ALPHA COLLEGE OF ENGG & TECH

ODD SEM 2018

ASSIGNMENT 1

SUB : ETH (2131905) 3RD SEM

NO	QUESTION	YEAR	MARKS
1	Explain microscopic and microscopic point of view.	D09	4
2	Define control volume. What is the difference between thermodynamics system	D11,JN14	3
3	Explain thermodynamic equlibrium.	D09,D11, JN13,MAY11	7
4	Explain following terms: Flow work, critical point, triple point.	D10	5
5	Explain quasi-static process with p-v diagram.	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7
6	Explain zeroth law of thermodynamics.	D11,D13,JN14	3,7
7	Explain point function and path function.	D09,JN15,MAY12	5,7
8	Explain flow work, shaft work and paddle wheel work transfer.	D11,D13,JN14	7
9	explain in brief about a)pure substance, b)thermodynamic system, c)surroundings,	D09,JN15,MAY12	7

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ASSIGNMENT 2

SUB : ETH (2131905) 3RD SEM

NO	QUESTION	YEAR	MARKS
1	State the first law of thermodynamics, its applications and limitations.	D09	4
2	State the Steady Flow Energy Equation and explain how this equation can be applied for (i) Nozzle, (ii) Boiler, and (iii) Steam Turbine.	D11,JN14	3
3	The mass flow rate of steam into a steam turbine is 1.5 Kg/s and heat loss from the turbine is 8.5 KW. The steam is entering the turbine at the pressure of 2MPa, temperature 3500C, Velocity 50 m/s, elevation 6 m/s and is leaving the turbine at a pressure of 0.1 MPa, quality of 100%, velocity of 200 m/s, elevation of 3 m/s. Determine power output of turbine.	D09,D11, JN13,MAY11	7
4	In steam power plant, steam pressure, temperature and velocity are 2 MPa, 400 0 C and 50 m/s respectively at inlet of steam turbine. At exit of steam turbine, steam pressure, dryness fraction and velocity are 15 kPa, 0.9 and 180 m/s respectively. Elevation difference between inlet and exit of steam turbine is 4 m. The power output of an adiabatic steam turbine is 5 MW. (1) Compare the magnitudes of Δh, Δke, and Δpe. (2) Determine the work done per unit mass of the steam flowing through the turbine. (3) Calculate the mass flow rate of the steam	D10	5
5	A domestic refrigerator is loaded with food and the door closed. During a certain period the machine consumes 1 kW h of energy and the internal energy of the system drops by 5000 kJ. Find the net heat transfer for the system.	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7

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ASSIGNMENT 3

SUB : ETH (2131905) 3RD SEM

NO	QUESTION	YEAR	MARKS
1	Define following terms: Kelvin Plank statement, Third law of Thermodynamics, Thermodynamic temperature scale, Exergy	D09	4
2	Show that the COP of heat pump is greater than the COP of refrigerator by unity.	D11,JN14	3
3	Prove that all reversible engines operating between operating between same temperatures limits have are equally efficient.	D09,D11, JN13,MAY11	7
4		D10	5
5	State Kelvin-Plank Statement of Second Law of thermodynamics and show that violation of Kelvin-Plank statement leading to violation of Clausius statement. OR Prove the equivalency of Kelvin-Plank and Clausius statements.	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7
6	Write the limitation of first law of thermodynamics. Explain the second law of thermodynamics by Clausius statement and Kelvin-Plank statement	D11,D13,JN14	3,7
7	Evaluate the following statements: 1. Heat pump provides a thermodynamic advantage over direct heating. 2. Kelvin temperature scale is independent of the peculiar characteristics of any particular substance.	D09,JN15,MAY12	5,7

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ASSIGNMENT 4

SUB : ETH (2131905) 3RD SEM

NO	QUESTION	YEAR	MARKS
1	Explain principle of increase of entropy for an isolated system. List the four application of entropy principle.	D09	4
2	Prove that entropy is a property of system.	D11,JN14	3
3	With usual notations prove that $\delta Q/T <= 0$.	D09,D11, JN13,MAY11	7
4	What do you mean by the term entropy? What are the characteristics of entropy? How the principle of entropy is used to determine whether the process path is reversible, irreversible or impossible.	D10	5
5	A cool body at temperature T_1 is brought in contact with high temperature reservoir at temperature T_2. Body comes in equilibrium with reservoir at constant pressure. Considering heat capacity of body as C, find entropy change of universe	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7
6	Using second laws of thermodynamics check the following and also indicate nature of cycle. (i) Heat engine receiving 1000 kJ of heat from a reservoir at 500 K and rejecting 700 kJ heat to a sink at 27°C. (ii) Heat engine receiving 1000 kJ of heat from a reservoir at 500 K and rejecting 600 kJ of heat to a sink at 27°C.	D11,D13,JN14	3,7
7	Show that entropy of universe during mixing of flow fluid always increases.	D09,JN15,MAY12	5,7
8	1 kg of ice at 0° C is mixed with 12 kg of water at 27° C. Assuming the surrounding temperature as 15°C, calculate the net increase in entropy and unavailable energy when the system reaches common temperature : Given: Specific heat of water = 4.18 kJ/kg K; specific heat of ice = 2.1 kJ/kg K and enthalpy of fusion of ice (latent heat) = 333.5 kJ/kg.	D11,D13,JN14	7
9	5 kg of water at 0^0 C is exposed to reservoir at 98^0 C. Calculate the change of entropy of water, reservoir and universe. Assume that specific heat of water is 4.187 KJ/Kg-K.	D09,JN15,MAY12	7
10	A lump of 800 kg of steel at 1250 K is to be cooled to 500 K. If it is desired to use the steel lump as source of energy, calculate the available energy and unavailable energy.	D11,D13,JN14	4,6,7

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ASSIGNMENT 5

SUB : ETH (2131905) 3RD SEM

NO	QUESTION	YEAR	MARKS
1	What is irreversibility? State various types of irreversibilities and explain them.	D09	4
2	Define following terms (1) Availability (2) Dead State (3) High Graded Energy (4) unavailable energy (5) reversibility (6) irreversibility (7) effectiveness (8) Elements of irreversibility (9) Second law of efficiency (10) Availability function.	D11,JN14	3
3	Derive equation for exergy of finite heat capacity source at temperature T. Also differentiate between available and unavailable energy. (or) Explain the available energy referred to finite heat source.	D09,D11, JN13,MAY11	7
4	Explain the concept of decrease in available energy when heat is transferred through a finite temperature difference with the aid of T-S diagram. (or) The same amount of heat loss at higher temperature is more harmful than that at a lower temperature discuss.	D10	5
5	Define available and unavailable energy. With usual notations derive the availability of a closed system (or) Derive the expression for Availability in a closed system at a given state. Mention clearly the assumptions made (or) Define “Availability”. Also derive expression for availability in a non-flow system.	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7
6	What is dead state and why it is referred in the concept of availability?	D11,D13,JN14	3,7
7	Two Kg of air at 500 KPa, 80°C expands adiabatically in a closed system until its volume is doubled and its temperature becomes equal to that of surrounding which is at 100 kPa, 5 °C . For this process, determine (a) maximum work, (b) Change in availability and irreversibility , for air take C v =0.718 kJ/Kg K, R=0.287 kJ/Kg K.	D09,JN15,MAY12	5,7
8	5 kg of air at 550 K and 4 bar is enclosed in a closed system. (i) Determine the availability of the system if the surrounding pressure and temperature are 1 bar and 290 K respectively. (ii) If the air is cooled at constant pressure to the atmospheric temperature, determine the availability and effectiveness.	D11,D13,JN14	7
9	5 kg of water at 0 0 C is exposed to reservoir at 98 0 C. Calculate the change of entropy of water, reservoir and universe. Assume that specific heat of water is 4.187 KJ/Kg-K.	D09,JN15,MAY12	7

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ASSIGNMENT 6

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NO	QUESTION	YEAR	MARKS
1	Explain Carnot vapor cycle .State and explain required modifications with help of suitable diagrams to make the cycle feasible.	D09	4
2	With help of T-s diagram, explain the variables effecting the efficiency of Rankine cycle.	D11,JN14	3
3	State various methods to improve efficiency of Rankine cycle. With suitable diagrams, explain any two of them.	D09,D11, JN13,MAY11	7
4	Derive an expression for efficiency of Rankine cycle with single regenerator with usual notation.	D10	5
5	Derive an expression for efficiency of Rankine cycle with reheat.	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7
6	In a Rankine cycle, the steam at inlet to the turbine is saturated at pressure of 35bar and exhaust pressure is 0.2bar. Determine: 1)the pump work, 2) the turbine work, 3) the Rankine efficiency, 4) the quality of steam at the end of expansion. Assume flow rate of 9.5kg/sec. **Note: use of moiler chart is prohibited.**	D11,D13,JN14	3,7
7	Dry and saturated steam at pressure of 10.5 bar is supplied to a turbine and expanded isentropically to a pressure 0.075 bar. Calculate Thermal efficiency of Rankine cycle.	D09,JN15,MAY12	5,7
8	A steam turbine of a power plant operating on ideal rankine cycle receives steam at 20 bar, 300 ^{0} c at the rate of 3 Kg/s and it exhausts at 0.1 bar. Determine the following (1) Net power output (2) Rankine cycle efficiency	D11,D13,JN14	7

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ASSIGNMENT 7

SUB : ETH (2131905) 3RD SEM

NO	QUESTION	YEAR	MARKS
1	What are the air standard assumptions? State various methods to improve efficiency of Brayton cycle. With suitable diagrams, explain any one of them.	D09	4
2	How actual Brayton cycle differes from the theoretical cycle? Explain with the help of T-S diagram.	D11,JN14	3
3	Compare Otto, diesel and dual cycles on basis of: i)Equal compression ratio and heat input. ii)Constant maximum pressure and heat input. iii)Constant maximum pressure and output. iv)Constant maximum pressure and temperature.	D09,D11, JN13,MAY11	7
4	Draw the Diesel cycle on p -v and T-s diagram. Also derive expression for air standard efficiency with usual notations for the cycle.	D10	5
5	An ideal diesel engine has a diameter 150 mm and stroke 200 mm. The clearance volume is 10% of the swept volume. Determine the compression ratio and air standard efficiency of the engine if cut off takes place at 6% of the stroke.	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7
6	In an I C Engine working with the Otto cycle, the cylinder diameter is 250mm and a stroke is 375mm. If the clearance volume is 0.00263 m 3 , and the initial pressure and temperature are 1bar and 50 0 C, calculate the air standard efficiency and mean effective pressure of the cycle. The maximum cycle pressure is limited to 25bar.	D11,D13,JN14	3,7
7	A closed cycle ideal gas turbine plant operates between temperature limits of 800°C and 30°C and produces a power of 100 kW. The plant is designed such that there is no need for a regenerator. A fuel of calorific 45000 kJ/kg is used. Calculate the mass flow rate of air through the plant and rate of fuel consumption. Assume c p = 1 kJ/kg K and γ = 1.4.	D09,JN15,MAY12	5,7
8	An engine operating on diesel cycle has maximum pressure and temperature of 45 bar and 1500°C. Pressure and temperature at the beginning of compression are 1 bar and 27°C. Determine air standard efficiency of the cycle. Take γ = 1.4 for air.	D11,D13,JN14	7

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ASSIGNMENT 8

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NO	QUESTION	YEAR	MARKS
1	State the Boyle's law, Charle's and Avogadro's law for perfect gas.	D09	4
2	Explain briefly Dalton's law, Gibbs-Dalton law and Amagat's law for perfect gas mixture.	D11,JN14	3
3	Explain in detail Dalton's law of partial pressures.	D09,D11, JN13,MAY11	7
4	What is the Vander waal's equation of state? State its importance and derive it.	D10	5
5	Explain how are the characteristic gas constant, molecular weight and specific heats of a gas mixture computed?	D09, D10,JA13,15,JN14 ,15, MR10,MAY11,MAY 12	4,6,7

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