



NATIONAL OPEN UNIVERSITY OF NIGERIA
Plot 91, Cadastral Zone, Nnamdi Azikiwe Express Way, Jabi-Abuja
FACULTY OF SCIENCES
January\February Examination 2018

Course Code: MTH315
Course Title: Analytics Dynamics I
Credit Unit: 3
Time Allowed: 3Hours
Total Marks: 70%

INSTRUCTION: ANSWER QUESTION ONE(1) AND ANY FOUR (4) QUESTIONS
(TOTAL = 5 QUESTIONS IN ALL)

- 1(a) State Conservation theorem for Total Angular Momentum **(4marks)**
- 1(b) Prove the theorem in a) above **(12marks)**
- 1(c) What are the scalar and vector representation of a conservative force?
(3marks each =6marks)
- 2(a) Write out the Lagrange's equation **(4marks)**
- 2(b) A particle is moving with simple harmonic motion of period 4π about a centre O, it passes through a point distance 4m from O with the velocity 4m/sec away from O. Find the time which elapses before it next passes through this point.
(8marks)
- 3 A particle moves along a curve whose parameter equation is given as
 $x = e^t$, $y = 2 \cos 3t$, $z = 2 \sin 3t$; where t is the time.
- (a) Determine its velocity and acceleration at any time t **(6marks)**
- (b) Find the magnitude of its velocity and acceleration at $t = 0$ **(6marks)**
- 4 A train moving with constant acceleration passes through three post A, B, C on a straight road. The distance from A to B is 15m and from B to b to C is 20m. The train takes 6seconds to go from A to B and 5seconds to go from B to C. Find the acceleration of the train and its distance from A to when its speed is 5.5m/seconds
(12marks)

5(a) A particle moves along the x-axis in a force field having potential $V = \frac{1}{2}kx^2$, $k > 0$.

Determine the point of equilibrium

(4marks)

5 (b) A string is tied to two points at the same level, and a smooth ring of weight W which can slide freely along the string is pulled by a horizontal force P . If in the position of equilibrium, the portions of the string are inclined at angle 60° and 30° to the vertical, find the value of P and the tension in the string.

(8marks)

6 A particle moves along a curve whose parameter equation is given as $x = e^t$, $y = 2 \cos 3t$, $z = 2 \sin 3t$; where t is the time.

(a) Determine its velocity and acceleration at any time t

(6marks)

(b) Find the magnitude of its velocity and acceleration at $t = 0$

(6marks)