

This question paper contains 2 printed pages]

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S. No. of Question Paper : 814.

Unique Paper Code : 222353

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Name of the Paper : Physics-II (GEHT-304)

Name of the Course : B.Sc. (Hons.) Geology

Semester : III

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all.

Question No. 1 is compulsory.

1. (a) What is weightlessness ? Give two examples in support. 3
- (b) Define normal coordinates and normal modes of a coupled system. 3
- (c) If 12 particles are distributed randomly between two boxes A and B with equal probability, then calculate the probability of the "most probable and the least probable distribution". 3
- (d) State and explain Gauss's law. 3
- (e) Define Doppler's effect. 3
2. (a) Show that $\text{curl}(\text{grad } \phi) = 0$ 5
- (b) Show that $\text{div}(\text{curl } \mathbf{A}) = 0$. 5
- (c) A mass of 120 kg starting from rest accelerates upto 30 m/s in 15 seconds. After that it moves with a constant speed of 30 m/s for the next 1 min. Find the average force acting on the particle. 5

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3. (a) What do you mean by Damped harmonic oscillations ? Derive its differential equation and solve the same for the case of periodic damping. 10
- (b) A simple pendulum has a period of 1 sec and amplitude of 10° . After 10 complete oscillations its amplitude reduces to 5° . Find the Relaxation time and Quality factor of the system. 5
4. (a) Explain the law of conservation of Linear momentum for a system of particles. 5
- (b) Find the recoil speed of the 700 g gun when a shooter fires a 70 g bullet with a muzzle speed of 400 m/s. 5
- (c) Two balls of 30 g and 50 g are moving with speeds of 10 m/s and 5 m/s respectively. Find their speeds after the collision, assume the collision is elastic. 5
5. (a) State the theorem of parallel and perpendicular axes of moment of inertia. 8
- (b) Derive an expression for the moment of Inertia of a solid sphere about an axis passing through its centre. 7
6. (a) State and explain Kepler's laws of planetary motion. 6
- (b) The mean distance of sun from a planet is two times the distance of the sun from the earth. In-how many years will that planet complete one revolution around the sun ? 5
- (c) Compute the mass of sun from the period and radius of the Earth's orbit. 4
7. (a) Derive an expression for the magnetic field along the equatorial line of a magnetic dipole. 8
- (b) Obtain the expression for the most probable energy and most probable speed of a gas molecule. 7
8. Explain any *three* of the following :
- (a) Dielectric Polarization and its types 5
- (b) Bernoulli's theorem 5
- (c) Maxwell's equations 5
- (d) Travelling waves. 5