(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.

2) Figures to the right indicate marks.

3) Illustrations, in-depth answers and diagrams will be appreciated.

4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All the Questions (15M)

(a) Multiple Choice Questions:

1. Which of the following function represents y=mx+c?

a) Linear b) Cubic

c) Trigonometric d) Quadratic

2. The Theorem of Pythagoras in 3D is

a) $d = \sqrt{\Delta x2 + \Delta y2 + \Delta z2}$ b) $d = \sqrt{\Delta x1 + \Delta y2 + \Delta z1}$

c) $d = \sqrt{\Delta x2 + \Delta y1 + \Delta z2}$ d) $d = \sqrt{\Delta x2 + \Delta y2 + \Delta z1}$

3. Which of the following lightning type interpolates the normal and perform lightning calculations?

a) diffuse lightning b) pixel lightning

c) point lightning d) spot lightning

4. Which of the following method of MonoBehaviour class is called 60 frames per second?

a) Start() b) Init()

c) Update() d) Run()

5. Which of the following represents animation clips structured flowchart?

a) Animation Container b) Animation Controller

c) Animation Class d) Animation Frame

(b) Fill in the blanks (Use following pool to answer questions)

[Unit, depth, Position, XMFLOAT3, Box, Circle, Roll]

1. A vector p is vector if point P(x, y, z) is vector's head and origin is its tail.

2. The buffer is a texture that does not contain image data but contains depth information about a particular pixel.

3. In 3D graphics angle of rotation of an object about x-axis is .

4. describes a 3D vector consisting of three single precision floating point values.

5. In UFO game collider is best suited for pickup objects.

(c) Answer in ONE or TWO sentences:

1. What is Sine Rule?

2. What is back buffer?

3. Explain the prototype of WinMain() function.

4. What is unit quaternion?

5. List any four applications of augmented reality.

Q. 2 Attempt the following (Any THREE) (15M)

(a) Define quaternion. Explain addition and subtraction of quaternion with suitable example.

(b) Explain in brief the situation which leads to gimbal lock.

(c) What is GPU? Explain in brief the communication between CPU and GPU.

(d) Explain in brief 3D scaling and 3D translation with suitable example.

(e) Write a short note on perspective projection.

(f) Explain how to derive a unit normal vector for a triangle.

Q. 3 Attempt the following (Any THREE) (15M)

(a) Explain in brief the role of following functions in window creation:

a. GetMessage()

b. PeekMessage()

c. TranslateMessage()

d. DispatchMessage()

e. PostQuitMessage()

(b) Explain the concept on index buffer and vertex buffer.

(c) Explain the input assembler(IA) stage of Direct3D11 rendering pipeline.

(d) State and prove the cosine rule.

(e) What is the idea behind compound angle?
Show that:

a. $\sin(A \pm B) = \sin(A)\cos(B) \pm \cos(A)\sin(B)$

b. $\sin(2B) = 2\sin(B)\cos(B)$

(f) Write a short note on swap chain of DirectX rendering pipeline.

Q. 4 Attempt the following (Any THREE) (15 M)

(a) What is mixed reality? Explain in brief any four applications of it.

(b) Write a short note on smart glasses.

(c) Explain capsule and sphere colliders used in Unity under 3D project.

(d) Write a short note on animation controller in Unity.

(e) Write down the steps for following:

a. Adding Audio

b. Adding Video

c. Adding GUIText element

(f) Write a short note on RigidBody component of Physics under 3D project.

Q. 5 Attempt the following (Any THREE) (15 M)

(a) Given a light source at (20,20,40) and the illuminated source as (0,10,0) and unit
vector n (0,1,0) check the visibility of the object.

(b) State the difference between diffuse lighting and specular lightning.

(c) What is multi-sampling? Describe how multi-sampling is done in Direct3D.

(d) Explain in brief COM with respect to Direct3D.

(e) State the difference between virtual reality and augmented reality.