**Problem Set 9 Rotation II (Due 4/29/2025 before class in stapled A4-sized paper)**

**Late homework will NOT be accepted, unless you have notified the course instructor 3 days BEFORE deadline.**

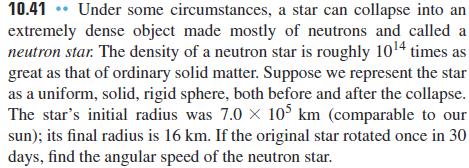
**Part I (60%)**

**图示

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**文本

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**Part II (40%)**

1. Calculate the net torque about point O for the two forces applied as in Figure below. The rod and both forces are in the plane of the page.

**图示

描述已自动生成**

1. A metal bar is in the xy-plane with one end of the bar at the origin. A force is applied to the bar at the point *x =* 3.00 m, *y* = 4.00 m. What are the magnitude and direction of the torque with respect to the origin produced by ***F***
2. A wheel rotates without friction about a stationary horizontal axis at the center of the wheel. A constant tangential force equal to 80.0 N is applied to the rim of the wheel. The wheel has radius 0.120 m. Starting from rest, the wheel has an angular speed of 12.0 rev/s after 2.00 s. What is the moment of inertia of the wheel?
3. What fraction of the total kinetic energy is rotational for the following objects rolling without slipping on a horizontal surface? (a) a uniform solid cylinder; (b) a uniform sphere; (c) a thin-walled, hollow sphere; (d) a hollow cylinder with outer radius R and inner radius R/2?
4. A 392-N wheel comes off a moving truck and rolls without slipping along a highway. At the bottom of a hill it is rotating at 25 rad/s. The radius of the wheel is 0.600 m, and its moment of inertia about its rotation axis is 0.800*MR*2. Friction does work on the wheel as it rolls up the hill to a stop, a height h above the bottom of the hill; this work has absolute value 3500 J. Calculate h.
5. An engine delivers 175 hp to an aircraft propeller at 2400 rev/min. (a) How much torque does the aircraft engine provide? (b) How much work does the engine do in one revolution of the propeller?
6. Compute the torque developed by an industrial motor whose output is 150 kW at an angular speed of 4000 rev/min
7. A drum with negligible mass, 0.400 m in diameter, is attached to the motor shaft in problem 7, and the power output of the motor is used to raise a weight hanging from a rope wrapped around the drum. How heavy a weight can the motor lift at constant speed and how fast will the weight rise?
8. Find the magnitude of the angular momentum of the second hand on a clock about an axis through the center of the clock face. The clock hand has a length of 15.0 cm and a mass of 6.00 g. Take the second hand to be a slender rod rotating with constant angular velocity about one end.
9. Calculate A thin, uniform metal bar, 2.00 m long and weighing 90.0 N, is hanging vertically from the ceiling by a frictionless pivot. Suddenly it is struck 1.50 m below the ceiling by a small 3.00-kg ball, initially traveling horizontally at 10 m/s. The ball rebounds in the opposite direction with a speed of 6 m/s. Find the angular speed of the bar just after the collision.