



KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2020 Admission
IV Semester Final Examination – August 2022

Fpme.2207

Thermodynamics and Automotive Engines (2+1)

Marks: 50
Time: 2 hours

I State True or False

(10x1=10)

1. A boundaries of a thermodynamic system can move.
2. The area under the p-V curve represents the heat transfer during a process.
3. Efficiency of a Carnot engine is 100 %.
4. Ignition system is not required in a diesel engine.

Fill in the blanks

5. For an isothermal process the work transfer equals _____ transfer.
6. For an adiabatic heating process the change in entropy of the system is _____.
7. An ideal diesel engine cycle has heat addition process at constant _____.
8. Ethylene glycol is added to engine coolant to avoid _____.

Choose the correct answer

9. Work transfer is a _____ function. (path/point)
10. A rich fuel-air mixture has more _____ (fuel/air) than stoichiometric proportion.

II Write short notes on ANY FIVE of the following

(5x2=10)

1. Write down the first law of thermodynamics applied to a closed system.
2. Draw the p-V diagram for an isothermal expansion process. Clearly label the plot.
3. If the actual volume intaken in an engine is 1552 cc and the volumetric efficiency is 85%, calculate the stroke volume.
4. For an engine that develops 60 kW of power, what is the fuel consumption rate assuming a calorific value of 42 MJ/kg?
5. What is the function of the ignition coil in a petrol engine?
6. What are the desired properties of an engine lubricant?
7. State the conditions under which air-cooling of engines is suitable.

III Answer ANY FIVE of the following

(5x4=20)

1. State the Clausius inequality and apply it to a reversible cycle. Draw schematics and diagrams clearly.
2. Show that the violation of the Kelvin-Planck statement of the second law of thermodynamics will violate the Clausius statement.
3. Draw the p-V and T-s diagram from an air-standard diesel cycle and derive the expression for the efficiency.
4. What are the components of a carburetor? Draw a simple carburetor and label clearly.
5. Explain the phenomenon of knocking in CI engines. State the remedies for avoiding it.
6. For an air standard diesel engine cycle with $\gamma = 1.4$, with a compression ratio of 8 and expansion ratio of 5, calculate the air standard efficiency and the peak temperature assuming the lower pressure as 1 bar.
7. An engine with 0.08 kg/s air consumption operates at 1000 rpm. The fuel consumption is 0.06 g/s while the indicated power is 1 kW. The indicated thermal efficiency is 35% and mechanical efficiency is 85%. Calculate the brake power and heating value of the fuel.

IV

Write an essay on ANY ONE of the following

(1x10=10)

1. An engine with brake power of 3.68 kW with thermal efficiency of 30% and mechanical efficiency of 80%. The fuel can be assumed to have a calorific value of 42 MJ/kg with $s.g=0.9$. Calculate the specific fuel consumption, indicated specific fuel consumption and brake specific fuel consumption.
2. At the start of compression in an air-standard diesel engine cycle, the pressure is 1 bar and temperature 350 K. The compression ratio is 16 and the heat added is 900 kJ/kg. Calculate the quantities p, T at various points in the cycle
