Computer Graphics 1ˢᵗ Exam [*50 Marks*]

Q1/ What is computer graphics? [5 Marks]

Computer graphics provides a set of tools to create pictures and to interact with them in natural ways. The tools consist of both hardware and software, and together they permit programmers to fashion programs with a strong graphics capability. Data are presented visually through shapes, colors, and texture rather than by tables of numbers. Words and numbers are replaced whenever possible by pictures, because the eye-brain system is better at recognizing and interpreting visual representations. With interactive graphics a person instructs the computer using natural hand movements, such as pointing and drawing.

Computer graphics has become an important technical discipline within computer science and engineering, with its own set of fascinating ideas, techniques, and sometimes astonishing graphics devices.

Q2/ State the process of writing an algorithm. [5 Marks]

- Taking your problem
- Breaking it down
- Abstracting it to be able to be solved without a computer
- Then you can translate those steps into code

Q3/ Define: Image processing, An algorithm. [5 Marks]

An algorithm is any well-defined computational procedure that takes some values as input and produces some values as output. An algorithm provides a step-by-step method for solving a computational problem.

Image processing (more precisely, digital image processing) is the field that deals with methods, techniques, and algorithms for image manipulation, enhancement, and interpolation.

Q4/ Compare between: Algorithm and Program. [*5 Marks*]

Unlike programs, algorithms are not dependent on a particular programming language, machine, system, or compiler (usually described using natural language and pseudo code).

Q5/A/ As was taken in the circle lecture, a circle is symmetric about 4-axis which generate 8 points. Write a procedure that generate 8-point from a given point (X, Y) and circle center (X_c, Y_c). [*10 Marks*]

```
drawCircle(int xc, int yc, int x, int y)
{
    putpixel(xc+x, yc+y);
    putpixel(xc-x, yc+y);
    putpixel(xc+x, yc-y);
    putpixel(xc-x, yc-y);
    putpixel(xc+y, yc+x);
    putpixel(xc-y, yc+x);
    putpixel(xc+y, yc-x);
    putpixel(xc-y, yc-x);
}
```

Q5/B/ A circle with center (30, 20) and radios 2, give the corresponding points using the following algorithm: [*20 Marks*]

1. Set initial values of (X_c, Y_c) and (X_0, Y_0)
2. Set decision parameter d to $d_0 = 1 - r$
3. Call drawCircle(X_c, Y_c, X, Y) function
4. Suppose the current point is (X_k, Y_k) and the next point is (X_{k+1}, Y_{k+1}).
5. If $d_k < 0$: $X_{k+1} = X_k + 1$, $Y_{k+1} = Y_k$, $d_{k+1} = d_k + 2(X_{k+1}) + 1$
6. Else: $X_{k+1} = X_k + 1$, $Y_{k+1} = Y_k - 1$, $d_{k+1} = d_k - 2(Y_{k+1}) + 2(X_{k+1}) + 1$
7. Call drawCircle(X_c, Y_c, X, Y) function
8. Repeat from step 4 until $X_k >= Y_k$

30,22	31,22	32,21
30,22	29,22	28,21
30,18	31,18	32,19
30,18	29,18	28,19
32,20	32,21	31,22
28,20	28,21	29,22
32,20	32,19	31,18
28,20	28,19	29,18