

FACULTY OF ENGINEERING

B.E IV-Semester (CBCS) (Mech) (Main & Backlog) Examination, May / June 2019

Subject : Applied Thermodynamics

Time: 3 Hours

Max. Marks: 70

Note: Answer all questions from Part A and any five questions from Part -B

PART- A (20 Marks)

1. Define and derive an expression for volumetric efficiency of reciprocating air compressor in terms of pressure ratio, index of compression and expansion?
2. Define FAD of reciprocating air compressor?
3. Define "Ignition delay" as referred to a SI engine and give its significance?
4. Define indicated thermal efficiency of an IC Engine?
5. Write short notes on knocking of CI engine?
6. Explain with a neat sketch "simple carburetor" of an IC engine?
7. Differentiate between "Fire-tube and "Water-tube" boilers?
8. Define condenser and explain any one type of jet condenser?
9. How does "regeneration" contribute to improvement of the efficiency of a Rankine cycle?
10. Explain with sketch for variation of pressure convergent divergent nozzle?

PART-B (5x10=50 Marks)

11. A single-stage double acting reciprocating air compressor takes in 14m^3 of air per minute measured at 1.013bar and 15°C , the delivery pressure is 7bar and the compressor speed is 300rpm and the compressor has clearance volume 5% of swept volume with a compression & expansion index of $n=1.3$. Calculate (i) swept volume of the cylinder, (ii) delivery temperature and (iii) indicated power.
12. In a trial of single cylinder oil engine working on dual cycle the following observations were made: Compression ratio= 15 ; oil consumption= 10 kg/hr ; the calorific value of the fuel= 43900 kJ/kg ; air consumption= 3.8 kg/min , speed= 1900 rpm ; torque on the brake drum= 186 N-m ; quantity of cooling water circulated= 15.5 kg/min , temperature rise= 36°C ; exhaust gas temperature= 410°C ; room temperature= 20°C ; C_p of exhaust gas= 1.17 kJ/kg K ; C_p of water= 4.18 kJ/kg K . Calculate (i) B.P., (ii) bsfc, (iii) η_{DTH} and (iv) draw the heat balance sheet on minute basis.
13. Describe the combustion phenomena of CI engine with P- θ diagram and how knocking occurs in it?
14. a) Explain the working principle of stirling boilers.
b) Differentiate between surface and jet type steam condensers.
15. A steam power plant operates on an ideal Rankine cycle between a boiler pressure of 45bar , 350°C and a condenser pressure of 0.037bar . Calculate cycle efficiency, work ratio and specific steam consumption for

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- i) Ideal Rankine cycle
- ii) Rankine cycle when expansion process has an isentropic efficiency of 85%

16. Define critical pressure of nozzle and derive condition for critical pressure.

17. a) Describe briefly the functioning of wet-sump lubrication system with neat sketch.

b) Write notes on fire tube boiler with at least one example

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