
FAST National University of Computer and Emerging Sciences, Lahore

Course: EE-117: Applied Physics

Session: Fall 2019

Due Date: 23-Sep-2019 (In Class on Monday)

Section (Please circle): B / F

Name: _____

Instrument: Assignment-1

Instructor: Muhammad Shiraz Ahmad

Total Points: 100*

Roll No.: _____

*100 points = 90 points for questions and 10 bonus points if you obtain non-zero points in all of the questions.

Note: At the slightest suspicion of cheating, your submission will be marked zero. Write your answers/solutions in the spaces given below. After due date, 20% marks per day will be deducted.

Q. 1 (5 points) For What values of a are $\vec{A} = a\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{B} = 2a\hat{i} + a\hat{j} - 4\hat{k}$ perpendicular?

Q. 2 (5 points) Find a unit vector parallel to xy-plane and perpendicular to the vector $4\hat{i} - 3\hat{j} + \hat{k}$?

Q. 3 (25 points) Evaluate each of the following:

1. (5 points): $2\hat{j} \times (3\hat{i} - 4\hat{k})$
2. (5 points): $(\hat{i} + 2\hat{j}) \times \hat{k}$
3. (5 points): $(2\hat{i} - 4\hat{k}) \times (\hat{i} + 2\hat{j})$
4. (5 points): $(4\hat{i} + \hat{j} - 2\hat{k}) \times (3\hat{i} + \hat{k})$
5. (5 points): $(2\hat{i} + \hat{j} - \hat{k}) \times (3\hat{i} - 2\hat{j} + 4\hat{k})$

Q. 4 (5 points) A sky diver jumps out of a hovering helicopter. A few seconds later, another sky diver jumps out, and they both fall along the same vertical line. Ignore air resistance, so that both sky divers fall with the same acceleration. Does the difference in their speeds stay the same throughout the fall? Does the vertical distance between them stay the same throughout the fall? (No Calculation is Required!)

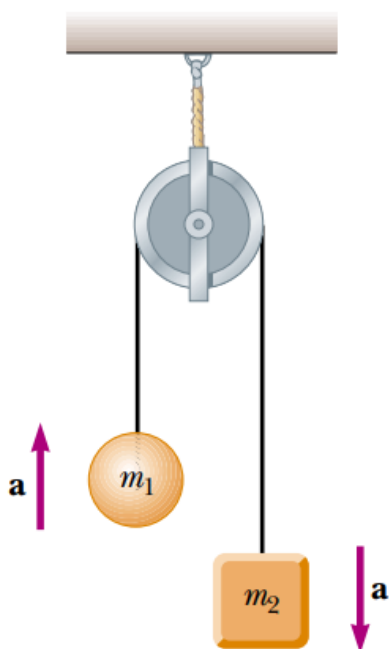
Q. 5 (5 points) A tennis ball is dropped from shoulder height (about 1.5 m) and bounces three times before it is caught. Sketch graphs of its position, velocity, and acceleration as functions of time, with the +y direction defined as upward. (No Calculation is Required!)

Q. 6 (30 points) The ball is thrown, straight upward, from the top of a tower with an initial velocity of 20.0 m/s. The height of the tower is 50.0 m high, and the ball misses the edge of the roof on its way down. Find:

1. (a) (5 points): time at which ball reaches its maximum height,
(b) (5 points): maximum height,
(c) (5 points): time at which ball returns to the height from which it was thrown.
(d) (5 points): velocity of ball at this instant, and
(e) (5 points): velocity and position of ball at $t = 5$ s.
2. (10 points) What if tower was 30.0 m tall instead of 50.0 m tall? Which answers in previous part would change? and Why? (No Calculation is Required!)



Q. 7 (5 points) Determine the magnitude of the acceleration of the two objects and the tension in the lightweight cord, in the configuration shown below:



Q. 8 (10 points) Discuss uniform circular motion to calculate:

1. (3 points) centripetal acceleration,
2. (1 point) time period,
3. (3 points) scalar components of velocity vector, acceleration vectors and the angle between x and y components of acceleration.
4. (3 points) Draw respective diagrams showing displacement vectors, velocity vectors and acceleration vectors.