

**III- SEM MECH /AERO/AUTO/DME/MECH(MAIN)/MECH(PROD)/ MECH(SAND)
/MECH(II)/MECH. ENGG. AUTO/2019(W)/NEW**

Th. 4-THERMAL ENGINEERING-I

Full Marks: 80

Time: 3 Hours

Answer any FIVE Questions including Q No. 1 & 2

Figures in the right hand margin indicates marks

1	<p>Answer ALL the questions in brief:</p> <ol style="list-style-type: none">What do you mean by macroscopic and microscopic approach in thermodynamics?What do you mean by a path function?What are the limitations of first law of thermodynamics?State second law of thermodynamics.State Carnot's Theorem.What do you mean by a "Reversible Process" and mention its characteristics?What do you mean by Perpetual Motion Machine of second kind?What is an IC engine and mention its parts?What are secondary fuels? List some examples.What is the relationship between a Celsius scale & a Fahrenheit scale?	2X10
2	<p>Answer any SIX questions:</p> <ol style="list-style-type: none">A vacuum recorded in the condenser of a steam power plant is 740 mm of Hg. Find the absolute pressure in the condenser in Pascal. The barometric reading is 760 mm of Hg. (Given 1mm of Hg= 133.4 N/m²)Differentiate between CI and SI engine.Derive the relationship between C_p and C_v.A cyclic heat engine operates between 1000 degree Celsius and a sink temperature of 40 degree Celsius. Find the least rate of heat rejection per KW net output of heat engine.What are the terminology used in IC engine and explain each one of them?What are the advantages and disadvantages of using Liquid fuels?Explain the various stages involved in a Carnot cycle along with PV and TS diagram.	5X6
3	<p>A reversible heat engine operates between two reservoirs at temperatures of 800 degree Celsius and 40 degree Celsius. The engine drives a reversible refrigerator which operates between reservoirs at temperature of 40 degree Celsius and -20 degree Celsius. The heat transfer to the engine is 2 MJ and the net work output of the combined engine and refrigerator plant is 360 KJ. Find the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40 degree Celsius. Also find these values if the efficiency of the heat engine and COP of the refrigerator are each 40% of their maximum values?</p>	10
	<p>What do you mean by Calorific Value of a fuel? Explain about the different types of solid fuel available for combustion purposes.</p>	10
5	<p>Explain with the help of suitable sketches the working of a 4- stroke cycle and 2-stroke cycle diesel engine?</p>	10
6	<p>A system contains 0.20 m³ of a gas at a pressure of 4.8 bar and 180° C. It is expanded adiabatically till the pressure falls to 1 bar. The gas is then heated at a constant pressure till its enthalpy increases by 70 kJ. Determine the total work done. Take $C_p = 1\text{kJ/kg-K}$ and $C_v = 0.714\text{kJ/kg-K}$.</p>	10
7	<p>Explain briefly Otto Cycle with the help of PV and TS diagram and derive an expression for the ideal air standard efficiency of Otto cycle.</p>	10