



**UNIVERSITY OF GHANA**  
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**B.Sc (ENGINEERING) SECOND SEMESTER EXAMINATIONS: 2012/2013**

**FAEN 104: BASIC MECHANICS II (2credits)**

**INSTRUCTION:**

**ANSWER ALL QUESTIONS**

**TIME ALLOWED: TWO (2) HOURS**

1. a) Explain the principle of conservation of mechanical energy. (4 marks)
- b) A 6-kg block is released from rest 1 meter above the end of an unstressed spring (fig. 1). The spring has a modulus of 100 N/m. Determine the maximum deflection of the spring. (15 marks)

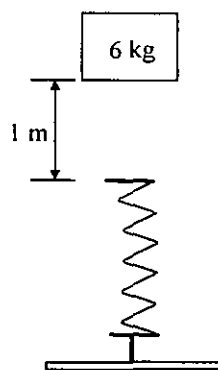


Figure 1

2. a) Define the following terms related to rectilinear motion of a particle:

- i. Displacement
- ii. Instantaneous velocity
- iii. Instantaneous acceleration

(6 marks)

b) A particle with an initial position vector  $\mathbf{r} = 5\mathbf{i} + 6\mathbf{j} + k$  m has an acceleration imposed on it, given as  $\mathbf{a} = 6t\mathbf{i} + 5t^2\mathbf{j} + 10k$  m/s<sup>2</sup>. If the particle has a zero velocity initially, what are the acceleration, velocity, and position of the particle when  $t = 10$  sec?

(15 marks)

3. a) A point on the rim of a flywheel has a peripheral speed of 10 m/s at an instant when this speed is decreasing at the rate of 60 m/s<sup>2</sup>. If the total acceleration of the point at this instant is 100 m/s<sup>2</sup>, find the radius of the flywheel.

(15 marks)

b) Two aircrafts,  $A$  and  $B$ , are flying at approximately the same altitude. Aircraft  $A$  is flying west with a velocity  $v_A = 900$  km/h, while aircraft  $B$  is flying north with a velocity  $v_B = 600$  km/h. Determine the magnitude and direction of the velocity which  $A$  appears to have to a passenger riding in  $B$ .

(15 marks)