B. N. Bandodkar College of Science, Thane

First Semester Examination, October 2011

USPH101

Duration : 2 Hours] [Marks : 60

N.B. (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Use of non programmable calculator is allowed.

1. (a) Attempt any ONE of the following: 8

   i) Show that the shear strain is equal to mutually perpendicular compression and extension strains.

   ii) State and prove Bernoulli's theorem.

   (b) What is pseudo force? Give example. 4

   (c) State Newton's first law of motion. 3

2. (a) Attempt any **ONE** of the following: 8

   i) Obtain relations between pressure, volume and temperature in an adiabatic interaction for a perfect gas.

   ii) Considering the internal energy to be a function of pressure and temperature, Obtain Mayer's relation for real gases.

   (b) Derive an expression for variation of temperature with atmospheric height above sea level. 4

   (c) One mole of a perfect gas at 800K is compressed isothermally to half its original volume. Calculate the work done on the system and change in its internal energy. Given: R=8.4J/mole/K and 1cal=4.2J 3

3. (a) Attempt any **ONE** of the following: 8

   i) Derive expression for the velocity of a simple harmonic wave in a stretched string.

   ii) What is magnetostriction? What are different methods of producing ultrasonic waves? Explain any one method in detail.

   (b) An auditorium of volume 3500 m^3 is found to have reverberation time of 1.3 s. The sound absorbing surface of the hall has an area of 600m^2. Calculate the average absorption coefficient. 4

   (c) What are the requirements of a good auditorium? 3

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4. (a) Attempt any **THREE** of the following: 12

i) Define Poisson's ratio. Show that theoretical limiting values of it are -1 to 0.5.

ii) An elevator is moving upward with acceleration of 5 m/s2. A person of mass 50 kg standing in the elevator. What would be its weight on the scale fixed up on the floor of the elevator?

iii) Derive an expression for work done by a perfect gas in an adiabatic change.

iv) Define enthalpy. Is it a state function? Get an expression for the same.

v) Obtain the differential equation of wave motion.

(b) What are the properties of ultrasonic waves?. 3

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