

B. N. Bandodkar College of Science, Thane.
Department of Physics
F.Y.B.Sc (ATKT): Paper-I February-2011

Duration: 3 hrs

Total Marks: 90

- N.B:** 1) All questions are compulsory
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator and Log tables are allowed.
4) Answers to both the sections must be tied together.

SECTION- I

- Q.1] (a) Attempt any One 8**
- i) 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.
- ii) Two unequal masses m_1 and m_2 are connected by an unstretchable weightless string passing over a smooth light pulley at the end of smooth inclined plane at an angle ' θ ' to the horizontal. The mass m_2 lies on the inclined plane and mass m_1 hangs freely vertically. Find the acceleration of two masses and the tension in the string.
- (b) Derive the equation of continuity for a liquid flowing in and out of a tube. 4**
- (c) A steel wire of diameter 3.2×10^{-4} mt. and length 3mt. extends by 1.8×10^{-3} mt. under a load of 1kg. Find the Young's modulus of the wire. 3**
- Q.2] (a) Attempt any One 8**
- i) Derive an expression for work done by a perfect gas during an isothermal expansion of a gas
- ii) State and explain zeroth law of thermodynamics.
- (b) Explain the terms: 4**
- Isobaric change, isochoric change, isothermal change, Adiabatic change
- (c) Calculate the temperature drop over 1km of atmosphere if $\gamma = 1.4$ for air and the average molecular weight of air is 0.029kg/mole. $R=8.4\text{J/mole k.}$ and $g=9.8\text{m/s}^2$ 3**
- Q.3] a) Attempt any One 8**
- i) State the wave equation in one dimension and obtain its solution.
- ii) Describe piezoelectric oscillator and explain how ultrasonic waves are produced by it.
- b) Explain the factors affecting the acoustic quality of building 4**
- c) Describe the applications of ultrasonics. 3**

SECTION-II

- Q.4] (a) Attempt any one 8**
- (i) Discuss the composition of two perpendicular simple Harmonic oscillators with same period and different amplitudes and initial phases. Show that the resultant motion is a general equation of ellipse.
 - (ii) Set up the equation of motion of a rocket and derive an expression for maximum velocity.
- (b) Derive an expression for total kinetic energy of a Rigid body. 4**
- (c) Define: simple Harmonic Motion, Epoch, phase of simple Harmonic Motion 3**
- Q.5] a) Attempt any one 8**
- (i) With the help of a neat diagram, derive an expression for the focal length of lens.(Lens Makers Formula)
 - (ii) Describe Newton's rings experiment to find wavelength of incident light. Draw a neat diagram.
- (b) Describe with the help of suitable diagram Axial spherical aberration 4**
- (c) Explain a spectrometer with the help of a neat diagram 3**
- Q.6] a) Attempt any one 8**
- (i) With the help of a neat diagram of optical resonator, explain the basic principle of a 'LASER' what do you mean by 'Amplification' in a LASER
 - (ii) What is numerical aperture (NA) of an optical fibre. Derive an expression for it.
- b) Explain in brief how communication system is based on optical fibres. 4**
- C) Explain the following processes with neat diagram. 3**
- Absorption
Spontaneous Emission
Stimulated Emission

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