**LOK NAYAK JAIPRAKASH INSTITUTE OF TECHNOLOGY CHAPRA, BIHAR**

**(**Established under AICET Act, \_\_\_\_\_)

**Department of Mechanical Engineering**

**021821 Mechanical System Design**

**Assignment I**

1. A four stroke diesel engine has the following specifications:

Brake power = 5kw; Speed=1200 r.p.m; Indicated mean effective pressure = 0.35 N/mm2; Mechanical efficiency = 80%. Determine: 1. Bore and length of the cylinder; 2. Thickness of the cylinder head; and 3. Size of studs for the cylinder head.

1. A 50-kg iron block at 80°C is dropped into an insulated tank that contains 0.5 m3 of liquid water at 25°C. Determine the temperature when thermal equilibrium is reached.
2. A frictionless piston–cylinder device initially contains air at 200 kPa and 0.2 m3. At this state, a linear spring is touching the piston but exerts no force on it. The air is now heated to a final state of 0.5 m3 and 800 kPa. Determine (*a*) the total work done by the air and (*b*) the work done against the spring. Also, show the process on a *P-v* diagram.
3. The electric heating systems used in many houses consist of a simple duct with resistance heaters. Air is heated as it flows over resistance wires. Consider a 15-kW electric heating system. Air enters the heating section at 100 kPa and 17°C with a volume flow rate of 150 m^`3/min. If heat is lost from the air in the duct to the surroundings at a rate of 200 W, determine the exit temperature of air.
4. Design a cast iron piston for a single acting four stroke engine for the following data:

Cylinder bore=100 mm; stroke=120 mm; Maximum gas pressure=4N/mm2 ; Indicated mean effective pressure=0.75 N/mm2 ; Mechanical efficiency=80%; Fuel consumption=0.15 kg/bp/h; Higher calorific value of fuel=42x103 kj/kg; speed=2000 r.p.m

Any other data required for the design may be assumed.