PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

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

TEST – 1

Odd Semester 2018-19   Course: **PET 220 Hydrocarbon Thermodynamics**   III Sem. Petroleum

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

Part A

(3 Q x 2 M = 6 Marks)

1. What is isothermal and isobaric process?

2. Write the following

    i. Define phase.

    ii. Define quasi-static process

3. What is Internal energy? Explain.

Part B

(1 Q x 7 M = 7 Marks)

4. A piston–cylinder device contains 0.2 kg of air initially at 1.8 MPa and 300°C. The air is first expanded isothermally to 480 kPa, then compressed polytropically with a polytropic exponent of 1.4 to the initial pressure, and finally compressed at the constant pressure to the initial state. Determine the boundary work for each process and the net work of the cycle.

Part C

(1 Q x 7 M = 7 Marks)

5. A 100 Litre vessel contains 500 g of water at a pressure of 175 kPa. Determine

    a) temperature
    b) quality
    c) enthalpy of the water
    d) volume occupied by the vapor phase

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TEST 2

Odd Semester: 2018-19

Course Code: PET 220

Course Name: Hydrocarbon Thermodynamics

Branch & Sem: PET & III Sem

Date: 27 November 2018

Time: 1 Hour

Max Marks: 20

Weightage: 20%

Instructions:
(i)   *Read the question properly and answer accordingly.*
(ii)   *Question paper consists of 3 parts.*
(iii) *Scientific and Non-programmable calculators are permitted.*
(iv)   *Using Steam table is permitted.*

Part A

Answer **all** the Questions. **Each** question carries **two** marks.   (3x2=6)

1. What is dead state? Explain

2. What is a thermal reservoir? What are its types? Explain

3. Give the significance of the equation $\frac{\delta Q}{T} \leq 0$.

Part B

Answer **all** the Questions. **Each** question carries **four** marks.   (2x4=8)

4. An automobile engine consumes fuel at a rate of 24 L/h and delivers 60 kW of power to the wheels. If the fuel has a heating value of 45.5 MJ/kg and a density of 0.832 g/cm3, determine the efficiency of this engine.

5. A rigid tank contains 5 kg of refrigerant-134a initially at 20°C and 150 kPa. The refrigerant is now cooled while being stirred until its pressure drops to 100 kPa. Determine the entropy change of the refrigerant during this process.

Part C

Answer the Question. Question carries **six** marks.   (1x6=6)

6. Apples are to be cooled from 24 to 13°C at a rate of 220 kg/h by a refrigeration system. The power input to the refrigerator is 1.5 kW. Determine the rate of cooling, in kJ/ min, and the COP of the refrigerator. The specific heat of apple above freezing is 3.64 kJ/kg·°C.

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END TERM FINAL EXAMINATION

Odd Semester: 2018-19   **Date**: 29 December 2018

Course Code: PET 220   **Time**: 2 Hours

Course Name: Hydrocarbon Thermodynamics   **Max Marks**: 40

Programme & Sem: PET & III Sem   **Weightage**: 40%

Instructions:
(i)   Read the question properly and answer accordingly.
(ii)   Question paper consists of 3 parts.
(iii)   Scientific and Non-programmable calculators are permitted.
(iv)   Using Steam table is permitted.

Part A

Answer **all** the Questions. **Each** question carries **four** marks.   (3Qx4M=12)

1. Write a short note on solid liquid equilibrium (SLE).
2. 'The total mass of each element is conserved during a chemical reaction'. Give reasons and explain with an example.
3. Define enthalpy of formation, reaction and combustion? What is the standard condition to measure enthalpy of formation?

Part B

Answer **both** the Questions. **Each** question carries **seven** marks.   (2Qx7M=14)

4. Draw phase diagrams of oil and gas reservoirs with all the details.
5. A 150 liter vessel contains 5 kg of water at a pressure of 200 kPa. Determine
   i)   the temperature
   ii) the quality
   iii) the enthalpy of the water
   iv) the volume occupied by the vapor phase.

Part C

Answer the Question. Question carries **fourteen** marks.   (1Qx14M=14)

6. A certain natural gas has the following volumetric analysis: 64 percent CH_4, 8 percent H_2, 19 percent N_2, 4 percent O_2, and 5 percent CO_2. Find the air-fuel ratio for the combustion process if
   a) The gas is burned completely with the stoichiometric amount of dry air.   (6 Marks)
   b) The gas is burnt completely with moist air that enters the combustion chamber at 25°C, 1 atm and 70 percent relative humidity.   (8 Marks)