UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	COMPUTER GRAPHICS AND ANIMATION
COURSE CODE	:	BIM 20303
PROGRAMME CODE	:	BIM
EXAMINATION DATE	:	DECEMBER 2017 / JANUARY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 For **Q1(a) – (j)**, answer **True** or **False**.

(a) Using odd parity rule, a point lies inside a polygon if a line starting at the point intersects with an even number of edges

(b) Fonts can only be stored in raster graphic in order to ease the process of modifying its resolution.

(c) Color gradient is one example of color interpolation in a polygon.

(d) In image processing, color interpolation using weight matrix is assigned to each pixel for smoothing operation.

(e) Directed Acyclic Graph (DAG) contains no loop and each node can have several parent nodes.

(f) For rendering a 3D object, the surfaces are approximated by a large number of triangles because every point of the triangle lies in the same plane.

(g) Larger voxel will give good quality approximation of 3D object because of its low computation and memory cost.

(h) Object-precision algorithm computes each object in the clipping volume.

(i) Back-face culling can remove unnecessary polygons quickly.

(j) The purpose of front-end culling is to detect polygons that are invisible in a particular scene

(10 marks)

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Q2 (a) Consider the endpoints of $P_1(2,3)$, $P_2(8,7)$. Calculate the points that made up the line P_1P_2 using Bresenham's algorithm.

```
Decision parameters:
P₀ = 2Δy – xΔ
Pk+1 = Pk + 2Δy or Pk+1 = Pk + 2Δy –2Δx
```

(14 marks)

(b) Plot the resulting pixel line which has been obtained from **Q2(a)** on a given plotting sheet in Figure **Q2(b)**.

(2 marks)

Q3 Based on the endpoints given in **Q2(a)**, write an OpenGL code snippet to generate a straight line using Bresenham's algorithm based on the following functions:

(a) `setPixel(x,y)`

(6 marks)

(b) `line()`

(21 marks)

Q4 (a) Using the midpoint circle algorithm, determine the position of each pixel of the circle in the third quadrant if a radius, $r = 6$ is given. Show your work to derive the answer.

```
Decision parameters:
p₀ = 1– r
pk+1 = pk + 2xk+1 + 1 or pk+1 = pk + 2xk+1 + 1 – 2yk+1
```

(8 marks)

(b) Plot the resulting pixel line which has been obtained from **Q4(a)** on a given sheet in Figure **Q4(b)**.

(3 marks)

Q5 (a) Shade the interior of the polygon shown in Figure **Q5(a)** according to the odd parity rule.

(6 marks)

(b)   One of the problem in odd parity rule implementation is intersection between scan line and vertices of the polygon. Explain that problem and suggest **ONE (1)** solution to solve the problem. Support your explanation with an appropriate diagram.

(5 marks)

Q6   (a)   Explain why surface and texture properties are important for conveying information from 3D object?

(6 marks)

(b)   Computer animation can be produced by **THREE (3)** activities. State those activities.

(6 marks)

Q7   (a)   Explain octrees model as 3D modeling technique.

(8 marks)

(b)   Give **THREE (3)** advantages and **TWO (2)** disadvantages of z-buffer algorithm.
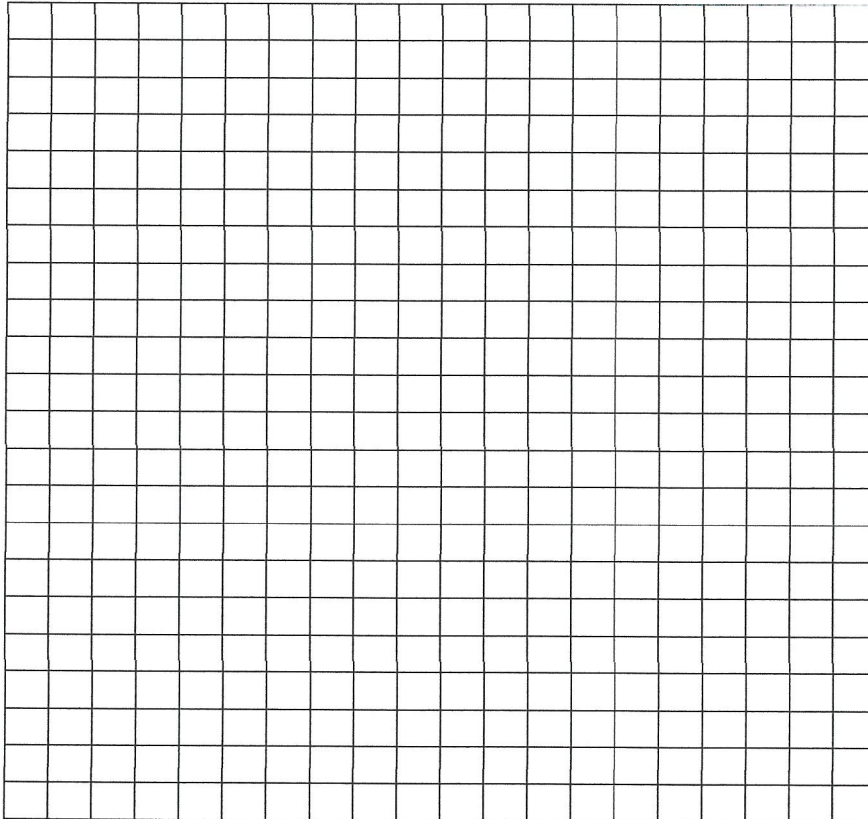
(5 marks)

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- END OF QUESTION -
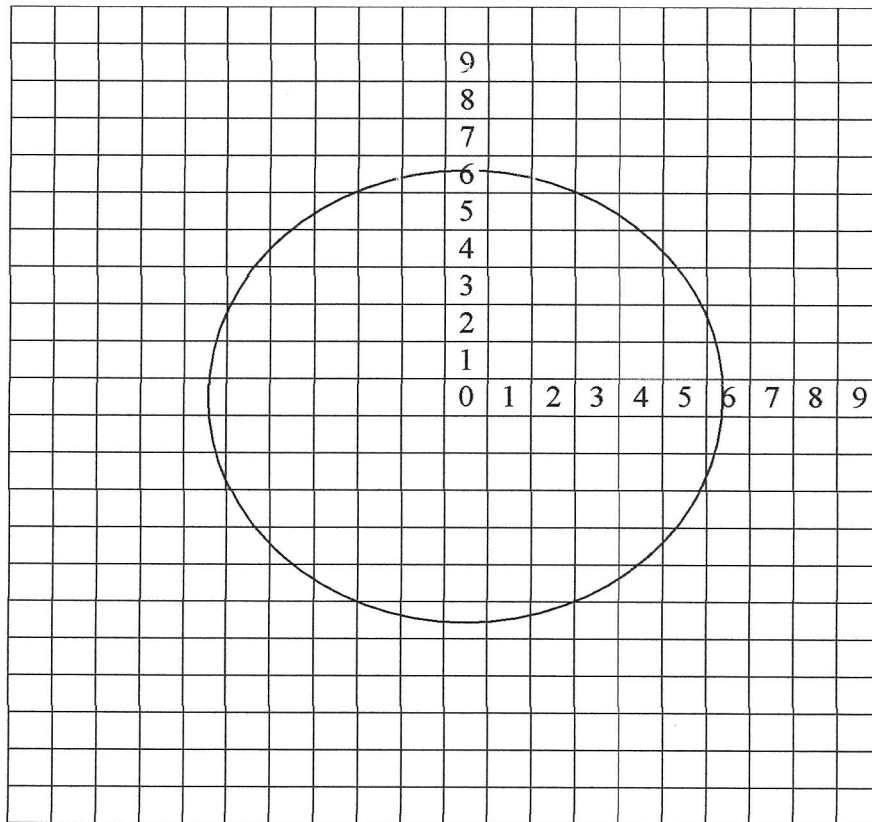
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FIGURE Q2(b)

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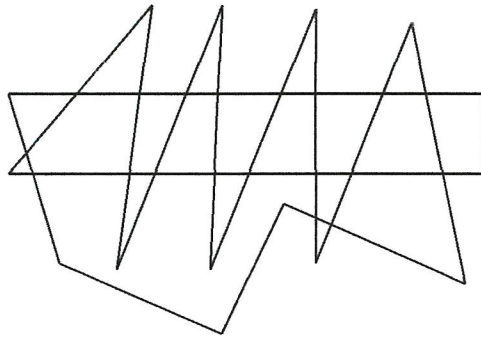**FIGURE Q4(b)**

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FIGURE Q5(a)