

Program: BE Mechanical Engineering

Curriculum scheme: Revised 2019

Examination: Second Year Semester III

Course Name: Thermodynamics

Sample Paper

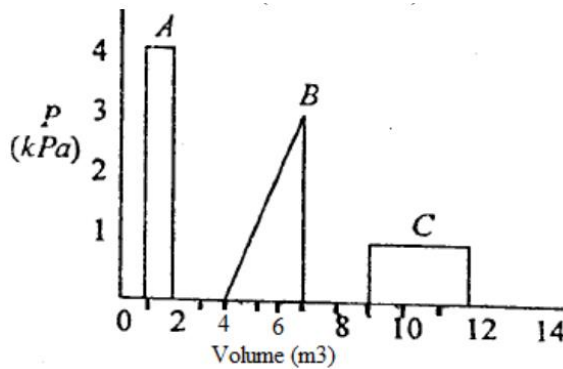
1.	<p>Heat is?</p> <p>A. Point function, inexact differential</p> <p>B. Point function, exact differential</p> <p>C. Path function, inexact differential</p> <p>D. Path function, exact differential</p> <p>Answer: C</p>
2.	<p>A gas contained in a cylinder is compressed, the work required for compression being 5000KJ. During this process, heat interaction of 2000KJ causes the surroundings to be heated. The changes in internal energy of the gas during the process is</p> <p>A. -7000KJ</p> <p>B. +7000KJ</p> <p>C. -3000KJ</p> <p>D. +3000KJ</p> <p>Answer: D</p>
3.	<p>A gas undergoes a reversible non flow process according to relation $P = (-3V + 15)$ where V is volume in m^3 and P is the pressure in bar. Determine work done (in KJ) when the volume changes from 3 to 6 m^3.</p> <p>A. 4.5</p> <p>B. 450</p> <p>C. 45</p> <p>D. 0.45</p> <p>Answer: B</p>
4.	<p>When heat is added at higher temperature then in comparison to same heat added at lower temperature; heat transfer at higher temperature will have _____availability and _____ change in entropy.</p> <p>A. higher,lower</p>

	<p>B. lower,higher</p> <p>C. zero,same</p> <p>D. same,zero</p> <p>Answer: A</p>
5.	<p>Change of entropy of universe is always?</p> <p>A. $(\Delta S)_{Univ} \leq 0$</p> <p>B. $(\Delta S)_{Univ} \geq 0$</p> <p>C. $(\Delta S)_{Univ} = 0$</p> <p>D. $(\Delta S)_{Univ} < 0$</p> <p>Answer: B</p>
6.	<p>In Rankine cycle enthalpy at turbine inlet is 3470 KJ/Kg, enthalpy at turbine outlet is 2030 KJ/Kg, enthalpy at pump inlet is 151.5 KJ/Kg, enthalpy at pump outlet is 165.58 KJ/Kg. Net shaft work and pump work are _____KJ/Kg and _____KJ/Kg respectively.</p> <p>A. 1440,15.08</p> <p>B. 1440,14.08</p> <p>C. 1425.92,14.08</p> <p>D. 1425.92,15.08</p> <p>Answer: C</p>
7.	<p>Calculate efficiency of Diesel cycle if cut off ratio is 1.78 and compression ratio is 14.</p> <p>A. 60.43</p> <p>B. 71.06</p> <p>C. 28.56</p> <p>D. 42.19</p> <p>Answer: A</p>
8.	<p>Net heat transfer is 107.54 KJ/Kg, mass=0.0292 Kg,stroke volume is 0.02365 cubic metre. Calculate mean effective pressure</p> <p>A. 132.77 KPa</p> <p>B. 1.32 KPa</p> <p>C. 4547.14 KPa</p> <p>D. 4.54 KPa</p> <p>Answer: A</p>
9.	<p>If compression ratio is 8 calculate efficiency of otto cycle</p> <p>A. 56.47</p>

B. 94.55
 C. 87.5
 D. 44.79
 Answer: A

10. Lenoir cycle consists of
 A. constant pressure heat addition, constant volume heat rejection, isothermal expansion
 B. constant pressure heat addition, constant volume heat rejection, isentropic expansion
 C. constant volume heat addition, constant pressure heat rejection, isentropic expansion
 D. constant volume heat addition, constant pressure heat rejection, isothermal expansion
 Answer: C

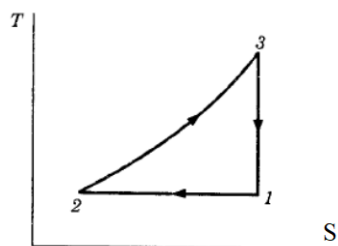
11. Which one of the following is the correct sequence of the three cycles A, B and C in the increasing order of the amount of work done by a gas following ideal-gas expansions?



- A. A-B-C
- B. B-A-C
- C. A-C-B
- D. C-A-B

Answer: D

12. An ideal air standard cycle is shown on T-s diagram



Select the appropriate P-v diagram for same cycle.

	<p>Answer: a</p>
13.	<p>A cyclic heat engine receives 600 KJ of heat from a 1000 K source and rejects 450 KJ to a 300 K sink. The quantity $\oint \frac{dQ}{T}$ and efficiency of the engine are respectively</p> <p>A. -0.9 KJ/K and 25 % B. 2.1 KJ/K and 70% C. +0.9 KJ/K and 70% D. -2.1 KJ/K and 25%</p> <p>Answer: A</p>
14.	<p>A Carnot engine operates between 330°C and 30°C. If the engine produces 300 KJ of work, determine the entropy change during heat addition?</p> <p>A. 0.5 KJ/K B. 1 KJ/K C. 1.5 KJ/K D. 2 KJ/K</p> <p>Answer: B</p>
15.	<p>Compression ratio of a reciprocating engine is defined as the ratio of</p> <p>A. maximum to minimum pressure B. maximum to minimum volume C. maximum to minimum temperature D. expansion to compression work</p> <p>Answer: B</p>
16.	<p>A tube, with the diverging section in the direction of flow, can be used as</p> <p>1. Supersonic nozzle 2. Subsonic nozzle 3. Supersonic diffuser 4. Subsonic diffuser</p> <p>A. 1 alone B. 2 alone C. 1 and 4 D. 2 and 3</p> <p>Answer: C</p>

17. A convergent-divergent nozzle is used when the discharge pressure is

- A. less than the critical pressure
- B. equal to the critical pressure
- C. more than the critical pressure
- D. none of the these

Answer: A

18. An Otto cycle is characterized by

- A. isochoric heat addition and isochoric heat rejection
- B. isobaric heat addition and isochoric heat rejection
- C. isochoric heat addition and isobaric heat rejection
- D. isobaric heat addition and isobaric heat rejection

Answer: A

19. In an air-standard Otto cycle, the compression ratio is 10. The condition at the beginning of the compression process is 100 kPa and 27°C. Heat added at constant volume is 1600 kJ/kg, while 700 kJ/kg of heat is rejected during the other constant volume process in the cycle. Specific gas constant for air = 0.287 kJ/kgK. The mean effective pressure (in kPa) of the cycle is

- A. 1161
- B. 310
- C. 515
- D. 1032

Answer: A

20. Consider phase diagram of a certain substance as shown in given figure. Match list I (process) with list II (curves/lines)

The diagram shows a Pressure-Temperature phase diagram. The vertical axis is labeled 'Pressure' and the horizontal axis is labeled 'Temperature'. There are three curves originating from point F: a vertical curve EG, a curve ED, and a curve EF. The curve EF is the steepest, followed by ED, and then EG.

List-I (Process)	List-II (Curves/lines)
A. Vaporization	1. EF
B. Fusion	2. EG
C. Sublimation	3. ED

A. A3,B2,C1

	<p>B. A3,B1,C2</p> <p>C. A2,B3,C1</p> <p>D. A1,B2,C3</p> <p>Answer: A</p>										
21.	<p>Steam enters an adiabatic turbine operating at steady state with an enthalpy of 3251.0 kJ/kg and leaves as a saturated mixture at 15 kPa with quality (dryness fraction) 0.9. The enthalpies of the saturated liquid and vapour at 15 kPa are $h_f = 225.94$ kJ/kg and $h_g = 2598.3$ kJ/kg respectively. The mass flow rate of steam is 10 kg/s. Kinetic and potential energy changes are negligible. The power output of the turbine in MW is</p> <p>A. 6.5</p> <p>B. 8.9</p> <p>C. 9.1</p> <p>D. 27</p> <p>Answer: B</p>										
22.	<table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: center;">List I</th> <th style="text-align: center;">List II</th> </tr> </thead> <tbody> <tr> <td>A. Critical point</td> <td>1. All the three phases - solid, liquid and vapour co-exists in equilibrium</td> </tr> <tr> <td>B. Sublimation</td> <td>2. Phase change from solid to liquid</td> </tr> <tr> <td>C. Triple point</td> <td>3. Properties of saturated liquid and saturated vapour are identical</td> </tr> <tr> <td>D. Melting</td> <td>4. Heating process where solid gets directly transformed to gaseous phase</td> </tr> </tbody> </table> <p>A. A2,B1,C4,D3</p> <p>B. A3,B4,C1,D2</p> <p>C. A2,B4,C1,D3</p> <p>D. A3,B1,C4,D2</p> <p>Answer: B</p>	List I	List II	A. Critical point	1. All the three phases - solid, liquid and vapour co-exists in equilibrium	B. Sublimation	2. Phase change from solid to liquid	C. Triple point	3. Properties of saturated liquid and saturated vapour are identical	D. Melting	4. Heating process where solid gets directly transformed to gaseous phase
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23.	<p>The region outside the Mach cone is called</p> <p>A. zone of action</p> <p>B. zone of silence</p> <p>C. control volume</p> <p>D. none of the mentioned</p> <p>Answer: B</p>										
24.	<p>An airplane is flying at an altitude where the pressure is 30 kPa (absolute) and the density is 0.3 kg/m³. If the plane has attained a Mach number of 1.8, what is the speed of plane in km/hr?</p>										

	<p>A. 76.67</p> <p>B. 673.49</p> <p>C. 2424.59</p> <p>D. 1709.88</p> <p>Answer: C</p>
25.	<p>Among the followings, which one is not a consequence of irreversible expansion in a Rankine cycle?</p> <p>A. reduction in cycle efficiency</p> <p>B. increase in turbine exit quality</p> <p>C. increase in pump work</p> <p>D. increase in heat rejection at condenser</p> <p>Answer: C</p>