Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
300 level 1st Semester Examination – Jul. / Aug. 2016
CST361-2 Computer Graphics

Uva Wellassa University

Instructions to candidates:
Duration: Two (02) hours
Number of questions: Four (04)
Answer all questions
Mark allocation: 100

1.

a. Define the term **Infographics**.

(2 mark)

b. Differentiate between Computer Graphics and Digital Image Processing.

(8 mark)

c. Critically analyze the importance of having dedicated graphic processing unit for a computer rather than sharing resources.

(5 mark)

d.

i. Explain the principal sensor arrangements used in image acquisition.

(3 mark)

ii. Compare and contrast the working principles of Charge-Coupled Device (CCD) and Complementary Metal-Oxide Semiconductor (CMOS) sensor technologies.

(5 mark)

e. What is meant by **demosaicing**?

(2 mark)

2.

a.

i. List the key differences between additive and subtractive colour models.

(3 mark)

ii. State the mathematical relationship(s) for converting an RGB value to CMYK value.

(3 mark)

iii. Convert the RGB value (255,155, 0) to CMYK.

(2 mark)

b. List key steps of Digital Differential Analyzer (DDA) line drawing algorithm acts as an incremental approach to speed-up the scan conversion.

(3 mark)

(42) (20)

c. Using Cohen-Sutherland Clipping algorithm determine whether a lines shown in Fig.01 are inside, outside or partially inside of the world window.

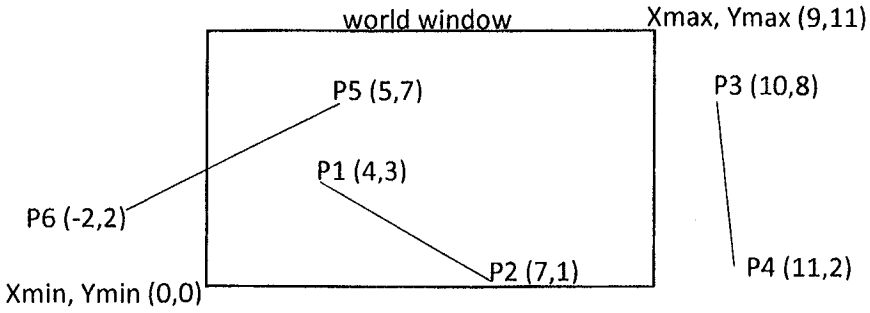

Figure 01: Position of some straight lines w.r.t. a world window

(4 mark)

d. Using Sutherland Hodgman polygon clipping algorithm, clip the polygon below (Fig.02). Note: Clearly state the intermediate steps.

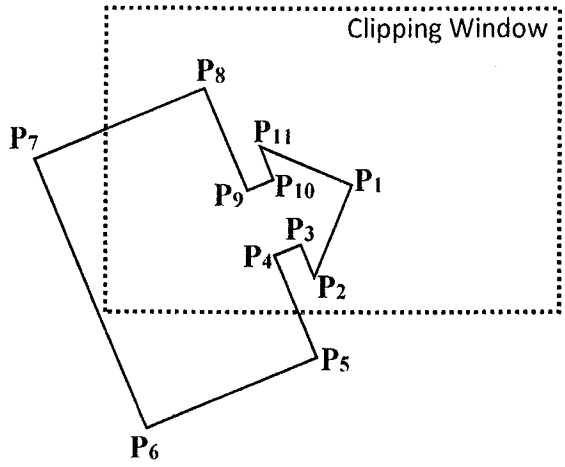

Figure 02: A polygon to be clipped

(10 mark)

3.

a. Explain three (03) basic components of a typical illumination model.

(4 mark)

b. Compare and contrast different types of planar geometric projections used to describe a three-dimensional object.

(3 mark)

c.

i. List the sequence of transformations required to rotate an object about its centre point (x_c, y_c).

(4 mark)

ii. Derive the composite transformation matrix for the sequence written for c.(i).

(6 mark)

iii. Find the resulting points after rotating +45° about its center, for the following case (Refer Fig. 03.), using the derived composite transformation matrix in above c.(ii).

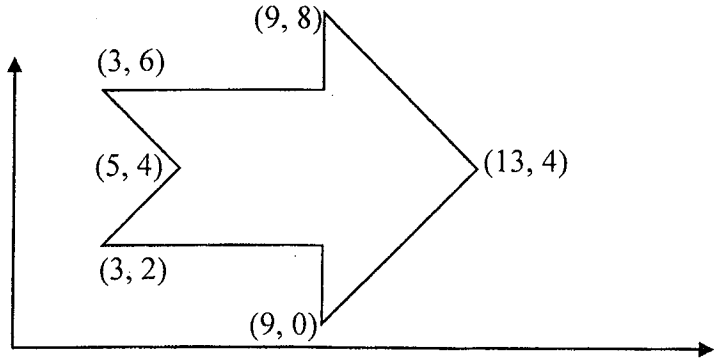

Figure 03: Object to be rotated about its centre

(8 mark)

4.

a.

i. List the steps to be followed in order to perform a general 3-D rotation of an object in a 3D space.

(3 mark)

ii. Derive the formula for the composite transformation $\boldsymbol{R(\theta)}$ stated in a.(i).

(4 mark)

b. Derive the composite matrix for the following sequence of transformations:

i. Translate by $-t_x$, $-t_y$, $-t_z$ in x, y, and z respectively to move it to origin
ii. Rotate by an angle of α about y-axis
iii. Scale the object by scale factors $S_y = 2.S_x$ and $S_z = 3.S_x$
iv. Reflex it through x-z plane
v. Translate it back to its original position

(10 mark)

c. Transform the position vector [5 -6 7 1] according to the above 4.b. sequence of operations. ($t_x = 2$, $t_y = 4$, $t_z = 6$, $S_x = 0.5$, $\alpha = +30°$)

(8 mark)