



**KERALA AGRICULTURAL UNIVERSITY**  
**B. Tech. (Agri. Engg.) 2023 & Previous Admissions**  
**IV Semester Final Examination – June 2025**

**Fpme.2207**

**Thermodynamics and Automotive Engines (2+1)**

**Marks: 50**  
**Time: 2 hours**

- I Define** **(10x1=10)**
1. A thermodynamic system
- Choose the correct answer**
2. Pressure is a ..... function. (path/point)
- Fill in the blanks**
3. The stoichiometric fuel-air ratio for petrol is .....
  4. For an adiabatic process the work transfer equals the .....
  5. An ideal otto cycle has the heat addition process at constant .....
  6. For an isolated system the change in entropy is .....
- State True or False**
7. The area under the T-S curve represents the heat transfer during a process.
  8. A carburettor is used to pressurize the air for the operating the engine.
  9. All reversible engines operating between two reservoirs have the same efficiency.
  10. A radiator in a cooling system removes heat by radiation.
- II Write short notes on ANY FIVE of the following** **(5x2=10)**
1. Write down the expression for the first law of thermodynamics applied to a control volume.
  2. Draw the T-S diagram for a reversible adiabatic compression process. Label the plot clearly.
  3. If the swept volume of an engine is 942 cc and the bore diameter is 0.01 m, calculate the stroke length.
  4. Assuming an A/F ratio of 15, calculate the air flow rate for a fuel consumption rate of 4.5 g/s.
  5. What are the various types of nozzles used in a diesel engine?
  6. What is the need for compensating type carburetors?
  7. What are the components of an engine indicating device?
- III Answer ANY FIVE of the following** **(5x4=20)**
1. State and explain the Clausius statement of the second law of thermodynamics. Draw a schematic and label.
  2. Prove that entropy is a property of a system.
  3. Draw the P-V and T-S diagrams for an Otto cycle and derive the expression for efficiency.
  4. What are the components of a fuel feed system of diesel engine? Draw and label clearly.
  5. What is knocking in SI engines? Draw a P-T diagram and explain.
  6. An engine operating on Otto cycle has a ratio of pressures at constant volume as 1:5. If the temperature at the end of compression is 475 K ( $pV^{1.2} = C$ ) and the engine operates between 1 bar and 25 bar pressures, calculate its efficiency and that of a Carnot cycle for the same temperature range.
  7. A four-stroke CI engine with 4 cylinders develops an indicated power of 150 kW and delivers a brake power of 125 kW. Calculate the frictional power and mechanical efficiency



**IV**

**Write an essay on ANY ONE of the following**

**(1x10=10)**

1. A 4 stroke SI engine delivers a brake power of 450 kW with a mechanical efficiency of 85%. The fuel consumption is 0.04 kg/s while the air consumption is 0.7 kg/s. The fuel has a calorific value of 42 MJ/kg. Calculate the indicated power, frictional power, air-fuel ratio, indicated thermal efficiency and brake thermal efficiency.
2. For an air standard Otto cycle, the pressure ratio for the combustion is 1.5. The heat supplied is 1034 kJ/kg and the compression ratio is 13. Calculate the thermal efficiency and p, T at various states of the cycles if the initial state has 0.9 bar and 340 K.

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