PHYS 2325 - Dr. Honan - Test 2 - A Name _____

Possibly Useful Information: $g = 9.80 m/s^2$

Problem 1 Multiple Choice (3 points each)

_____ [i] A car moving at 20 mi/hr can stop on a wet surface in a minimum distance of 50 ft. What is the minimum stopping distance if the car moves on the same wet surface at 80 mi/hr? Assume the stopping acceleration is the same in both cases: (a) 50 ft (b) 100 ft (c) 200 ft (d) 400 ft (e) 800 ft (f) 1600 ft

_____ [ii] The coefficients of kinetic and static friction between a 1000 lb refrigerator and floor are 0.40 and 0.45 . When at rest the refrigerator is pushed with a horizontal force of 300 lb. What is the force of friction between the refrigerator and floor? (a) 300 lbs (b) 400 lbs (c) 450 lbs (d) 850 lbs (e) 1000 lbs (f) 1300 lbs (g) none of the above

_____ [iii] A car drives up a hill at a constant speed. What are the signs of the changes in kinetic energy and potential energy? (a) $\Delta K > 0, \Delta U > 0$ (b) $\Delta K > 0, \Delta U = 0$ (c) $\Delta K > 0, \Delta U < 0$ (d) $\Delta K = 0, \Delta U > 0$
(e) $\Delta K = 0, \Delta U = 0$ (f) $\Delta K = 0, \Delta U < 0$ (g) $\Delta K < 0, \Delta U > 0$ (h) $\Delta K < 0, \Delta U = 0$
(i) $\Delta K < 0, \Delta U < 0$ (j) It cannot be determined.

Problem 2 A 23 kg crate is lowered down a frictionless inclined plane at a 48° angle. A person pushes up the incline with a force F so that the crate moves downward with constant *speed* of 3 m/s. What is F? (7 points)

Problem 3 (7 points each)
(a) Junior pulls his 12 kg sled along a horizontal icy (frictionless) surface. If he pulls with a rope that makes an angle of 40° from horizontal, then what tension is necessary to give the sled a forward acceleration of 1.5 m/s^2?

(b) A force of $F(x) = 6x^2 - 50$ (in SI units) acts on a particle moving in one dimension from $x = 1m$ to $x = 4m$. What is the work done by this force?

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Problem 4 (7 points each)

(a) A 1500 kg car drives at the bottom of a trough with an effective radius of 80 m at a speed of 20 m/s. What is the normal force of the road on the car?

(b) What is the angle between $\vec{A} = \langle -3,6,-4 \rangle$ and the positive x-axis?

Problem 5 (7 points each)

(a) A mass m swings in a vertical circle at the end of a rope of length L. What is the minimum speed the mass must have at the bottom for it to pass over the top without the string collapsing?

(b) A banked curve has a turn radius of R and is banked at an angle of θ. At exactly what speed could a car take the curve without slipping on a very icy day when there is no friction?

(c) A 0.30 kg mass slides on a horizontal surface with friction. Initially the mass compresses a horizontal spring (with a spring constant of 45 N/m) by 0.20 m. After it is released the mass moves a total distance of 1.5m before stopping. What is the coefficient of kinetic friction between the mass and surface?

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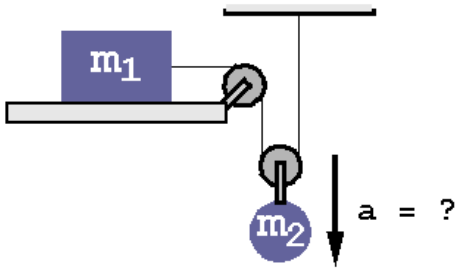
Problem 6 (6 points each)
(a) A space station with a radius of 120 m rotates once every 70 s to create artificial gravity. If the astronaut has an earth weight of 160 lbs, then what is its artificial weight?

(b) A 2000N crate initially at rest is dragged along a horizontal floor a distance of 3m by a rope with a tension of 800N at an angle of 35° from horizontal while a 500N friction force acts backward. What is the final speed of the crate?

Problem 7 A mass m_1 slides on a horizontal surface with a coefficient of kinetic friction μ_k. It is connected by a rope to a hanging mass m_2 over the pulley arrangement shown. What is the downward acceleration of the hanging mass m_2?
(7 points)



Problem 8 If the coefficient of static friction between the incline and block is 0.30, then what is the minimum force F needed to prevent the block from sliding?
m = 20 kg and θ = 50° (7 points each)