CBCS SCHEME

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15MR43

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Applied Thermodynamics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define the following:
(i) Excess air
(ii) Enthalpy of formation
(iii) Enthalpy of combustion
(iv) Air/Fuel ratio. **(08 Marks)**

b. Calculate the amount of theoretical air required for the complete combustion of 1 kg acetylene (C_2H_2) to CO_2 and H_2O. **(08 Marks)**

OR

2 a. With a neat sketch, explain the analysis of exhaust gases by ORSAT apparatus. **(08 Marks)**

b. Balance the chemical equation for combustion of octane C_8H_{18} with theoretical amount of air. Also find the theoretical air-fuel ratio. **(08 Marks)**

Module-2

3 a. Explain : (i) William's line method. (ii) Morse test method. **(08 Marks)**

b. With a neat sketch explain swinging field dynamometer. **(05 Marks)**

c. Explain heat balance sheet. **(03 Marks)**

OR

4 a. Derive an expression for workdone in reciprocating compressor for without clearance. **(08 Marks)**

b. In a two stage air compressor, the work output is found to be 350 kJ/kg of air. It is used to compress 1 kg of air from 1 bar pressure of 32°C initial temperature. The value of n = 1.3 and R = 0.287 KJ/kg K. Find the intermediate pressure. **(08 Marks)**

Module-3

5 a. Explain with T-S diagram ideal regenerative Rankine cycle. **(08 Marks)**

b. Steam enters the turbine, which is operating on Rankine cycle at 10 bar 300°C. The condenser pressure is 0.1 bar. Steam leaving the turbine is 90% dry. Calculate the adiabatic efficiency of the turbine and cycle efficiency, neglect pump work. **(08 Marks)**

OR

6 a. Derive an expression for the air standard efficiency of a diesel cycle. Write PV and TS diagrams. **(08 Marks)**

b. The following particulars refers to the German Mercedes 190 D car operating on four stroke inline diesel engine cycle. Compression ratio 21 : 1 and Expansion ratio 10.5 : 1. Determine the cut off ratio and air standard efficiency. **(08 Marks)**

Module-4

7 a. Explain closed cycle gas turbine with a neat sketch. And write the advantages of CCGT over OCGT. **(08 Marks)**

b. Explain briefly the effects of intercooling and reheating on Brayton cycle efficiency with T-S diagrams. **(08 Marks)**

OR

8 a. Write a short note on jet propulsion. And explain working of Ramjet with neat sketch. **(08 Marks)**

b. Air enters the compressor of a gas turbine plant operating on brayton cycle at 1 bar pressure and 300 K temperature. The pressure ratio is 5 and the maximum cycle temperature is limited to 1075 K. If the compressor and turbine efficiencies are 80% and 85% respectively. Calculate net work output, cycle efficiency and work ratio. **(08 Marks)**

Module-5

9 a. What is refrigerant? What are the types of refrigerant? Explain the desirable properties of refrigent. **(08 Marks)**

b. Find the least power of a perfect reversed heat engine that makes 400 kg of ice per hour at -8°C from feed water at 18°C. Assume specific heat of ice as 2.09 KJ/kgK and latent heat as 334 kJ/kg. **(08 Marks)**

OR

10 a. With a neat sketch describe the working of summer air conditioning system for hot and dry weather. **(08 Marks)**

b. Atmospheric air at 101.325 kPa has 30°C DBT and 15°C DPT. Without using Psychrometric chart, using the property values from the tables. Calculate

(i) Partial pressures of air and water vapour
(ii) Specific humidity
(iii) Relative humidity
(iv) Vapour density
(v) Enthalpy of moist air. **(08 Marks)**

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