A   Reg. No. : | | | | | | | | | | | |

Question Paper Code: U4A02

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth semester

Agriculture Engineering

21UAG402-FUNDAMENTALS OF THERMODYNAMICS FOR AGRICULTURE ENGINEERING

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which of the following is not a branch of thermodynamics?   CO1 -U

   (a)Classical   (b)Biological   (c)Chemical   (d) Equilibrium

2. The thermodynamic system characterized by energy transfer but not   CO1-U
   mass transfer is known as

   a)Continuous system   b)Closed system   a)Continuous system   b)Closed system

3. Which of the following possesses greatest degree of entropy?   CO2 -U

   (a)Gases   (b)Liquids   (c)Solids   (d) Semi-solids

4. Increase in regularity of a thermodynamic system results in   CO2 -U

   a)Constant entropy   b)Decreased   a)Constant entropy   b)Decreased
                         entropy   entropy

5. The state from which change of phase of a pure substance occurs without a   CO3-U
   change in pressure or temperature is called

   (a)Critical state   (b)Saturation state   (c)Supercritical state   (d)Triple point state

6. Conversion of solid into liquid occurs by absorption of   CO1-U

   (a) Latent heat of vaporization   (b) Latent heat of fission

   (c) Latent heat of fusion   (d) All the above

7. The heat supplied during warming stage of steam production is   CO1-U

a)Latent heat   b)Sensible heat   a)Latent heat   b)Sensible heat

8. Identify the equation indicated by the expression, pv = n RT   CO1-U

    (a) Real gas equation   (b) Ideal gas equation

    (c) Van der waal's equation   (d) Maxwell's equation

9. What are the major components of dry air?   CO1-U

    (a) Ozone & Xenon   (b) Oxygen & Nitrogen

    (c) Argon & Neon   (d) Krypton & Helium

10. Which of the following is not a parameter involved in psychrometric   CO5-U
charts?

    a) Dry bulb & wet bulb temperatures   b) Volume & enthalpy of the mixture

    c) Relative humidity   d) Pressure

<center>PART – B (5 x 2= 10Marks)</center>

11. State the principle of conservation of energy.   CO1-U

12. A carnot engine absorbs 500 J of heat from a reservoir at the temperature of   CO2- App
the normal boiling point of water and rejects heat to a reservoir at the
temperature of triple point of water. Find the heat rejected, the work done by
the engine and the thermal efficiency.

13. Distinguish between saturated solid state and saturated vapour state.   CO1- U

14. Five moles of helium gas fills up an empty balloon to a volume of 6.5 litres.   CO2-App
What would be the volume of the balloon if an additional 8.5 moles of helium
gas is added? (Assume that the temperature and the pressure are kept
constant)

15. What is dry air? Mention the composition and properties of dry air.   CO5-U

<center>PART – C (5 x 16= 80Marks)</center>

16. (a) Explain the different thermodynamic states and processes.   CO1-U   (16)
<center>Or</center>
    (b) Discuss the laws of thermodynamics with suitable examples.   CO1-U   (16)

17. (a) A cyclic heat engine operates between a source temperature of   CO2-App   (16)
       1200°C and a sink temperature of 50degree. What is the least rate
       of heat rejection per kW net output of the engine?

    (b) A carnot engine converts one fifth of the heat input into work. If   CO2-App   (16)
       the sink temperature is reduced by 80 degree, the efficiency gets

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doubled. Find the source and the sink temperature. Calculate the net efficiency of the heat engine. Provide the consequences of carnot cycle.

18. (a) Diagrammatically illustrate the P – V relationship of a pure substance   CO1-U   (16)

Or

   (b) Compute the work done in various flow and non-flow thermodynamic processes   CO1-U   (16)

19. (a) Describe the various stages involved in the process of steam formation.   CO1- U   (16)

Or

   (b) State and derive Van der waal's equation of state.   CO2 -App   (16)

20. (a) Outline the important features of psychrometric charts.   CO1 -U   (16)

Or

   (b) Discuss the applications of sensible heat as a mode of heat exchange.   CO1- U   (16)

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