e. If earth shrinks suddenly, what would happen to length of the day?

f. If the earth is suddenly struck by meteorites, the earth will slow down slightly. Explain.

g. If the ice on the polar caps of the earth melt, how will be the duration of the affected? Explain.

h. Apply the principle of angular momentum conservation to find duration of day if earth suddenly shrink to $\frac{1}{27}$ of its original volume and mass remains unchanged. for solid sphere.

i. A ballet dancer spins with $2.4 \ rev/s$ with her arms outstretched when the MI about the axis of rotation is I, with her arms folded, the MI about same axis becomes $0.6I$. Calculate new rate of spin.

j. A student sits on a pivoted stool while holding a pair of weights. The stool is free to rotate about a vertical axis with negligible friction. The moment of inertia of student, weight and stool is $2.5kgm^2$. The student is set in rotation with arms outstretched, making one complete turn every $1.26 \ Sec$.
i. What is the initial angular speed of the system?
ii. As he rotates, he pulls the weights inward so that the new moment of inertia of the system becomes $1.80 \ kgm^2$. What is the new angular speed of the system?

Day-6

1. A ring, a disc, solid sphere, hollow sphere are dropped from the same inclined plane of same height then which of the following reaches the ground first,
   a. Ring   b. Disc   c. Solid Sphere   d. Hollow Sphere

2. If a gymnast on a rotating stool with his arms outstretched suddenly lowers his arms
   a. The angular velocity decreases
   b. The moment of inertia decreases
   c. The angular velocity remains constant
   d. The angular momentum increases

3. The torque needed to increase the velocity of flywheel of moment of inertia $4kgm^2$ from rest to $60 \ rev/min$ in 2 revolutions is,
   a. $2.8Nm$ b. $4.6Nm$ c. $6.3Nm$ d. $8.6Nm$

4. a. A horizontal disc rotating about a vertical axis makes 100 revolutions per minute. A small piece of wax of mass $10g$ falls vertically on the disc and adheres to it at a distance of $9cm$ from the axis. If the number of revolutions per minute is thereby reduced to 90, calculate the moment of inertia of the disc.
   b. A physics teacher stands on a freely rotating platform. He holds a dumbbell in each hand of his outstretched arms while a student gives him a push until his angular velocity reaches $1.5rad/sec$. When the freely spinning teacher pulls his hands in close to his body, his angular velocity increases to $5.0 \ rad/sec$. What is the ratio of his final kinetic energy to initial kinetic energy?

- *Angular velocity of earth increases when it comes closer to the sun in its orbit:* ***As it come closer to sun, Its Moment of inertia decreases and to conserve angular momentum its angular velocity must Increase***

- *If earth shrinks suddenly, what would happen to length of the day:* ***[If earth shrinks suddenly, its moment of inertial decreases(radius decreases) and from conservation of angular momentum $\{I \propto \frac{1}{\omega}\}$ its angular speed increase: length of the day decreases]***

- *If the earth is struck by meteorites, the earth will slow down slightly:* ***[I increases, ω decreases $\{I \propto \frac{1}{\omega}\}$, length of the day increases]***

- *If the polar ice caps melts, what would happen to the length of the day:* ***[I increases, ω decreases $\{I \propto \frac{1}{\omega}\}$, length of the day increases]***

- *When tall building are constructed on earth, the duration of day night slightly increases:* ***[I increases, ω decreases $\{I \propto \frac{1}{\omega}\}$, length of the day increases]***

- *A Ballet dancer can increase or decrease her spinning rate by using the principle of conservation of angular momentum:* ***[From principle of conservation of angular momentum $\{I \propto \frac{1}{\omega}\}$, she can change her spinning rate by changing moment of inertia, and moment of inertia can be changed by stretching or folding her hands]***

- *A dancer girl/man is rotating over a turntable with her/his arms outstretched. If she lowers her arms how does this affect her motion?*