P P SAVANI UNIVERSITY

Third Semester of Diploma Examination

November 2022

IDCH2050 Chemical Engineering Thermodynamics

30.11.2022, Wednesday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. Make suitable assumptions and draw neat figures wherever required.
2. Use of scientific calculator is allowed.

Q - 1	**Short Question/Fill in the Blanks**	**[05]**	**CO**	**BTL**
(i)	A system which is completely uniform throughout in physical state and chemical composition is called _____.		**4**	**4**
(ii)	List out different types of systems.		**4**	**1**
(iii)	State zeroth law of thermodynamics.		**2**	**1**
(iv)	Write the Van der Waals equation for real gas behavior.		**4**	**1**
(v)	Write equation for work done in isothermal process.		**1**	**2**
Q - 2 (a)	Explain with example: System, Surrounding and Universe.	**[05]**	**1**	**2**
Q - 2 (b)	What do you understand by State function and path function?	**[05]**	**1**	**2**
	OR			
Q - 2 (a)	Explain extensive and intensive properties with example.	**[05]**	**1**	**2**
Q - 2 (b)	The potential energy of a body of mass 25 kg is 4.6 kJ. Find the height of the body from the ground. If the same body is moving with a velocity of 45 m/s, find its kinetic energy.	**[05]**	**4**	**5**
Q - 3 (a)	Explain the equivalence of Kevin Planck and Celsius statement.	**[05]**	**4**	**4**
Q - 3 (b)	Explain Heat Engine along with working fluid.	**[05]**	**4**	**3**
	OR			
Q - 3 (a)	Explain the Carnot cycle and its efficiency.	**[05]**	**4**	**1**
Q - 3 (b)	A small metallic object 5 kg in mass at a temperature of 450 K is thrown into the lake which is at 300 K. Calculate the change in entropy of the universe. Data: C_p of object = 0.50 kJ/(kg.K)	**[05]**	**4**	**5**
Q - 4	**Attempt any one**	**[05]**		
(i)	Derive an equation of first law of thermodynamics for non-flow Process.		**3**	**2**
(ii)	A system undergoes a process 1-2 in which it absorbs 100 kJ energy as heat and does 40 kJ work. Then the system follows the process 2-3 during which 30 kJ is rejected as heat while 50 kJ work is done on it. It is desired to restore the system to the initial state by an adiabatic path. Calculate the work and heat interactions during the adiabatic process.		**3**	**5**
Q - 5	**MCQ**	**[15]**		
(i)	_____ is the branch of science which deals with all forms of energy and the interconversion of different forms of energy. a) Thermodynamics b) Chemical Potential c) Designing d) Energy		**1**	**1**
(ii)	The International System of Units, abbreviated as _____. a) MKS b) FPS c) SI d) CGS		**1**	**1**
(iii)	Primary quantities such as mass are represented by symbol? a) M b) L c) Q d) T		**1**	**1**
(iv)	Newton-meter/second is the unit of _____. a) Pressure b) Energy c) Power d) Force		**1**	**1**
(v)	Prefix – giga represents _____		**1**	**1**

	a) 10^3 b) 10^6 c) 10^9 d) 10^{12}			
(vi)	The unit of force newton, abbreviated as N, has been named after the scientist a) Pascal b) Newton c) Apple d) Delta		1	1
(vii)	1 atm = _____ torr a) 760 b) 101325 c) 1.103 d) 14.7		1	1
(viii)	The combination of a system and its surroundings is _____. a) Boundaries b) universe c) Vessel d) All of the above		1	2
(ix)	A system which can exchange energy but not matter with its surroundings is called? a) Closed System b) Open System c) Isolated System d) Adiabatic System		1	2
(x)	A system in which matter (and energy also) crosses the boundary of the system is called? a) Closed System b) Open System c) Isolated System d) Adiabatic System		1	2
(xi)	A system which can exchange neither matter nor energy through the boundaries with its surroundings is called? a) Closed System b) Open System c) Isolated System d) Adiabatic System		1	2
(xii)	A system which is thermally insulated from its surroundings is called? a) Closed System b) Open System c) Isolated System d) Adiabatic System		1	2
(xiii)	The properties of a system which depend on the mass / amount (quantity) of the system are called? a) Extensive propertie b) Intensive properties c)both of them d) none of them		1	2
(xiv)	The properties of a system which are independent of the mass / amount of the system are called? a) Extensive properties b) Intensive properties c)both of them d) none of them		1	2
(xv)	The energy possessed by a body by virtue of its motion is called a) Kinetic energy b) potential energy c) internal energy d) total energy		1	2
Q - 6	Define Pressure, Work and Power with SI Unit in details.	[05]	4	1
Q - 7	Explain Closed and Open system with example.	[05]	1	1
Q - 8	A man weighs 600 N on the earth's surface where the gravitational acceleration is 9.81 m/s^2. Calculate the weight of the man on the moon where the gravitational acceleration is 1.67 m/s^2.	[05]	3	5

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create