ROLL NO:	

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

Weightage: 20 % Max Marks: 40 Max Time: 1 hr Monday , 24th September 2018

TEST – 1

Odd Semester 2018-19 Course: **MEC 201 Basic Thermodynamics** III Sem. Mechanical

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Instruction:

(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted.

Part A

(3 Q x 4 M = 12 Marks)

1. Write all three types of Equilibrium with examples.
2. Write the name of different types of thermodynamics processes in displacement work.
3. Write the difference between Reversible, Quasi-Static and Irreversible Processes.

Part B

(2 Q x 8 M = 16 Marks)

4. Derive heat transfer expression with the help 1st Law and the displacement work for expansion/ compression in thermodynamics processes for

(a) Polytrophic Process (pV^n = Constant)

(b) Isothermal Process (pV = Constant)

5. A mass of gas is compressed in a quasi-static process from 80 KPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3. Assuming that the pressure and volume are related by pV^n = constant, find the work done by the gas system.

Part C

(1 Q x 12 M = 12 Marks)

6. The temperature 't' on a thermometric scale is defined in terms of a property *K* by the relation

$$t = (a \ln (K)) + b$$

Where *a* and *b* are constants. The values of *K* are found to be 1.83 and 6.78 at the ice point and the steam point, the temperatures of which are assigned the numbers 0 and 100 respectively. Determine the temperature corresponding to

(a) Reading of *K* equal to 2.42 on the thermometer
(b) Reading of *K* equal to 9.47 on the thermometer
(c) Reading of *K* equal to 3.78 on the thermometer.

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TEST 2

Odd Semester: 2018-19 | **Date**: 27 November 2018

Course Code: MEC 201 | **Time**: 1 Hour

Course Name: Basic Thermodynamics | **Max Marks**: 40

Branch & Sem: MEC & III Sem | **Weightage**: 20%

Instructions:

(i) Read the questions properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non programmable calculator are permitted.

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (3x4=12)

1. The ventilating fan of the bathroom of a building has a volume flow rate of 30 L/s and runs continuously. If the density of air inside is 1.20 kg/m^3, determine the mass flow rate of air:-

2. What is a thermal energy reservoir? Explain the term source and sink with neat figure:-

3. Define the COP of refrigerator with neat figure

Part B

Answer **both** the Questions. **Each** question carries **eight** marks. (2x8=16)

4. Heat is transferred to a heat engine from a furnace at a rate of 80 MW. If the rate of waste heat rejection to a nearby river is 50 MW, determine the net power output and the thermal efficiency for this heat engine.

5. Write steady flow energy equation (SFEE) for single stream entering and single stream leaving a control volume and explain various term in it with neat figure?

Part C

Answer the Question. Question carries **twelve** marks. (1x12=12)

6. A turbine operates under steady flow conditions, receiving steam at the following state: Pressure 1.2 MPa, temperature 188°C, enthalpy 2785 kJ/kg, velocity 33.3m/s and elevation 3 m. The steam leaves the turbine at the following state: Pressure 20 kPa, enthalpy 2512 kJ/kg, velocity 100 m/s, and elevation 0 m. Heat is lost to the surroundings at the rate of 0.29 kJ/s. If the rate of steam flow through the turbine is 0.42 kg/s, what is the power output of the turbine in kW?

Roll No.											

PRESIDENCY UNIVERSITY
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END TERM FINAL EXAMINATION

Odd Semester: 2018-19 | **Date**: 27 December 2018

Course Code: MEC 201 | **Time**: 2 Hours

Course Name: Basic Thermodynamics | **Max Marks**: 80

Programme & Sem: MECH & III Sem | **Weightage**: 40%

Instructions:

(i) Read the questions properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non programmable calculator are permitted.

Part A

Answer **all** the Questions. **Each** question carries **five** marks. (4Qx5M=20)

1. What do you understand by entropy principle?
2. Explain available energy and unavailable energy with the help of diagram.
3. 5 kg of air is compressed in a reversible polytrophic process from 1 bar and 40°C to 10 bar with an index of compression 1.25. Calculate the entropy change during the process.
4. A 1.8-m^3 rigid tank contains steam at 220°C as shown in figure 1. One-third of the volume is in the liquid phase and the rest is in the vapor form. Determine (a) the pressure of the steam, (b) the quality of the saturated mixture, and (c) the density of the mixture.

Figure 1

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30)

5. Ten grams of water at 20°C is converted into ice at –10°C at constant atmospheric pressure. Assuming the specific heat of liquid water to remain constant at 4.2 J/gK and that of ice to be half of this value, and taking the latent heat of fusion of ice at 0°C to be 335 J/g, calculate the total entropy change of the system. Draw the T-s diagram for the process.

6. Two bodies of equal heat capacities C and temperatures T_1 and T_2 form an adiabatically closed system. What will the final temperature be if one lets this system come to equilibrium (a) freely? (b) Reversibly? (c) What is the maximum work which can be obtained from this system?

7. A reversible engine, as shown in Figure 2 during a cycle of operations draws 5 MJ from the 400 K reservoir and does 840 kJ of work. Find the amount and direction of heat interaction with other reservoirs.

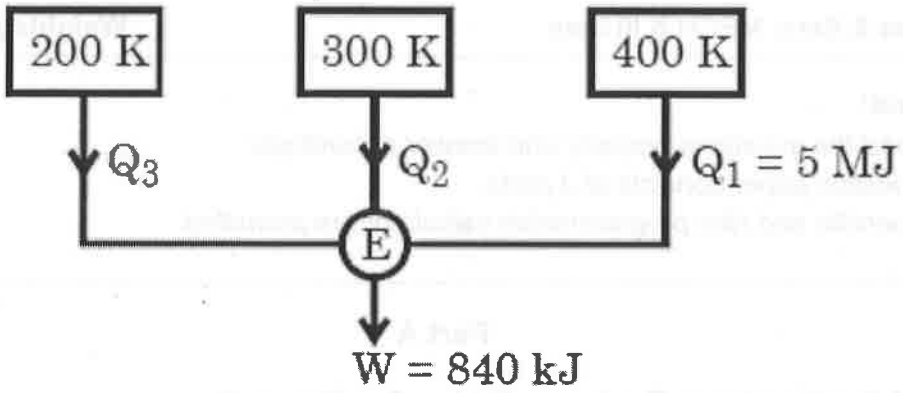

Figure 2

Part C

Answer **all** the Questions. **Each** question carries **fifteen** marks. (2Qx15M=30)

8. Show that there is decrease in available energy when heat is transferred through a finite temperature difference.

9. A rigid closed tank of volume 3 m^3 contains 5 kg of wet steam at a pressure of 200 kPa. The tank is heated until the steam becomes dry saturated. Determine the final pressure and the heat transfer to the tank.