B. N. BANDODKAR COLLEGE OF SCIENCE, THANE - 400 601.

FIRST TERM EXAMINATION OCT. - 2010

F. Y. B. Sc.

TIME : 2 Hrs.

SUBJECT : PHYSICS - I **MARKS :** 60

N. B. : 1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Use of non programmable calculators and Log table are allowed.

Q.1 a) Attempt ANY THREE : [12]

i) Show that the work done by a perfect gas in an isothermal expansion from volume ϑ_1 to ϑ_2 is given by

$$W = nRT\ell n\left(\frac{\vartheta_2}{\vartheta_1}\right)$$

ii) What is meant by Reverberation time ? State Sabine's formula for Reverberation time. State its significance.

iii) A longitudine disturbance generated by an earthquake travels 1000 km in 3 minutes. If the average density of the rock is assumed to be 2700 kg/m^3, calculate the bulk modulus of the rock.

iv) Explain the terms (a) Coefficient of viscosity (b) Hooke's Law (c) Yield point (d) Perfectly elastic body.

v) Two unequal masses m_1 and m_2 connected by light and inextensible string of negligible mass are hung vertically over light and frictionless pulley. If $m_2 > m_1$ determine the acceleration of two masses and the tension in the string.

b) A block of 400 kg mass placed on a 30° inclined plane is acted upon by a force of 4800 Nt. at 30° with the incline. If the Co-efficient of friction is 0.2, find the acceleration of the block. Take g = 10m/s^2. [3]

Q.2 a) Attempt ANY ONE : [8]

i) Derive a relation for the moment of a couple required to twist one end of a cylinder when the other end is fixed.

ii) Derive Bernoulli's equation. What is the principle involved ?

b) A block slides down an incline of angle 37° with an acceleration of 0.3g. Find the Co-efficient of Kinetic friction if sin 37° = 0.6. [4]

P.T.O.

c) Define Poisson's Ratio. Show that the theoretical limiting values of Poisson's Ratio are -1 and 0.5.

Q.3 a) **Attempt ANY ONE :** [8]

I) Considering internal energy to be a function of P and T, Prove that

$$\left(\frac{\partial v}{\partial P}\right)_T = PVK_T - (C_P - C_V)\frac{K_T}{\beta}$$

Where symbols have their usual meaning.

ii) Derive an expression for the change in atmospheric temperature with the height above sea level.

b) Show that PV^r = constant for adiabatic changes in an ideal gas. [4]

c) One mole of a perfect gas at 800 k is isothermally compressed to half its volume. Calculate the heat rejected by the system and the work done on the system and change in internal energy.
Given R = 8.4 J/mole°k, 1 cal = 4.2 J. [3]

Q.4 a) **Attempt ANY ONE :** [8]

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

ii) What do you mean by Ultrasonics ? Describe peizoelectric oscillator and explain how Ultrasonic waves are produced by it.

b) State any four application of Ultrasonic waves. [4]

c) Write a short note on Accoustics of buildings. [3]