# V.P.M's B. N. Bandodkar College of Science, Thane
## S.Y.J.C Second Terminal Examination October 2018
## Subject: Physics

**Date: 26.10.2018** **Time: 08.00 am to 10.00 am**
**Day: Friday** **Marks: 50**

**Note: 1) All questions are compulsory.**
**2) Section 'A' contains Q. no 1 to 3 of multiple choice type of questions carrying one mark each. Q. no 4 to 6 are very short answer type of questions carrying one mark each.**
**3) Section 'B' contains Q. no 7 to 11 of short answer type of questions carrying two marks each. Internal choice is provided to only one question.**
**4) Section 'C' contains Q. no 12 to 19 of short answer type of questions carrying three marks each. Internal choice is provided to only one question.**
**5) Section 'D' contains Q. no 20 and 21 of long answer type of questions carrying five marks each. Internal choice is provided to each question.**
**6) Use of logarithmic table is allowed. Use of calculator is not allowed.**

### Section – A

**Q.1** If the K.E. of a particle of mass 'm' performing a U.C.M. in a circle of radius 'r' is E, then the acceleration of particle is **01**

a) $(2E/mr)^2$ b) 2Emr c) 4E/mr d) 2E/mr

**Q.2** The relation between magnetization and magnetic intensity is **01**

a) $Mz=\mu H$ b) $Mz=\mu_0(1+\chi)H$ c) $Mz=\chi H$ d) $Mz=H/\chi$

**Q.3** When an alternating e.m.f. $e=300\sin(120\pi t)$ volt is applied across a bulb the peak value of current is found to be1.5A,the average power consumed is **01**

a) 225 watt b) 450 watt c) 0 d) 112.5 watt

**Q.4** Explain why centrifugal force is called a pseudo force. **01**

**Q.5** Calculate the minimum velocity with which a spaceship should be launched so as not to return earth.($g = 9.8\ m/s^2$, $R = 6400$ km) **01**

**Q.6** Define limit of resolution of an optical instrument. **01**

### Section – B

**Q.7** Derive an expression for binding energy of a body at rest on the earth's surface. **02**

**Q.8** A transverse wave of amplitude 0.01 m and frequency 500 Hz is travelling along a stretched string with a speed of 200 m/s. Find the displacement of a particle at a distance of 0.7 m from the origin after 0.01 second. **02**

**Q.9** Distinguish between overtones and harmonics. **02**

**Q.10** A coil having an area of $0.5\ m^2$ and 1000 turns is kept perpendicular to a magnetic field of $0.05\ wb/m^2$. Calculate the e.m.f. induced in the coil if the coil is rotated through $60^\circ$ in 5s. **02**

**Q.11** Explain construction of spherical wavefront. **02**

**OR**

**Q.11** Explain construction of a plane wavefront. **02**

## Section – C

**Q.12** Define period of conical pendulum and obtain expression for it. **03**

**OR**

**Q.12** The bob of a simple pendulum of length 100 cm is moved sideways and revolved in a horizontal circle of radius 50 cm. If the mass of bob is $20\sqrt{3}$ g. Find its linear speed and tension in the string. ($g = 980$ cm/s$^2$) **03**

**Q.13** State Kepler's laws of planetary motion. **03**

**Q.14** Derive an expression for a one dimensional simple harmonic progressive wave travelling in the direction of positive X-axis. Express it in different forms. **03**

**Q.15** A sonometer wire under certain tension is in unison with a tuning fork. When only the tension in the wire is increased by 2%, 3 beats per second are produced. Find the frequency of the tuning fork. **03**

**Q.16** What is series L C R resonant circuit? State conditions for series resonance. Also derive expression for resonant frequency. **03**

**Q.17** When 100 V d.c.is applied across a coil, a current of 1A flows through it. When 100 V a.c. of frequency 50Hz is applied to the same coil only 0.5A current flows through it. Calculate resistance, impedance and self inductance of coil. **03**

**Q.18** State and prove Brewster's law. **03**

**Q.19** An electron in an atom revolves around the nucleus in an orbit of 0.5 A. Calculate the equivalent magnetic moment and orbital angular momentum of electron if the frequency of revolution of electrons $10^{16}$ Hz. **03**

Given: Charge on electron = $1.6\times10^{-19}$ C, Gyromagnetic ratio = $8.8\times10^{10}$ C/kg.

## Section – D

**Q.20** Derive an expression for the pressure exerted by the gas on the basis of kinetic theory of gases. **05**

**OR**

**Q.20** **a)** Find the number of molecules per unit volume of oxygen at N.T.P. (Mass of oxygen molecule = $5.313 \times 10^{-26}$ kg, R.M.S. speed of oxygen molecules at N.T.P. = 461.2 m/s and 1 atmosphere pressure = $1.013\times10^5$ N/m$^2$ ) **05**

**b)** State the assumptions of kinetic theory of gases.

**Q.21** Describe with neat diagram Fraunhofer diffraction due to single slit. Hence derive expression for position of secondary minimum and secondary maximum. **05**

Diffraction pattern of single slit of width 0.5 cm is formed by a lens of focal length 40 cm. Calculate the distance between the first dark and next bright fringe from the axis. Wavelength of light used is 4890 A.

**OR**

**Q.21** Using analytical method derive an expression for the path difference between two light waves. **05**

When one of the slits in Young's experiment is covered with transparent sheet of thickness $3\times10^{-3}$ cm, the central fringe shifts to a position originally occupied by 30$^{th}$ bright fringe. If the refractive index of the sheet is 1.5, find wavelength of light.

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