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# Daffodil International University

**Faculty of Science & Information Technology**
**Department of Computer Science and Engineering**
**Mid Semester Examination, Spring-2024**
**Course Code: PHY-101 Course Title: Physics-I**
**Level: 1 Term: 1**

**Exam Duration: 1.5 Hours** **Marks: 25**

## Answer All Questions

***[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]***

| | | | | |
|---|---|---|---|---|
| **1.** | ***a)*** | Tell something about conservation of momentum. | **[Marks] [1×5 = 5]** | **CO-1** |
| | ***b)*** | Why Newton's 1st law of motion is called the law of inertia? | | |
| | ***c)*** | Recall impulse of force. | | |
| | ***d)*** | Define kinetic friction and its friction coefficient? | | |
| | ***e)*** | State work energy theorem. | | |
| **2.** | ***a)*** | Prove that the momentum being conserved in two-body collision. | **[Marks] [2.5×4 = 10]** | **CO-2** |
| | ***b)*** | Show that the moment of inertia of a thin uniform rod is $I = \frac{ml^2}{12}$ when axis pass through the mid-point and normal to the length of the rod. | | |
| | ***c)*** | Which of the following one is easier Push or Pull a box? Prove it mathematically. | | |
| | ***d)*** | Derive the differential equation of simple harmonic motion. | | |
| **3.** | ***a)*** | An object is launched at an angle of 30 degrees to the horizontal with an initial speed of 20 m/s. Calculate the height after 1.2 sec. of its launched. | **[Marks] [2.5×4 = 10]** | **CO-3** |
| | ***b)*** | If a 40 kg box is moving horizontally with a constant velocity on a rough surface with a coefficient of sliding friction of 0.425, what is the magnitude of the minimum horizontal force being applied to the box? | | |
| | ***c)*** | A spring with a force constant of 400 N/m is compressed by 0.2 meters. Calculate the work done in compressing the spring. | | |
| | ***d)*** | The displacement of a particle executing simple harmonic vibration is expressed by **$y = 3 \sin(31.416t + \phi)$**. If the displacement at 0 sec is 6 mm. By solving the equation determine the followings: (i) amplitude of motion (ii) the time period and (iii) frequency of vibration. | | |