Assigned Seat Number _____

Agin/Meyer

Exam I

Spring 2004
Serway & Jewett, Chapters 1-5

PART I: QUALITATIVE

Fill in the bubble for the correct answer on the answer sheet. next to the number.

NO PARTIAL CREDIT: SUBMIT ONE ANSWER ONLY

Note that in qualitative multiple choice questions, sometimes one answer is clearly correct, while the others are clearly incorrect. However, with some questions you must choose the best or most complete answer.

Note also that even though this section is qualitative, the formula sheet may be useful for some questions.

20 problems, 3 pts each =60 pts =50% of exam

1) An example of vector quantity would be:
   a) speed
   b) density
   c) temperature
   d) velocity
   e) distance traveled

2) (135.5 x 1.43) + 17.1 computed to the correct # of significant digits is:
   a) 210.9
   b) 211
   c) 2.1×10^2
   d) 210.86
   e) 211.0

3) Which of the following describes an object moving with constant ***velocity***?
   a) A car sliding to a halt at a snow-covered intersection
   b) A toy train traveling in a circle at constant speed
   c) A ball thrown out the window of a tall building
   d) A person walking on a straight sidewalk at constant speed
   e) A box sliding down a frictionless hill

4) An object with constant **acceleration** will, over time, always:
   a) speed up
   b) slow down
   c) change direction
   d) change speed
   e) change velocity

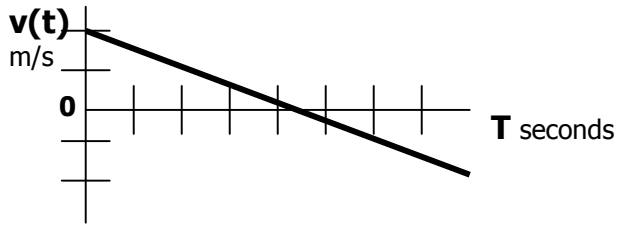
5) An object has a velocity of - 7.00 m/s at t=0. If acceleration is constant and negative, a velocity the object could have at some later time is:

a) zero m/s
b) -3.00 m/s
c) -10.0 m/s
d) 10.0 m/s
e) 3.00 m/s

6) The displacement of an object at time t=7 seconds is 15.0 m. One possible distance traveled causing this displacement is:

a) -8.00 m
b) 0.00 m
c) 7.00 m
d) 14.0 m
e) 17.0 m

7) In the velocity vs. time graph shown below, which statement is **false**?



a) The object starts from rest
b) The object stops at one point
c) The object experiences constant acceleration
d) The object changes direction
e) The object has a changing speed

8) The fundamental unit equivalent for Newtons (the unit of force) is:

a) kg m/s
b) s^2/kg m
c) kg m/s^2
d) kg m^2/s^2
e) m kg^2/s

9) When two vectors **A** and **B**, which have different directions and magnitudes, are added, their resultant will have a magnitude:

a) A+B
b) $\sqrt{|\mathbf{A}|^2 + |\mathbf{B}|^2}$
c) ½(**A**+ **B**)
d) zero
e) This cannot be determined without more information.

10) A child sleds down a hill. On a second trip down, his father, with mass 4 times that of the child, goes WITH the child in the same sled. The ratio of the sled/hill coefficient of kinetic friction on the first (child only) ride to that on the second (child and father) ride is:

a) 5:1
b) 1:4
c) 1:25
d) 1:5
e) 1:1

11) Planes get lift (the force that keeps them in the air) by maintaining a minimum air speed (the speed of air moving past the wings of the plane.) To maximize lift, on a windy day, a pilot should:

a) take off into the wind and land with the wind
b) take off with the wind and land into the wind
c) both take off and land with the wind
d) both take off and land into the wind
e) take off perpendicular to the prevailing wind

12) A car brakes while traveling around a 90 degree corner. In this situation:

a) $a_t \neq 0$ and $a_r \neq 0$
b) $a_t = 0$ and $a_r \neq 0$
c) $a_t \neq 0$ and $a_r = 0$
d) $a_t = 0$ and $a_r = 0$
e) $a_r \neq 0$, but impossible to tell about a_t

13) Consider your exam paper resting on your desk. The Newton's third law reaction force due to the action of the exam's weight on the desk is:

a) the friction between the paper and desk
b) the force of your pencil pushing down on the paper
c) the force of the desk pushing up on the paper
d) non-existent in this case
e) a force larger than the weight of the exam

14) An orange sitting on a shelf can be defined as being in a state of equilibrium. This means:

a) no forces are acting on the orange
b) all forces acting on the orange cancel each other out
c) only the force of gravity is acting on the orange
d) the orange is in a state of freefall
e) even if someone pushed on the orange, it would not move

15) A car on an icy road takes a corner too fast and slides off the road. The appropriate physics explanation for this would be that the ice resulted in:

a) too little centripetal force
b) too much frictional force
c) too much centripetal force
d) too little normal force
e) too much normal force

16) A projectile is launched over a level surface on the earth. Which of these statements about the projectile is **false**?

a) vertical acceleration is always $-9.80\ m/s^2$
b) horizontal velocity is constant
c) speed is a maximum when the projectile's at ground level
d) velocity is zero at the peak of its flight
e) the flight path is the shape of a parabola

17) An object here on earth has a mass of 41 kg. On the moon, where the gravitational acceleration is $1/6^{th}$ that of earth, the object would:

a) have a lower mass
b) have a higher mass
c) have a lower weight
d) have a higher weight
e) have the same mass and weight

18) The velocity of an object is described by the equation:
$\vec{v}(t) = 5\hat{\mathrm{i}} + 6t\hat{\mathrm{j}} + 7t\hat{\mathrm{k}}$ m/s. This object is accelerating in which directions?

a) y only
b) y and z
c) x, y, and z
d) z only
e) the object is not accelerating

19) A person is standing on a scale in an elevator. The scale reads 180 lb with the elevator at rest. The person presses the up button, then watches the scale while the elevator accelerates upward to a constant velocity, travels a bit, and then slows to a stop at a higher floor where the scale again reads 180 lb. During the trip, the scale's reading would:

a) decrease, return to 180 lb, increase
b) increase, return to 180 lb, decrease
c) increase and stay at a higher value
d) decrease and stay at a lower value
e) stay at 180 lb for the whole trip

20) A teacher pushes an eraser perpendicularly against a chalkboard where it stays. The force that keeps the eraser from falling to the floor is provided by:

a) the teacher's hand
b) the normal force
c) static friction
d) kinetic friction
e) centripetal force

Part II: QUANTITATIVE

Mark the bubble for the correct answer on the answer sheet. Use the backs of these test pages for scratch work.

<u>PARTIAL CREDIT POSSIBLE:</u> Select one (1), two (2), or three (3) answers
6 points if you mark the single correct answer
4 points if the correct answer is among your two choices
2 points if the correct answer is among your three choices

10 problems, 6 pts each =60 pts = 50% of exam

21) A car starts from rest and accelerates at a constant rate of 5.41 m/s^2 for 4.00 seconds. The car's average velocity during this time interval is:
a) 21.6 m/s
b) 10.8 m/s
c) 5.41 m/s
d) 7.20 m/s
e) 0 m/s

22) A ball undergoing constant acceleration rolls down a hill. At point A, its velocity is 2.65 m/s. At point B, its velocity is 4.21 m/s. If the two measurements are taken 3.10 seconds apart, find the constant rate of acceleration.
a) 6.86 m/s^2
b) 1.36 m/s^2
c) 3.43 m/s^2
d) 2.21 m/s^2
e) 0.503 m/s^2

23) A penny is dropped from an observation deck 421 m above a sidewalk. Neglecting air resistance, find the speed of the penny as it hits the sidewalk?
a) depends on the mass of the penny
b) 42.9 m/s
c) 64.2 m/s
d) 90.8 m/s
e) 1030 m/s

For problems 24-25, the displacement of an object is described by the equation: $\vec{r}(t) = 5\hat{i} + 6t^2\hat{j} + 7t\hat{k}$ m.

24) The displacement of this object at t=2.00 seconds is:
a) $\vec{r}(2) = 5\hat{i} + 24\hat{j} + 14\hat{k}$ m
b) $\vec{r}(2) = 24\hat{j} + 14\hat{k}$ m
c) $\vec{r}(2) = 5\hat{i} + 12\hat{j} + 14\hat{k}$ m
d) 43 m
e) 18 m

25) At t=3.00 seconds, the *y-component* of this object's velocity is:
a) 12 m/s
b) 24 m/s
c) 33 m/s
d) 36 m/s
e) 90 m/s

26) Consider the vector $\vec{R} = 7.51\,\hat{i} + 11.1\,\hat{j}$ m. Correctly expressed in polar coordinates, this vector is:

a) 13.4 m at 55.9° above the +x axis
b) -18.6 m at 55.9° above the +x axis
c) 18.6 m at 55.9° above the +x axis
d) 13.4 m at 34.1° above the +x axis
e) 13.4 m at 34.1° below the +x axis

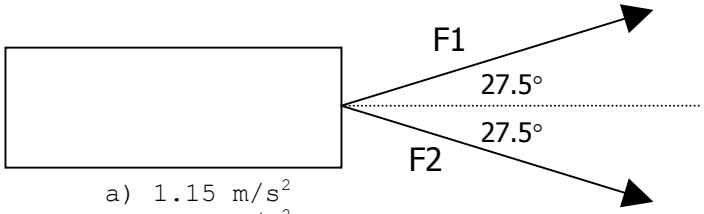
27) A ball with mass 0.550 kg is tied to a string and then swung in a horizontal circle with radius 1.45 m at a speed of 9.60 m/s. The tension force in the string is:

a) 3.64 N
b) 5.01 N
c) 19.2 N
d) 35.0 N
e) 36.7 N

28) A block with mass 2.50 kg slides at a constant velocity down a wooden ramp raised to an angle of 14.5° above the horizontal. What is the coefficient of kinetic friction between the block and ramp?

a) .251
b) .259
c) .310
d) .502
e) .968

29) A loaded sled with combined mass=271 kg rests on a level surface with μ_k= 0.25. Two people pull on ropes attached to the sled as shown from above. If F1 = F2 = 550 N, find the net acceleration of the sled.



a) 1.15 m/s^2
b) 1.81 m/s^2
c) 1.88 m/s^2
d) 3.60 m/s^2
e) 4.07 m/s^2

30) A baseball fan is in the stands just behind an outfield wall. She throws a ball onto the field. When the ball leaves her hand it has a purely horizontal velocity of 17.9 m/s and is 3.30 m above the level playing field. How far from the outfield wall the field does the ball hit the ground?

a) 5.42 m
b) 10.4 m
c) 14.7 m
d) 18.4 m
e) 29.6 m