to saturated water. Assume ideal Rankine cycle. Determine. **(10)**

i) Net work done/ keg of stram
ii) Rankine efficiency.

P.T.O.

Q.4 In a two stage air compressor in which intercooling is perfect, prove that the work done in compression is a minimum when the pressure in the inter cooler is the geometric mean between the initial and final pressures. Draw the indicator diagram for two stage compression. **(10)**

OR

Q.4 Find the percentage saving in work by compressing air in two stages from 1 bar to 7 bar instead of in one stage. Assume compression index 1.35 in both the cases and optimum pressure and complete intercooling in two stage compressor. **(10)**

Q.5 What are the types of Rotary air compressors? Give comparison between Reciprocating and Rotary Air compressors. **(10)**

OR

Q.5 What is a positive displacement compressor? Explain surging, chocking and stalling characteristics curves for rotodynamic compressors. **(10)**

Q.6 What is the excess air supplied? Lay down the procedure for determination of minimum air required for complete combustion of coal. **(10)**

OR

Q.6 What is high and low grade energy? Explain available and unavailable energy in detail. **(10)**

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