National Testing Agency

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Thermodynamics and its Application

Group Number :   1

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Thermodynamics and its Application -1

Section Id :   940918185

Section Number :   1

Section type :   Online

Mandatory or Optional :   Mandatory

Number of Questions :	50
Number of Questions to be attempted :	50
Section Marks :	100
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	940918250
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 9409188591 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Heat transferred to a closed stationary system at constant volume is equal to

1. Work transfer
2. Increase in internal energy
3. Increase in enthalpy
4. Increase in Gibbs function

Options :

94091832337. 1

94091832338. 2

94091832339. 3

94091832340. 4

Question Number : 2 Question Id : 9409188592 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following is the extensive property of a thermodynamic system?

1. Pressure
2. Volume
3. Temperature
4. Density

Options :

94091832341. 1

94091832342. 2

94091832343. 3

94091832344. 4

Question Number : 3 Question Id : 9409188593 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

During throttling process

1. internal energy does not change
2. pressure does not change
3. entropy does not change
4. enthalpy does not change

Options :

94091832345. 1

94091832346. 2

94091832347. 3

94091832348. 4

Question Number : 4 Question Id : 9409188594 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The cyclic integral of this is zero

1. Temperature
2. Work transfer
3. Heat transfer
4. Latent heat

Options :

94091832349. 1

94091832350. 2

94091832351. 3

94091832352. 4

Question Number : 5 Question Id : 9409188595 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

An isentropic process

1. is always reversible
2. is always adiabatic
3. need not be adiabatic or reversible
4. is always frictionless

Options :

94091832353. 1

94091832354. 2

94091832355. 3

94091832356. 4

Question Number : 6 Question Id : 9409188596 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A Carnot engine rejects heat to a cooling pond at 27°C. The heat rejected to the pond is 840 kJ/min. If the efficiency of the engine is 30%. Find the power of the engine .

1. 5 kW
2. 6 kW
3. 6.5 kW
4. 7 kW

Options :

94091832357. 1

94091832358. 2

94091832359. 3

94091832360. 4

Question Number : 7 Question Id : 9409188597 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A domestic food freezer maintains a temperature of -15^{0}C. The ambient air temperature is 30^{0}C. If heat leak into the freezer at the continuous ratio of 1.75 kJ/s, what is the minimum power required to pump this heat out continuously?

1. 0.105 kW
2. 0.305 kW
3. 0.4 kW
4. 0.35 kW

Options :

94091832361. 1

94091832362. 2

94091832363. 3

94091832364. 4

Question Number : 8 Question Id : 9409188598 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The efficiency of a Carnot engine is given as 0.75. If the cycle direction is reversed, what will be the value of COP of reversed Carnot Cycle?

1. 0.75
2. 1.33
3. 0.33
4. 0.25

Options :

94091832365. 1

94091832366. 2

94091832367. 3

94091832368. 4

Question Number : 9 Question Id : 9409188599 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The isentropic efficiency of a turbine is defined as the ratio of

1. $\dfrac{\text{Actual Work output}}{\text{Isentropic work output}}$

2. $\dfrac{\text{Isentropic Work output}}{\text{Actual work output}}$

3. $\dfrac{\text{Actual Work output}}{\text{Isentropic work input}}$

4. $\dfrac{\text{Isentropic Work input}}{\text{Actual work input}}$

Options :

94091832369. 1

94091832370. 2

94091832371. 3

94091832372. 4

Question Number : 10 Question Id : 9409188600 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Performance of an ideal cycle power plant pertains to

1. Work output
2. Efficiency
3. Specific fuel consumption
4. All the above

Options :

94091832373. 1

94091832374. 2

94091832375. 3

94091832376. 4

Question Number : 11 Question Id : 9409188601 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The thermal efficiency of Regenerative Cycle is

1. Always greater than simple Rankine thermal Efficiency
2. Greater than simple Rankine thermal Efficiency only when steam is boiled at particular pressure
3. Same as simple Rankine cycle thermal Efficiency
4. Always less than simple Rankine thermal Efficiency

Options :

94091832377. 1

94091832378. 2

94091832379. 3

94091832380. 4

Question Number : 12 Question Id : 9409188602 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The clearance volume in reciprocating air compressors is provided

1. To reduce the work done per kg of air delivered
2. To increase the volumetric efficiency of the compressor
3. To accommodate valves in the head of the compressor
4. To create turbulence in the air to be delivered

Options :

94091832381. 1

94091832382. 2

94091832383. 3

94091832384. 4

Question Number : 13 Question Id : 9409188603 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The following is not a component of Thermal Power Plant

1. Condenser
2. Cooling Tower
3. Turbine
4. Fuel tank

Options :

94091832385. 1

94091832386. 2

94091832387. 3

94091832388. 4

Question Number : 14 Question Id : 9409188604 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a vapour compression system, the working find is superheated vapour at entrance to

1. Evaporator
2. Condenser
3. Compressor
4. Expansion valve

Options :

94091832389. 1

94091832390. 2

94091832391. 3

94091832392. 4

Question Number : 15 Question Id : 9409188605 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Vapour absorption refrigeration system works using the

1. Ability of a substance to get easily condensed or evaporated
2. Ability of a vapour to get compressed or expanded
3. Affinity of a substance for another substance
4. Absorptivity of a substance.

Options :

94091832393. 1

94091832394. 2

94091832395. 3

94091832396. 4

Question Number : 16 Question Id : 9409188606 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In which of the following situation the entropy change will be negative?

1. Air expands isothermally from 6 bars to 3 bars
2. Air is compressed to half the volumes at constant pressure
3. Heat is supplied to air at constant volume till the pressure becomes three folds
4. Air expands isentropically from 6 bars to 3 bars

Options :

94091832397. 1

94091832398. 2

94091832399. 3

94091832400. 4

Question Number : 17 Question Id : 9409188607 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Pressure reaches a value of absolute zero

1. At a temperature of -273 K
2. Under vacuum condition
3. At the earth's centre
4. When molecular momentum of system becomes zero

Options :

94091832401. 1

94091832402. 2

94091832403. 3

94091832404. 4

Question Number : 18 Question Id : 9409188608 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

For a simple closed system of constant composition, the difference between the net heat and work interactions is identifiable as the change in

1. Enthalpy
2. Entropy
3. Flow Energy
4. Internal Energy

Options :

94091832405. 1

94091832406. 2

94091832407. 3

94091832408. 4

Question Number : 19 Question Id : 9409188609 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a heat engine operating in a cycle between a source temperature of 606ºC and a sink temperature of 20ºC, what will be the least rate of heat rejection per kW net output of the engine?

1. 0.50 kW
2. 0.667 kW
3. 1.5 kW
4. 0.0341 kW

Options :

94091832409. 1

94091832410. 2

94091832411. 3

94091832412. 4

Question Number : 20 Question Id : 9409188610 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Change in internal energy in a reversible process occurring in a closed system is equal to the heat transferred if the process occurs at constant

1. Pressure
2. Volume
3. Temperature
4. Enthalpy

Options :

94091832413. 1

94091832414. 2

94091832415. 3

94091832416. 4

Question Number : 21 Question Id : 9409188611 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A Carnot engine operates between 27°C and 327°C. If the engine produces 300 kJ of work, what is the entropy change during heat addition?

1. 0.5 kJ/K
2. 1.0 kJ/K
3. 1.5 kJ/K
4. 2.0 kJ/K

Options :

94091832417. 1

94091832418. 2

94091832419. 3

94091832420. 4

Question Number : 22 Question Id : 9409188612 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following are intensive properties?

a. Kinetic Energy

b. Thermal conductivity

c. Pressure

d. Entropy

1. a and b only
2. b and c only
3. b, c and d only
4. a, c and d only

Options :

94091832421. 1

94091832422. 2

94091832423. 3

94091832424. 4

Question Number : 23 Question Id : 9409188613 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which one of the following is correct? The cyclic integral of (Q - W) for a process is

1. Positive
2. Negative
3. Zero
4. Unpredictable

Options :

94091832425. 1

94091832426. 2

94091832427. 3

94091832428. 4

Question Number : 24 Question Id : 9409188614 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A refrigerator operates on Reversed Carrot cycle. What is the power required to drive the refrigerator between temperatures of 43°C and 4°C. If heat at the rate of 2 kg/s is extracted from the low temperature region?

1. 0.174 Kw
2. 0.374 Kw
3. 0.274 Kw
4. 0.474 Kw

Options :

94091832429. 1

94091832430. 2

94091832431. 3

94091832432. 4

Question Number : 25 Question Id : 9409188615 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which one of the following is correct? At critical point the enthalpy of vaporization is

1. Dependent on temperature only
2. Maximum
3. Minimum
4. Zero

Options :

94091832433. 1

94091832434. 2

94091832435. 3

94091832436. 4

Question Number : 26 Question Id : 9409188616 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Measurement of temperature is based on which law of thermodynamics?

1. Zeroth law of thermodynamics
2. First law of thermodynamics
3. Second law of thermodynamics
4. Third law of thermodynamics

Options :

94091832437. 1

94091832438. 2

94091832439. 3

94091832440. 4

Question Number : 27 Question Id : 9409188617 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A series combination of two Carnot's engines operate between the temperatures of 180ºC and 20ºC. If the engines produce equal amount of work, then what is the intermediate temperature?

1. 80ºC
2. 90 ºC
3. 100 ºC
4. 110 ºC

Options :

94091832441. 1

94091832442. 2

94091832443. 3

94091832444. 4

Question Number : 28 Question Id : 9409188618 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

0.70 kg/s of air enters with a specific enthalpy of 290 kJ and leaves it with 450 kJ of specific enthalpy. Velocities at inlet and exit are 6 m/s and 2 m/s respectively. Assuming adiabatic process, what is power input to the compressor?

1. 120 kW
2. 118 kW
3. 115 kW
4. 112 kW

Options :

94091832445. 1

94091832446. 2

94091832447. 3

94091832448. 4

Question Number : 29 Question Id : 9409188619 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The thermal efficiency of a Carnot heat engine is 30 %. If the engine is reversed inoperation to work as heat pump with operating conditions unchanged, then what will be the COP for heat pump?

1. 0.30
2. 2.33
3. 3.33
4. Cannot be calculated

Options :

94091832449. 1

94091832450. 2

94091832451. 3

94091832452. 4

Question Number : 30 Question Id : 9409188620 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A Carnot engine rejects 30 % of absorbed heat to a sink at 30°C. The temperature of the heat source is

1. 100°C
2. 433 °C
3. 737 °C
4. 1010 °C

Options :

94091832453. 1

94091832454. 2

94091832455. 3

94091832456. 4

Question Number : 31 Question Id : 9409188621 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Hot coffee stored in a well insulated thermos flask is an example of

1. Isolated system
2. Closed system
3. Open system
4. Non-flow diabatic system

Options :

94091832457. 1

94091832458. 2

94091832459. 3

94091832460. 4

Question Number : 32 Question Id : 9409188622 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The working temperature in the evaporator and condenser coils of a refrigerator are

-30ºC and 32ºC respectively. If the actual refrigerator has a COP of 0.75 of the maximum, the required power input for a refrigerating effect of 5 kW is, nearly,

1. 1.7 kW
2. 2.94 kW
3. 3.92 kW
4. 4.0 kW

Options :

94091832461. 1

94091832462. 2

94091832463. 3

94091832464. 4

Question Number : 33 Question Id : 9409188623 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Experimental measurements on a refrigeration system indicate that rate of heat extraction by the evaporator, rate of heat rejection in the condenser and rate of heat rejection by the compressor body to environment are 70 kW, 90 kW and 5 kW respectively. The power input (in kW) required to operate the system is

1. 15
2. 20
3. 25
4. 75

Options :

94091832465. 1

94091832466. 2

94091832467. 3

94091832468. 4

Question Number : 34 Question Id : 9409188624 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A refrigerator working on a reversed Carnot cycle has a COP of 4. If it works as a heat pump and consumes 1 kW, the heating effect will be

1. 1 kW
2. 4 kW
3. 5 kW
4. 6 kW

Options :

94091832469. 1

94091832470. 2

94091832471. 3

94091832472. 4

Question Number : 35 Question Id : 9409188625 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a vapour compression refrigeration system, the compressor capacity is 2100 kJ/minute and heat rejection factor is 1.2. What will, respectively be the heat rejected from the condenser and C.O.P.?

1. 5040 kJ/minute and 5
2. 2520 kJ/minute and 5
3. 2520 kJ/minute and 4
4. 5040 kJ/minute and 4

Options :

94091832473. 1

94091832474. 2

94091832475. 3

94091832476. 4

Question Number : 36 Question Id : 9409188626 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A refrigerator works on reversed Carnot cycle producing a temperature of -40°C. Work done per TR is 700 kJ per ten minutes. What is the value of its COP ?

1. 3
2. 4.5
3. 5.8
4. 7.0

Options :

94091832477. 1

94091832478. 2

94091832479. 3

94091832480. 4

Question Number : 37 Question Id : 9409188627 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A reversed Carnot cycle working as a heat pump has a COP of 7. What is the ratio of minimum to maximum absolute temperatures?

1. $\dfrac{7}{8}$

2. $\dfrac{1}{6}$

3. $\dfrac{6}{7}$

4. $\dfrac{1}{7}$

Options :

94091832481. 1

94091832482. 2

94091832483. 3

94091832484. 4

Question Number : 38 Question Id : 9409188628 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In vapour compression refrigeration system, at entrance to which component the working fluid is superheated vapour?

1. Evaporator
2. Condenser
3. Compressor
4. Expansion valve

Options :

94091832485. 1

94091832486. 2

94091832487. 3

94091832488. 4

Question Number : 39 Question Id : 9409188629 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A Carnot heat pump works between temperature limits of 277°C and 27°C. Its COP is

1. 1.108
2. 1.2
3. 2.2
4. 9.26

Options :

94091832489. 1

94091832490. 2

94091832491. 3

94091832492. 4

Question Number : 40 Question Id : 9409188630 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The efficiency of Rankine cycle is lower than the corresponding Carnot cycle because

1. The average temperature at which heat is supplied in Rankine cycle is lower than corresponding Carnot cycle
2. The Carnot cycle has gas as working substance and Rankine cycle has steam as working substance
3. The Rankine cycle efficiency depends upon properties of the working substance whereas Carnot cycle efficiency is independent of the properties of working substance
4. The temperature range of Carnot cycle is greater than that for Rankine cycle

Options :

94091832493. 1

94091832494. 2

94091832495. 3

94091832496. 4

Question Number : 41 Question Id : 9409188631 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Select the correct codes. The correct sequence of processes in a Rankine cycle is

I. Constant pressure heat addition

II. Adiabatic compression

III. Adiabatic expansion

IV. Constant pressure heat rejection

1. I II III IV
2. II I IV III
3. II I III IV
4. I II IV III

Options :

94091832497. 1

94091832498. 2

94091832499. 3

94091832500. 4

Question Number : 42 Question Id : 9409188632 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Mark the correct statement.

1. Pressure and temperature are independent during phase change.
2. An isothermal line is also a constant pressure like in the wet region.
3. Entropy decreases during evaporation.
4. The term dryness fraction is used to specify the fraction by mass of liquid in a mixture of liquid and vapour.

Options :

94091832501. 1

94091832502. 2

94091832503. 3

94091832504. 4

Question Number : 43 Question Id : 9409188633 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which relation is correct?

1. $(COP)_{HP} = (COP)_R + 1$
2. $(COP)_{HP} = (COP)_R - 1$
3. $\frac{(COP)_{HP}}{(COP)_R} = 1$
4. $(COP)_{HP} < (COP)_R$

Options :

94091832505. 1

94091832506. 2

94091832507. 3

94091832508. 4

Question Number : 44 Question Id : 9409188634 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A condenser of a refrigeration system rejects heat at the rate of 120 kW, while its compressor consumes a power of 30 kW. The coefficient of perfomance of the system would be

1. $\frac{1}{4}$
2. $\frac{1}{3}$
3. 3
4. 4

Options :

94091832509. 1

94091832510. 2

94091832511. 3

94091832512. 4

Question Number : 45 Question Id : 9409188635 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The refrigerant used for absorption refrigerators working heat from solar collectors is nature of water and

1. Carbon dioxide
2. Sulphur dioxide
3. Lithium bromide
4. Freon 12

Options :

94091832513. 1

94091832514. 2

94091832515. 3

94091832516. 4

Question Number : 46 Question Id : 9409188636 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The leakage in a Freon-based refrigeration system is detected by using a/an

1. Oxy-acety line torch
2. Halide torch
3. Sulphur torch
4. Blue litmus paper

Options :

94091832517. 1

94091832518. 2

94091832519. 3

94091832520. 4

Question Number : 47 Question Id : 9409188637 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Air enters an adiabatic nozzle at 300 kPa, 500 K with a velocity of 10 m/s. It leaves the nozzle at 100 kPa with a velocity of 180 m/s. The inlet area is 80 cm^2. The specific heat of air C_p is 1008 J/kg K. The exit temperature of the air is

1. 516 K
2. 532 K
3. 484 K
4. 468 K

Options :

94091832521. 1

94091832522. 2

94091832523. 3

94091832524. 4

Question Number : 48 Question Id : 9409188638 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A gas contained in a cylinder is compressed, the work required for compression being 5000 kJ. During the process, heat interaction of 2000 kJ causes the surroundings to be heated. The changes in internal energy of the gas during the process is

1. -7000 kJ
2. -3000 kJ
3. +3000 kJ
4. +7000 kJ

Options :

94091832525. 1

94091832526. 2

94091832527. 3

94091832528. 4

Question Number : 49 Question Id : 9409188639 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

If a reciprocating pump having a mechanical efficiency of 80% delivers water at the rate of 80 kg/s with a head of 30 m, the brake power of the pump is

1. 29.4 kW
2. 20.8 kW
3. 15.4 kW
4. 10.8 kW

Options :

94091832529. 1

94091832530. 2

94091832531. 3

94091832532. 4

Question Number : 50 Question Id : 9409188640 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a two-stage compressor with ideal intercooling, for the work requirement to be minimum, the intermediate pressure p_i in terms of condenser and evaporator pressure p_c and p_e respectively is

1. $p_i = p_c p_e$
2. $p_i = \sqrt{p_c p_e}$
3. $p_i = \sqrt{p_c / p_e}$
4. $p_i = p_c / p_e$

Options :

94091832533. 1

94091832534. 2

94091832535. 3

94091832536. 4