



LIT

DEPARTMENT OF
INFORMATION TECHNOLOGY

Semester: Semester 1 (Winter 2014-2015)

Date/Time: Wednesday 14th January 2015, 10 AM – 12 NOON

Programme: Bachelor of Science (Honours) in Computing (Games Design and Development)

Stage: Year 4

Module: GAME PHYSICS

COMP 08030

Time Allowed: 2 hours

Instructions: Attempt any three (3) questions

Additional Attachments: None

External Examiners: Derek O'Reilly

Internal Examiners: Janice O'Connell, Eugene Kenny

Question No. 1**(33 Marks)**

- (a) Why is it necessary to use numerical methods to solve certain physics equation? Name, describe and compare two techniques that are used to solve certain equations numerically. (15 marks)
- (b) For a time dependent variable, $x(t)$, satisfying the equation: (18 marks)

$$x(t) = 100t - 2t^2$$

and with $x = 0$ at $t = 0$ show how you would solve for x using the techniques you have described above.

Question No. 2**(33 Marks)**

- (a) Discuss the problem of how best to represent rigid bodies for the purpose of collision detection and describe the different approaches that may be taken to solve it. (12 marks)
- (b) When your game program detects penetration of one rigid body object by another what technique would you use to work out the time of the actual collision? (13 marks)
- (c) One unwelcome effect in modelling bodies that may collide is tunnelling. What does this refer to, why does it happen and how can it be avoided? (8 marks)

Question No. 3**(33 Marks)**

- (a) What is meant by the term coefficient of restitution and it applies to objects involved in a collision? (8 marks)
- (b) If an object is dropped on a wooden floor from a height of 1m it bounces back to a height of 70cm. If the same object is dropped onto a concrete floor it bounces back to a height of 80cm. What are the respective coefficients of restitution and why are they different? (12 marks)
- (c) What equations govern spring motion with and without damping? If there is no damping what type of motion ensues when a force is applied? (13 marks)

Question No. 4

(33 Marks)

- (a) Evaluate a physics engine you have used in terms of its functionality, ease of use, learning curve and support. (15 marks)
- (b) What in your opinion are the pros and cons of writing your own physics engine compared to using one off the shelf? (18 marks)