

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agricultural Engineering)

Semester	: 1 (New)	Term	: 1	Academic Year	: 2019-20
Course No.	: PFE 111	Title	: Thermodynamics		
Credits	: 2(1+1)	Time	: 10.00 to 12.00	Total Marks	: 40
Day & Date	: Saturday, 04.01.2020				

- Note :**
1. Solve **ANY EIGHT** questions from **SECTION "A"**.
 2. All questions from **SECTION "B"** are compulsory.
 3. All questions carry equal marks.
 4. Draw neat diagrams wherever necessary.

SECTION "A"

- Q.1 a) A Carnot engine, working between 650 K and 310 K, produces 150 kJ of work. Find thermal efficiency and heat added during the process.
- b) An engineer claims his engine to develop 3.75 kW. On testing, the engine consumes 0.44 kg fuel per hour having calorific value of 42000 kJ/kg. The maximum temperature recorded in the cycle is 1400 °C and minimum is 350 °C. Find whether the engineer is justified in his claim.
- Q.2 a) State the conditions that must be satisfied by the steady flow process.
- b) State the assumptions in thermodynamic cycles.
- Q.3 A quantity of air has a volume of 0.4 m³ at a pressure of 5 bar and temperature of 80 °C. It is expanded in a cylinder at a constant temperature to a pressure of 1 bar. Determine the amount of work done by the air during expansion.
- Q.4 Derive the expressions $P_1 V_1^\gamma = P_2 V_2^\gamma = C$.
- Q.5 Define thermodynamic system and explain its different types.
- Q.6 The pressure of steam inside a boiler, as measured by pressure gauge, is 1 N/mm². The barometric pressure of the atmosphere is 765 mm of mercury. Find the absolute pressure of steam in N/m², kPa, bar and N/mm².
- Q.7 Explain in detail the Otto cycle with the help of p-v and T-S diagram and derive the expression $\eta = 1 - \frac{1}{(r)^{\gamma-1}}$.
- Q.8 Explain in detail the construction of psychrometric chart with neat sketch.
- Q.9 a) State the advantages of superheating the steam.
- b) Calculate the enthalpy of 1 kg of steam at a pressure of 8 bar and dryness fraction of 0.8.
- Q.10 Explain in detail the formation of steam at constant pressure from water with neat illustrative figures.

(P.T.O.)

SECTION "B"

Q.11 Define the following terms.

- 1) Non-flow process
- 2) Heat engine
- 3) Hyperbolic process
- 4) Wet steam

Q.12 Fill in the blanks.

- 1) For steam, the value of critical temperature is _____.
- 2) Second law of thermodynamics defines _____.
- 3) _____ is that branch of engineering science, which deals with the study of moist air.
- 4) If the value of $n = 0$ in the general law $pv^n = C$, then the process is called _____.

