

BACHELOR OF SCIENCE EXAMINATION, 2018 (NEW)

(1st Year, 2nd Semester)

PHYSICS (HONOURS)**Paper : Core - 3**

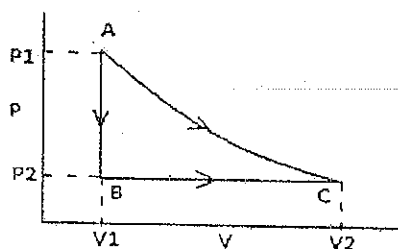
Time : Two hours

Full Marks : 50

Use separate Answer Script for each group

GROUP - A (25 marks)Answer any *five* questions.

1. One mole of ideal gas changes its state along (i) ABC and along (ii) AC (Isothermal). Find out the work done on both the cases. [2½ + 2½]



2. (a) State and explain 1st Law of Thermodynamics.
- (b) Show that $C_v = -T \left(\frac{\partial^2 F}{\partial T^2} \right)$ where the symbols have their usual meanings. [2+3]
3. (a) A Carnot's engine whose low temperature reservoir is at 7°C has efficiency 50%. It is desired to increase the efficiency to 70%. By how many degrees should the temperature of the high temperature reservoir be increased?
- (b) Why source and sink of heat are called reservoirs? [3+2]
4. (a) Draw Carnot's cycle in T-S diagram and find out its efficiency.
- (b) Describe a Rankine's cycle with proper diagram, and find out its efficiency in terms of Enthalpy of the system. [1½ + 3½]
5. Derive the 2nd and 3rd Maxwell's relation of Thermodynamics from Jacobian relation. [5]
6. (a) What are the similarities between Black-body radiation, and the molecules of Kinetic Theory of gases?
- (b) Define Kirchhoff's law of radiation. [4+1]
7. State and prove Stefan-Boltzmann law. [1½ + 3½]

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GROUP - B (25 marks)

Answer any *five* questions.

1. Explain the basic characteristics of Longitudinal wave. Derive wave equation for a Longitudinal wave. How does this equation varies in different media like gas, liquid and solid? 1+3+1
2. What is acoustic Pressure? Explain briefly how acoustic Pressure varies with the displacement of the wave. 1+4
3. a). Derive expression for the Doppler shift in frequency of sound when the source of sound approaches a stationary listener with uniform velocity. 2.5
b). A train is blowing a whistle while passing by a stationary observer. The frequency of sound appears to decrease from 220 Hz to 190 Hz as the train crosses the observer. Find the actual frequency of the whistle. 2.5
4. What is Laplace's correction? Calculate the velocity of sound considering this correction. How velocity changes, based on the different external parameters like temperature, pressure, etc. 1+3+1
5. What is sharpness of resonance? How sharpness of resonance varies with frequency and damping (R_m). Explain it's importance in LCR circuit. 1+3+2
6. What is beat? If two waves of frequency ratio 4 : 5 superimpose, what will be the output equation? explain with diagram. 1+4
7. Set up the wave equation for a string under tension and obtain the general solution in the form of a fourier series the two ends being fixed. 5