**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI (RAJ)**

Mid-semester Test (CLOSED BOOK)

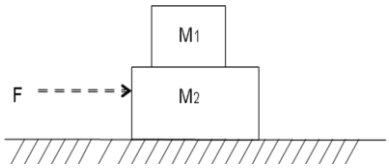
FIRST SEMESTER 2016-2017

GENERAL PHYSICS (PHY F112)

Date: 03-10-2016 Max. Time: 90 minutes Max. Marks: 90

---

**Q.1**: A block of mass $M_1$ rests on a block of mass $M_2$ which lies on a frictionless table. The coefficient of friction between the blocks is μ. What is the maximum horizontal force which can be applied to the blocks for them to accelerate without slipping on one another if the force is applied to (a) block 1 and (b) block 2? **(10+8)**



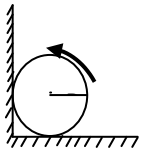

**Q2**. A block of mass 2 kg is pulled up on a smooth incline of an angle $30^o$ with the horizontal. If the block moves with constant acceleration of 1.0 $m/s^2$.

**(a)** Find the power delivered by the pulling force at a time 4.0 seconds after the motion starts? **(10)**

**(b)** What is the average power delivered during the 4.0 seconds after the motion? **(8)**

**Q3**. **(a)** A block of mass m is given an initial speed $v_i$ = 2.0 m/s on a plain floor. The coefficient of kinetic friction between the floor and the block is $\mu_k$ = 0.10. Find the distance the block moves before stopping. **(6)**

**(b)** A uniform solid cylinder of radius *R* is spinned about its axis and then placed into a corner as shown in the Fig. The coefficient of friction between the corner walls and the cylinder is equal to $\mu$. What is the angular acceleration of the cylinder? **(12)**



**Q4**. In Fig., block 2 (mass 1.0 kg) is at rest on a frictionless surface and touching the end of an unstretched spring of spring constant 200 N/m. The other end of the spring is fixed to a wall. Block 1 (mass 2.0 kg), traveling at speed $v_1$ = 4.0 m/s, collides with block 2, and the two blocks stick together. When the blocks momentarily stop, by what distance is the spring compressed? **(18)**


**Q5**. In Fig., two particles, each with mass *m* are fastened to each other, and to a rotation axis at O, by two thin rods, each with length *d* and mass *M*. The combination rotates around the rotation axis with angular speed ω. Measured about O, what are the combination's **(a)** rotational inertia and **(b)** kinetic energy in terms of *m*, *d*, *M* and ω. **(12+6)**