B. N. Bandodkar College of Science, Thane
Junior College
S.Y.J.C. 1st Term Examination, October 2014
Subject – Physics I and II

Day: Monday **Time: 11.00 am to 01.00 pm**
Date: 13/10/2014 **Max. Marks: 50**

Note: 1) Figures to the right indicate full marks.
2) Draw neat labeled diagram wherever necessary.
3) Use of logarithmic table is allowed.

Section – I

Q.1 **Select and write the most appropriate answer from the given alternatives for each sub question:** 05

1) The height at which the acceleration due to gravity becomes g/9 in terms of radius of the earth R is .....
a) $\frac{R}{\sqrt{2}}$ b) $\frac{R}{2}$ c) $\sqrt{2}R$ d) 2R

2) A body staring from rest undergoes rotational motion with uniform angular acceleration of 5 rad/s^2. Number of rotations it will complete in 50 seconds .....
a) 995 b) 1050 c) 850 d) 895

3) Common property between sound and light wave is .....
a) both can pass through vacuum b) both are transverse waves
c) both can show interference effect d) both can travel with same speed in air

4) The fifth overtone of closed organ pipe is unison with fifth overtone of open organ pipe. The ratio of their length is
a) $\frac{12}{11}$ b) $\frac{11}{12}$ c) $\frac{5}{6}$ d) $\frac{6}{5}$

5) Average density of the earth
a) does not depend on g b) is complex function of g
c) is directly proportional to g d) is inversely proportional to g

Q.2 **Attempt *any Four:*** 08

1) Derive relationship of linear velocity with angular velocity for U.C.M
2) The maximum vertical distance through which a full dressed astronaut can jump on the earth is 0.5 m. Find the maximum vertical distance he can jump on moon. [Given – acceleration due to gravity on moon is 1/6 times that on the earth.]
3) Explain Quincke's tube experiment.
4) Distinguish between beats and stationary wave.
5) A string and tunning fork are sounded together. They produce 8 beats per second when the length of the string is either 0.95 m or 1 m. What is the frequency of fork?
6) A wave equation is given by $y = 4\,sin\left[\pi\left(\frac{t}{5} - \frac{x}{9} + \frac{1}{6}\right)\right]$ where x is in cm and t in sec. Then find wavelength and frequency of wave.

Q.3 **Attempt *any Four:*** 12

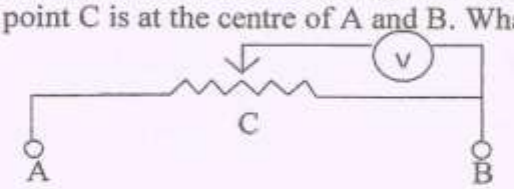
1) Explain the formation of stationary wave by analytical method. Find the distance between consecutive antinodes.
2) Define conical pendulum. Derive an expression for it.
3) Explain terms 1) Free vibrations 2) Forced vibrations 3) Resonance
4) In resonance tube experiment a tunning fork is sounded at open end then the first loudest sound is heard at open length 13 cm and then again loudest sound is heard at 41 cm. Find the frequency of tunning fork if velocity of sound is 350 m/s. Neglect end correction.
5) A body is released from a point distance r from the centre of earth. If R is the radius of the earth and r > R then prove that the velocity of the body at the time of striking the earth will be $\sqrt{\frac{2gR(r-R)}{r}}$

6) A meter gauge train is moving at 72 km / hr along a curved road of radius of curvature 500 m at a certain place. Find the elevation of outer rail above inner rail, so that there is no side pressure on rail. ($g = 9.8$ m / s^2).

Section – II

Q.4 **Attempt *any Four:*** **08**

1) Explain the principle of potentiometer.
2) Explain how a moving coil galvanometer is converted into voltmeter. Derive the necessary formula.
3) A potential difference of 240 V is across 8000 ohm rheostat. The voltmeter V has a resistance 1000 Ω and point C is at the centre of A and B. What is the reading in voltmeter



4) Discuss magnetization of a ferromagnetic material with help of Rowland ring.
5) An unknown resistance X is connected in the left gap and a known resistance R in the right gap of a metre bridge. The balance point is obtained at 60 cm from the left end of the wire. When R is increased by 2 Ω, the balance point shifts by 10 cm. Find X and R.
6) A copper disc of diameter 36 cm rotates with its plane at right angles to a uniform magnetic field of induction 20 wb/m^2 at the rate of 250 rpm. Find the e.m.f induced between two points one at the centre and other at the edge of the disc.

Q.5 **Attempt *any Four:*** **12**

1) Prove theoretically, the relation between e.m.f induced and rate of change of magnetic flux in the electric circuit in electromagnetic induction.
2) Explain ferromagnetism on the basis of domain theory.
3) An A.C circuit with resistor of 5Ω, inductor of 0.2H and capacitor of 25 μF are connected in series across 200 V (r.m.s) and 50 Hz supply. Calculate impedance, power factor and power dissipated in the circuit.
4) Explain parallel resonant circuit. State conditions for parallel resonance. Obtain an expression for resonant frequency.
5) Twelve wires of equal length and each of resistance 6 ohm are joined so as to form a skeleton cube. Find the equivalent resistance between two diagonally opposite points.
6) A cyclotron has frequency 10 MHz and radius of its D is 60 cm. Find the magnitude of its operating field and maximum kinetic energy acquired by proton. Mass of proton = 1.667×10^{-27} kg.

Q.6 **Select and write the most appropriate answer from the given alternatives for each sub question:** **05**

1) Sensitivity of potentiometer can be increased by
   a) increasing length b) increasing voltage
   c) increasing potential gradient d) increasing current
2) A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is B. It is then bent into a circular loop of n turns. The magnetic field at the centre of the coil will be
   a) nB b) n^2B c) 2nB d) $2n^2B$
3) The core of a transformer is laminated to avoid loss of energy due to:
   a) heating b) eddy current c) flux leakage d) hysteresis
4) Two inductors each of inductance L are joined in parallel. What is the equivalent inductance.
   a) 2L b) L c) $\frac{L}{2}$ d) Zero
5) A paramagnetic substance of susceptibility 3×10^{-4} is placed in a magnetic field of 4×10^{-4} Am^{-1}. Then the intensity of magnetization in the units of Am^{-1} is
   a) 1.33×10^8 b) 0.75×10^8 c) 12×10^8 d) 14×10^8

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