

**CITY COLLEGE**  
**Internal Examination 2020**  
**Physics (Hons.) Part 1 (1+1+1 System)**  
**Paper: 2A & 2B**  
**Time: 2 hours and 30 minutes; Full Marks: 50**

Group-A

*Answer any five questions from the following:* [5×5=25]

1. (a) A particle is under the influence of a force  $\vec{F}$  and has an instantaneous velocity  $\vec{V}$ . Show that  $\frac{dT}{dt} = \vec{F} \cdot \vec{V}$ , where T is the kinetic energy. (b) Find the time integral of a force. (c) What do you mean by pseudo force? [2+2+1]
2. (a) A system of particles is subjected to an external torque T. Show that the rate of change of total angular momentum of the system equals to the external torque. (b) State the nature of the internal forces for which this is true. [4+1]
3. (a) Find the centre of mass of a thin homogeneous semi-circular disc of radius  $r$  and surface mass density  $\sigma$ . (b) What is ellipsoid of inertia? [3+2]
4. (a) What is Brownian motion? (b) Derive Einstein equation for mean square displacement of Brownian particle. [1+4]
5. (a) Express the Van der Waal's equation of state as a virial equation. (b) Find an expression for the Boyle temperature from it. [3+2]
6. (a) State Newton's law of cooling. (b) Define emissive and absorptive power of a black body. (c) State Kirchhoff's law. [2+2+1]

Group-B

*Answer any five questions from the following:* [5×5=25]

7. (a) Define moment of inertia and radius of gyration. (b) Write down the unit of moment of inertia. [4+1]
8. (a) What are the basic differences between an ammeter and a voltmeter? (b) What will be the internal resistances in case of an ammeter and a voltmeter? [3+2]

**Please Turn Over**

9. (a) What are the advantages of Carey-Foster's bridge over a meter bridge? (b) What is the principle of operation of the bridge? [3+2]
10. (a) What is the condition for obtaining minimum deviation for a prism? (b) What is a monochromatic light? (c) Do you consider the sodium light strictly monochromatic? [2+2+1]
11. (a) What is the C.G.S. unit of flux density? (b) What do you mean by magnetic meridian? (c) State tangent law. [1+2+2]
12. (a) What is the basic difference between a Zener diode and an ordinary p-n junction diode? (b) What do you mean by a reference diode? (c) Write down the main use of a Zener diode. [2+2+1]
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Answer scripts must be emailed to [part1hcityphysics@gmail.com](mailto:part1hcityphysics@gmail.com) within 15 minutes of the end of the examination.