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**3rd Sem / Branch : Mech/ Prod,GE,CAD/CAM,CNC,  
Mettallurgy,Print Making Tech.,Mech (Ad.Manu.Tech),  
Mech Engg (Fabrication Tech)**

**Subject:- Thermodynamics-I/Thermodynamics/**

Time : 3Hrs.

**Pr. of Therm. Engg.**

M.M. : 100

### SECTION-A

**Note:** Multiple choice questions. All questions are compulsory  
(10x1=10)

- Q.1 Which of the following variables controls the physical properties of a perfect gas  
a) Pressure                      b) Temperature  
c) Volume                        d) All of the above
- Q.2 Which of the following laws is applicable for the behaviour of a perfect gas.  
a) Boyle's law                      b) Charle's law  
c) Gay-Lussac law                      d) All of the above
- Q.3 According to Gay-Lussac law for a perfect gas, the absolute pressure of given mass varies directly as  
a) Absolute temperature  
b) Absolute temperature, if volume is kept constant  
c) Volume, if temperature is kept constant  
d) Remains constant, if volume and temperature are kept constant
- Q.4 Which of the following statements is correct, in case of adiabatic expansion?  
a)  $\Delta U=0$                       b)  $\Delta U=\text{negative}$   
c)  $\Delta U=\text{positive}$                       d)  $\Delta W=0$
- Q.5 An ideal gas as compared to a real gas at very high pressure occupies

- a) More volume  
b) Less volume  
c) Same volume  
d) Unpredictable behaviour

- Q.6 General gas equation is  
a)  $PV=nRT$                       b)  $PV=mRT$   
c)  $PV=C$                       d)  $C_p-C_v=W_1$
- Q.7 Steam coming out of the whistle of the pressure cooker is mostly  
a) Wet vapour  
b) Dry saturated vapour  
c) Super heated vapour  
d) Very wet vapour with dryness fraction less than 0.5
- Q.8 The device which increases the temperature of saturated steam without raising its pressure is known as  
a) Superheater                      b) Economiser  
c) Air preheater                      d) Duplex pump
- Q.9 The efficiency of a carnot engine operating with reservoir temperatures of  $100^\circ\text{C}$  and  $-23^\circ\text{C}$  will be  
a) 33                      b) 67  
c) 40                      d) 60
- Q.10 The efficiency of air at the beginning of compression stroke is \_\_\_\_\_ atmospheric pressure  
a) Less than                      b) Equal to  
c) More than                      d) Unpredictable to

### SECTION-B

**Note:** Objective type questions. All questions are compulsory.  
(10x1=10)

- Q.11 Temperature is a \_\_\_\_\_ Property  
Q.12 Work done in a free expansion process is \_\_\_\_\_  
Q.13 Gas laws are applicable to \_\_\_\_\_ gases  
Q.14 Babcock and Wilcox boiler is a \_\_\_\_\_ tube boiler

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- Q.15 Second law of thermodynamics defines \_\_\_\_\_  
 Q.16 The value of Molar Gas constant is \_\_\_\_\_  
 Q.17 Diesel Cycle consists of following four processes \_\_\_\_  
 Q.18 Triple point of water exists at \_\_\_\_\_ temperature and \_\_\_\_\_ pressure.  
 Q.19 In Throttling process \_\_\_\_\_ is constant.  
 Q.20 The three modes of heat transfer are \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

### SECTION-C

**Note:** Short answer type questions. Attempt any twelve questions out of fifteen questions. (12x5=60)

- Q.21 Explain the following terms  
 a) Open system                      b) Closed system  
 Q.22 Explain universal gas constant.  
 Q.23 A closed vessel contains 2 kg of  $\text{CO}_2$  at  $T_1 = 20^\circ\text{C}$  and  $P_1 = 0.7$  bar, Heat is supplied to the vessel till the gas acquires a pressure of  $P_2 = 1.4$  bar find:  
 a) Find temperature of gas  
 b) Work done  
 c) Heat absorbed  
 Take  $C = 0.66$  kJ/kg K for  $\text{CO}_2$   
 Q.24 Briefly explain applications of general steady flow equation for a nozzle.  
 Q.25 What is Kelvin Planck statement and Clausius statement?  
 Q.26 Differentiate between Molar gas constant and Ideal gas constant.  
 Q.27 Derive general gas equation.  
 Q.28 Find the entropy of 1 kg dry saturated steam at a pressure of 5.2 bar. The boiling point of water at this pressure is given as  $152.6^\circ\text{C}$  and its total heat at this temperature is 2110 kJ/kg.  
 Q.29 Write a short note on Mollier diagram.  
 Q.30 Compare a fire tube boiler with a water tube boiler.

- Q.31 Briefly explain steam injector with the help of neat sketch.  
 Q.32 For same compression ratio Otto cycle is more efficient than Diesel cycle, explain  
 Q.33 Briefly explain the Carnot cycle with the help of its P-V diagram.  
 Q.34 A compressor is used to compress air from a pressure of 1.013 bar to 7.21 bar. The compression follows the law  $PV^{1.35} = \text{Constant}$ . The clearance volume of compressor is  $200 \times 10^{-6} \text{ m}^3$ . If the volumetric efficiency of compressor is 80% and the stroke is 250 mm, find the cylinder diameter of compressor.  
 Q.35 Compare a reciprocating air compressor with a rotary compressor.

### SECTION-D

**Note:** Long answer type questions. Attempt any two questions out of three questions. (2x10=20)

- Q.36 Derive an expression for work done during an adiabatic process.  
 Q.37 A vessel of capacity  $4 \text{ m}^3$  has 16 kg of an ideal gas having molecular mass of 44 at a temperature of  $25^\circ\text{C}$ . Find the pressure of the gas in bar.  
 Q.38 Explain construction and working of Nestler boiler with the help of neat sketch.

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