CATHOLIC UNIVERSITY OF EASTERN AFRICA

UNIT CODE: MAT 231:

UNIT NAME: classical mechanics 1

ASSESSMENT TEST ONE

a. Define Newton's third law of Motion (1mark)

b. A woman is driving between two toll booths 60m a part. She drives first 30m at a speed of 40m/s. at what constant speed should she drive the remaining distance so that her average speed between the toll booths to be 50m/s (4marks)

c. State two applications of classical mechanics (3marks)

d. The position of a particle as a function of time is given by

$$\tilde{r} = \{(2t^2 - 7t)i - t^4 j\}m$$

   i. Find it velocity at t=2sec (2marks)

   ii. Find its acceleration at 5sec (2marks)

   iii. Find its average velocity between t=1sec and t=3sec (2marks)

e. Give the definition of simple Harmonic motion (1mark)

f. If a cannon is fired from the point on the ground, the horizontal range R is defined as the distance from the firing point to the place where the shell hits the ground. Using the formula $y = x\tan\theta - \frac{1}{2}\frac{gx^2}{V_o{}^2 cos^2\theta}$ find this distance explaining each variable (4marks)

g. Suppose a force $\vec{F}$ is acting on a particle which undergoes a very small displacement $\Delta\vec{r}$ find the work done by this force (1mark)

h. A car decelerates with a constant deceleration from 60m/s to rest in a distance of 500m

   i. Calculate the acceleration (2marks)

   ii. How long did it take? (2marks)