

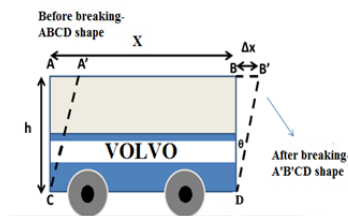
St. ID: _____,

Name: _____

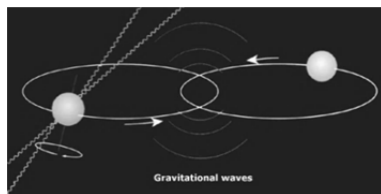
Chapter: 12-15, Serway; *ABSOLUTELY NO CHEATING!*

Please write down the answers on the blank space or on the back of this paper. Answer should be in english. [] indicates the question points.

Q1. VOLVO is designing new generation Truck with automatic emergency breaking system using AI (Artificial Intelligence) to avoid unexpected accident. Suppose a VOLVO truck starts journey from Taipei to Hualien with a speed 100 km/hr and for a emergency breaking if the upper part of the truck is tilted $\Delta x = 50$ cm as shown in figure with respect to the base, what will be the “Shear Stress”, Shear Strain” and “Shear Modulus” for the deformation? Let the length of the truck $L= 15$ m, height, $h = 5$ m and during the break there has been 500 N force produced in the horizontal direction. [30 %]



Q2. The gravitation wave is produced when two star systems merge/collide each other. If the two star systems of mass $M_1= 2 \times 10^{50}$ kg and $M_2=3 \times 10^{50}$ kg are orbiting in their own orbitals as shown in figure below and if they experience 6×10^{25} N force during the generation of gravitational wave, Find out the separation distance between them? [30%]



Q3. (a) If the gravitational wave is in simple harmonic motion and expressed by

$$y(x, t) = 4 \cos\left(\frac{8\pi}{20}x + 60\pi t + \phi\right),$$

find-out the (i) wavelength (ii) frequency (iii) period and (iv) amplitude of the motion. (Let, ‘x’ and ‘t’ are in kilometer and second) (b) (i) Write down the Bernoulli’s equation. (ii) Give two practical applications of Bernoulli’s principle. [20 +20 = 40%]