

Institute of Technology Blanchardstown
Bachelor of Science in Computing
Computer Graphics (COMP H3016)
Theory Examination 2 – Sample
Weighting: 25%

Instructions to candidates: This exam is **closed book** so notes/books cannot be used. Talking and other forms of inter-personal communication are strictly prohibited. The exam is a written exam so scripts should be handed to the invigilator at the end with your name and student number printed clearly on them. Keep handwriting as legible as possible.

Time allowed: 1 hour

Answer ALL questions (total 100 marks)

Question 1 (50 marks)

- a) What is the difference between a lighting model and a shading model?
Explain what ‘constant shading’ is and why it is not an appropriate technique for shading a polygonal mesh representing a curved surface.
(5 marks)
- b) Give a formula for calculating diffuse reflection according to the Phong model. Explain the meaning of all terms in the formula.
(15 marks)
- c) A surface has diffuse coefficients (0.2, 0.35, 0.5) with a light source strength of 250. The angle between the surface normal and the direction to the light is 30 degrees. Use the Phong diffuse reflection formula to calculate the reflected colour of the surface
(10 marks)
- d) Describe the workings of the Gouraud shading algorithm. Use diagrams and equations to support your answer.
(20 marks)

Question 2 (25 marks)

- a) Describe the Computer Graphics technique known as “texture mapping”? Explain the technique known as “two part texturing”. You should mention *S* mapping and the different types of *O* mapping. (15 marks)
- b) Describe briefly the following approaches to texture mapping:
- i) Diffuse Colour Modulation
 - ii) Bump Mapping
 - iii) Environment Mapping
- (10 marks)

Question 3 (25 marks)

- a) Explain the term “hidden surface removal”. List three reasons why a surface in world space should not be rendered in 3-d computer graphics. (10 marks)
- b) Describe the depth buffer/z-buffer algorithm for hidden surface removal (HSR). Your answer should use diagrams and pseudocode/C code. (15 marks)