UNIVERSITY OF GHANA

B.Sc. (ENG) SECOND SEMESTER EXAMINATIONS: 2015/2016

DEPARTMENT OF AGRICULTURAL ENGINEERING

FAEN 104: BASIC MECHANICS II (2 credits)

INSTRUCTION: *ANSWER ALL QUESTIONS*

TIME ALLOWED: *TWO AND HALF ($2\frac{1}{2}$) HOURS*

1. a) Explain the following terms:

i.	Displacement	**(2 marks)**
ii.	Instantaneous velocity	**(2 marks)**
iii.	Instantaneous acceleration	**(2 marks)**
iv.	Relative motion	**(2 marks)**
v.	Dependent motion	**(2 marks)**

b) A particle which moves along a straight line has a velocity in meters per second given by $v = 300 - 75t^2$ where t is in seconds. Calculate the total distance covered during the interval from $t = 0$ to $t = 3$ seconds and find the net displacement of the particle during this same interval.

(20 Marks)

2. a.) Define the term "impact" and explain the following:
   i. Central impact.
   ii. Eccentric impact.
   iii. Direct central impact.
   iv. Restitution period.

(8 marks)

b) Explain the Principle of conservation of linear momentum. **(2 marks)**

c) Two cylinders move along a rod in a frictionless manner as shown in figure 1. Cylinder *A* has a mass of 10 kg and moves to the right at a speed of 3 m/s, while cylinder *B* has a mass of 5 kg and moves to the left at a speed of 2.5 m/s. After collision, cylinder *A* moves to the left with a speed of 0.3 m/s.

i. What is the speed of cylinder *B* after impact
ii. What is the loss in kinetic energy?

(10 marks)

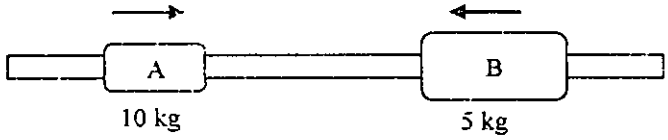

Figure 1

3. a) What is an impulsive force? **(5 marks)**

b) A particle of mass 1 kg is initially stationary at the origin, as a reference. A force having a known variation with time, given by $\boldsymbol{F(t)} = t^2\boldsymbol{i} + (6t + 10)\boldsymbol{j} + 1.6t^3\boldsymbol{k}$ N acts on the particle, where t is in seconds. Using the principle of linear impulse and momentum, determine the velocity of the particle after 10 seconds.

(15 marks)