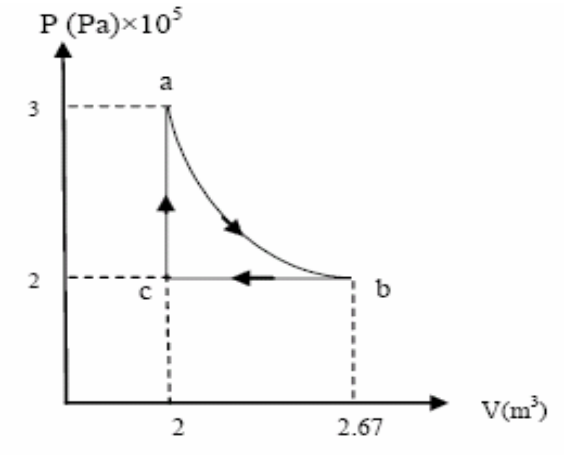
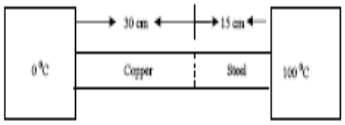
Chapter 18

Q#1. Consider one mole of a monatomic gas taken through the cycle shown in the figure. Find the change in internal energy of the system for the adiabatic process a → b. **(Ans: –100 kJ)**



Q2. A steel rod is 4.000 cm in diameter at 35 ^{o}C. A brass ring has an inner diameter of 3.992 cm at 35 ^{o}C. At what common temperature will the brass ring slide onto steal rod? $\alpha_{steel} = 11 \times 10^{-6} / K^{-1}$; $\alpha_{brassl} = 19 \times 10^{-6} / K^{-1}$ (Ans 286 ^{0}C)

Q3. The following figure shows a steel bar 15 cm long welded end to end to a copper bar 30 cm long. Each bar has a square cross section of 2.2 cm^2 on a side. The free end of steel is maintained at 100 ^{o}C and the free end of copper is maintained at 0.0 ^{o}C. Find the temperature at the junction of the two bars? *Ksteel*= 50.2 W/m.K; *Kcopper* =385 W/m.K] **(Ans: 21 °C)**



Q4. A glass flask with volume 250 cm^3 is filled with mercury at 25 ^{0}C. How much mercury overflows when the temperature of the system is raised to 105 ^{o}C (the coefficient of linear expansion of glass is 4.0 $\times 10^{-6}$ K^{-1} and coefficient of volume expansion of mercury is 1.82 $\times 10^{-4}$ K^{-1}). (Ans: 3.4 cm^3)

Q5. A gas is compressed from 600 cm3 to 200 cm3 at a constant pressure of 400 kPa. At the same time, 100 J of heat energy is transferred out of gas. What is change in the internal energy of the gas during this process? (A) 60 J

Chapter 17

Q1: An ambulance siren emits a sound of frequency 1.60 kHz. A person running with a speed of 2.50 m/s hears a frequency of 1.70 kHz as the ambulance approaches him from the back. How fast is the ambulance moving? (speed of sound is 340 m/s). **(Ans: 22.4 m/s.)**

Q#2: Two sound waves, from two different sources with the same frequency, 660 Hz, travel at a speed of 330 m/s. The sources are in phase. What is the phase difference of the waves at a point that is 5.0 m from one source and 4.0 m from the other? (The waves are traveling in the same direction. **)(Ans:. 4 Pi).**

Q#3: Two identical speakers, facing each other are driven by a common oscillator of frequency 600 Hz. A man, at the midpoint between the speakers, start moving toward one of them. He reaches the first minimum sound when he is 1 m from one of the speakers. Find the distance between the speakers. (Speed of sound = 343 m/s.) **[A 2.3 m]**

Q#4: The equation for a standing wave is given by: y = 4.00*10**(-3) sin(2.09 x) cos (60.0 t) (SI units). What is the distance between two consecutive antinodes? **[A 1.50 m]**

Chapter 16

Q#1: A uniform wire, having a mass of 0.4 kg and length of 6.5 m, is connected to a pulse generator. The tension is maintained in the wire by suspending a 3.5 kg mass on the other end. Find the time it takes a pulse to travel from a pulse generator to the other end. (Ans: 0.28 s)

Q#2. A string is vibrating in its fifth-harmonic standing wave pattern described by the equation : $y(x,t)= 0.25 \sin(\pi x) \times \cos(15t)$ m. Find the length of the string. (Ans: 5 m)

Q#3. Two sinusoidal waves having wavelength of 5 m and amplitude of 10 cm, are traveling in opposite directions on a 20-m long stretched string fixed at both ends. Excluding the nodes at the ends of the string, how many nodes appear in the resulting standing wave? (Ans: 7)