

Model Question Paper
Total Duration (H:M):3:00
Course: Basic Thermodynamics
Maximum Marks: 100

Q.No	Questions	Marks	CO	BL
1a	State the Clausius and kelvin Plank statement of second Law of thermodynamics.	5	CO2	L1
1b	What do you understand by Thermodynamic Equilibrium. Explain in brief.	5	CO1	L1
1c	An engine cylinder has a piston of area 0.12 m ² and contains gas at a pressure of 1.5MPa.The gas expands according to the process which is represented by a straight line on a pressure volume diagram. The final pressure is 0.15 MPa .calculate the work done by the gas on the piston if the stroke is 0.30m	5	CO1	L3
1d	What do you understand by the terms System, Surrounding and Universe in the context of Thermodynamics.	5	CO1	L2
2a	Explain the equivalence of kelvin plank statement of second law and Clausius statement of second law of Thermodynamics	5	CO3	L2
2b	What do you understand by path function and point function? Why is work and heat called as inexact differentials	5	CO1	L1
2c	What do you understand by thermal energy Reservoir? Explain what do you understand by Heat engine	5	CO1	L2
2d	A cyclic heat Engine operates between a source temperature of 800o C and a sink of 30o C .what is the least rate of heat rejection per KW net output of the engine?	5	CO2	L3
3a	Derive the equation for thermal efficiency of ideal Otto cycle with proper diagrams of PV and TS curve. A gas engine working on the Otto cycle has a cylinder of diameter 200mm and stroke 250mm.The clearance Volume is 1570cc.Find the air standard efficiency. Assume the ratio of specific heat equal to that of air.	10	CO4	L4
3b	Compare Otto, Diesel and Dual cycle for the same compression ratio and same amount of heat rejection. Determine the ideal efficiency of the diesel engine having a cylinder with bore 250 mm, stroke 375 mm and a clearance volume of 1500cc, with fuel cutoff occurring at 5% of the stroke. Assume the other constants if required	10	CO4	L3
4a	What is entropy? Three identical bodies of finite heat capacities are at temperature 300,300 and 100k.If no work or heat is supplied from outside, what is the highest temperature to which any of the bodies can be raised by the operation of heat engines or refrigerators?	10	CO4	L3
4b	Steam at 20 bar, 360oC is expanded in a steam turbine to 0.08 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds the water into the boiler.(a) Assuming ideal processes, find per kg of steam the net work and the cycle efficiency.(b) If the turbine and the pump have each 80% efficiency, find the percentage reduction in the net work and cycle efficiency.	10	CO5	L3

5a	<p>What do you understand by Throttling process. Explain.</p> <p>Air at a temperature of 15oC passes through a heat exchanger at a velocity of 30m/s where its temperature is raised to 800oC .It then enters a turbine with the same velocity of 30m/s and expands until the temperature falls to 650oC.On leaving the turbine ,the air is taken to a velocity of 60 m/s to a nozzle where it expands until the temperature falls to 500oC.If the air flow rate is 2kg/s calculate (a) the rate of heat transfer to the air in the heat exchanger (b) the power output from the turbine assuming no heat loss, and (c) the velocity at the exit from the nozzle assuming no heat loss .Take the enthalpy of air as $h= C_p t$ where C_p is the specific heat equal to 1.005 KJ/kg K and t is the temperature</p>	10	CO5	L3
5a	<p>What is joule – kelvin effect ? Explain. Also describe the inversion curve and its applications with diagrams.</p>	10	CO5	L5