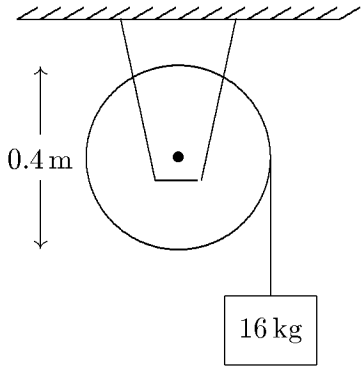
68. A certain wheel has a rotational inertia of $12\,\text{kg}\cdot\text{m}^2$. As it turns through 5.0 rev its angular velocity increases from 5.0 rad/s to 6.0 rad/s. If the net torque is constant its value is:

A. $0.016\,\text{N}\cdot\text{m}$
B. $0.18\,\text{N}\cdot\text{m}$
C. $0.57\,\text{N}\cdot\text{m}$
D. $2.1\,\text{N}\cdot\text{m}$
E. $3.6\,\text{N}\cdot\text{m}$

ans: D

69. A 16-kg block is attached to a cord that is wrapped around the rim of a flywheel of diameter 0.40 m and hangs vertically, as shown. The rotational inertia of the flywheel is $0.50\,\text{kg}\cdot\text{m}^2$. When the block is released and the cord unwinds, the acceleration of the block is:



A. $0.15g$
B. $0.56g$
C. $0.84g$
D. g
E. $1.3g$

ans: B

70. A 8.0-cm radius disk with a rotational inertia of $0.12\,\text{kg}\cdot\text{m}^2$ is free to rotate on a horizontal axis. A string is fastened to the surface of the disk and a 10-kg mass hangs from the other end. The mass is raised by using a crank to apply a 9.0-N·m torque to the disk. The acceleration of the mass is:

A. $0.50\,\text{m/s}^2$
B. $1.7\,\text{m/s}^2$
C. $6.2\,\text{m/s}^2$
D. $12\,\text{m/s}^2$
E. $20\,\text{m/s}^2$

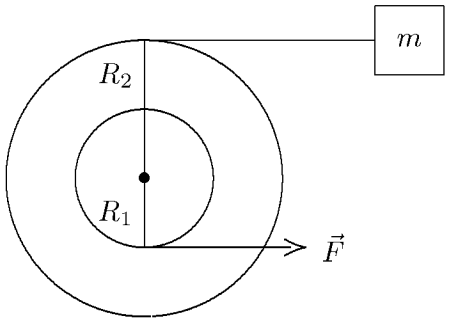
ans: A

71. A 0.70-kg disk with a rotational inertia given by $MR^2/2$ is free to rotate on a fixed horizontal axis suspended from the ceiling. A string is wrapped around the disk and a 2.0-kg mass hangs from the free end. If the string does not slip, then as the mass falls and the cylinder rotates, the suspension holding the cylinder pulls up on the cylinder with a force of:

A. 6.9 N
B. 9.8 N
C. 16 N
D. 26 N
E. 29 N

ans: B

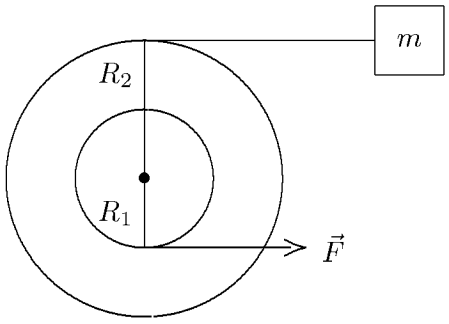
72. A small disk of radius R_1 is mounted coaxially with a larger disk of radius R_2. The disks are securely fastened to each other and the combination is free to rotate on a fixed axle that is perpendicular to a horizontal frictionless table top, as shown in the overhead view below. The rotational inertia of the combination is I. A string is wrapped around the larger disk and attached to a block of mass m, on the table. Another string is wrapped around the smaller disk and is pulled with a force $\vec{F}$ as shown. The acceleration of the block is:



A. R_1F/mR_2
B. $R_1R_2F/(I - mR_2^2)$
C. $R_1R_2F/(I + mR_2^2)$
D. $R_1R_2F/(I - mR_1R_2)$
E. $R_1R_2F/(I + mR_1R_2)$

ans: C

73. A small disk of radius R_1 is fastened coaxially to a larger disk of radius R_2. The combination is free to rotate on a fixed axle, which is perpendicular to a horizontal frictionless table top, as shown in the overhead view below. The rotational inertia of the combination is I. A string is wrapped around the larger disk and attached to a block of mass m, on the table. Another string is wrapped around the smaller disk and is pulled with a force $\vec{F}$ as shown. The tension in the string pulling the block is:



A. R_1F/R_2
B. $mR_1R_2F/(I - mR_2^2)$
C. $mR_1R_2F/(I + mR_2^2)$
D. $mR_1R_2F/(I - mR_1R_2)$
E. $mR_1R_2F/(I + mR_1R_2)$

ans: C

74. A block is attached to each end of a rope that passes over a pulley suspended from the ceiling. The blocks do not have the same mass. If the rope does not slip on the pulley, then at any instant after the blocks start moving, the rope:

A. pulls on both blocks, but exerts a greater force on the heavier block
B. pulls on both blocks, but exerts a greater force on the lighter block
C. pulls on both blocks and exerts the same magnitude force on both
D. does not pull on either block
E. pulls only on the lighter block

ans: A

75. A pulley with a radius of 3.0 cm and a rotational inertia of $4.5 \times 10^{-3}\,\mathrm{kg \cdot m^2}$ is suspended from the ceiling. A rope passes over it with a 2.0-kg block attached to one end and a 4.0-kg block attached to the other. The rope does not slip on the pulley. When the speed of the heavier block is 2.0 m/s the kinetic energy of the pulley is:

A. 0.15 J
B. 0.30 J
C. 1.0 J
D. 10 J
E. 20 J

ans: D

76. A pulley with a radius of 3.0 cm and a rotational inertia of $4.5 \times 10^{-3}\,\text{kg} \cdot \text{m}^2$ is suspended from the ceiling. A rope passes over it with a 2.0-kg block attached to one end and a 4.0-kg block attached to the other. The rope does not slip on the pulley. At any instant after the blocks start moving, the object with the greatest kinetic energy is:

A. the heavier block
B. the lighter block
C. the pulley
D. either block (the two blocks have the same kinetic energy)
E. none (all three objects have the same kinetic energy)

ans: C

77. A disk with a rotational inertia of $5.0\,\text{kg} \cdot \text{m}^2$ and a radius of 0.25 m rotates on a fixed axis perpendicular to the disk and through its center. A force of 2.0 N is applied tangentially to the rim. As the disk turns through half a revolution the work done by the force is:

A. 1.6 J
B. 2.5 J
C. 6.3 J
D. 10 J
E. 40 J

ans: A

78. A circular saw is powered by a motor. When the saw is used to cut wood, the wood exerts a torque of $0.80\,\text{N} \cdot \text{m}$ on the saw blade. If the blade rotates with a constant angular velocity of 20 rad/s the work done on the blade by the motor in 1.0 min is:

A. 0
B. 480 J
C. 960 J
D. 1400 J
E. 1800 J

ans: C

79. A disk has a rotational inertia of $6.0\,\text{kg} \cdot \text{m}^2$ and a constant angular acceleration of $2.0\,\text{rad/s}^2$. If it starts from rest the work done during the first 5.0 s by the net torque acting on it is:

A. 0
B. 30 J
C. 60 J
D. 300 J
E. 600 J

ans: D

80. A disk starts from rest and rotates around a fixed axis, subject to a constant net torque. The work done by the torque during the second 5 s is _____ as the work done during the first 5 s.

A. the same
B. twice as much
C. half as much
D. four times as much
E. one-fourth as much

ans: D