Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Computer Science and Technology
300 level 1st Semester Examination – Sept. / Oct. 2015
CST 361-2 Computer Graphics

Uva Wellassa University

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

1.

a. Define the term **Pixel**.

(2 mark)

b. Explain the working principle of a **Thin Film Transistor (TFT) Liquid Crystal Display (LCD)** monitor.

(8 mark)

c. Discuss the advantages of **accelerated graphics adapters** over **non- accelerated graphics adapters**.

(5 mark)

d.

i. What is an **Active-Pixel Sensor (APS)?**

(3 mark)

ii. What is the key technique used in **CMOS** sensor in order to improve **CCD**?

(2 mark)

e. Explain the importance of **High-dynamic-range imaging (HDRI or HDR)** technology.

(5 mark)

2.

a.

i. Compare and contrast **RGB** and **CMYK** colour models.

(3 mark)

ii. Convert the RGB value (200,150,100) to CMYK.

(4 mark)

b. Using appropriate examples, explain how **Cohen-Sutherland** Clipping algorithm can be used to determine whether a line is inside, outside or partially inside of the world window.

(5 mark)

c. Explain the terms of the following illumination model:
$\mathbf{Illum} = K_a I + K_d I \cos(\theta) + K_s I \cos^f(\varphi)$

(3 mark)

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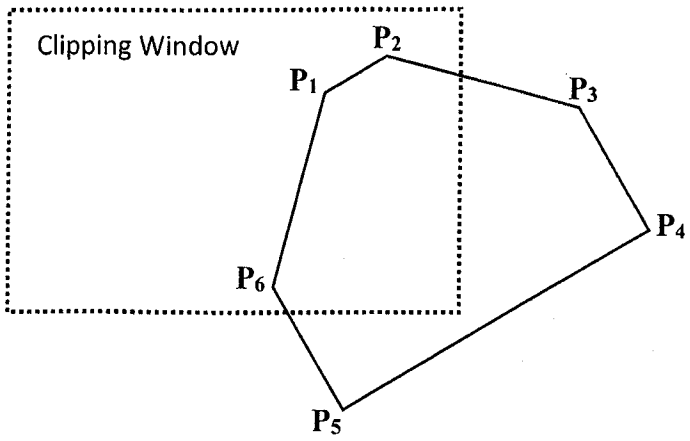
d. Using **Sutherland Hodgman** polygon clipping algorithm, clip the polygon below. Clearly state the intermediate steps.



(10 mark)

3.

a. Differentiate **perspective** and **parallel projections**.

(4 mark)

b. Using suitable graphical illustrations, explain how different perspective views are being produced by varying the number of **vanishing points**.

(3 mark)

c.

i. List the sequence of transformations required to rotate an object about an arbitrary point (x_a , y_a).

(4 mark)

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

(6 mark)

iii. Find the resulting points after rotating +30° about the point (6, 4), for the following case (Refer Fig. 01.), using the derived composite transformation matrix in above c.(ii).

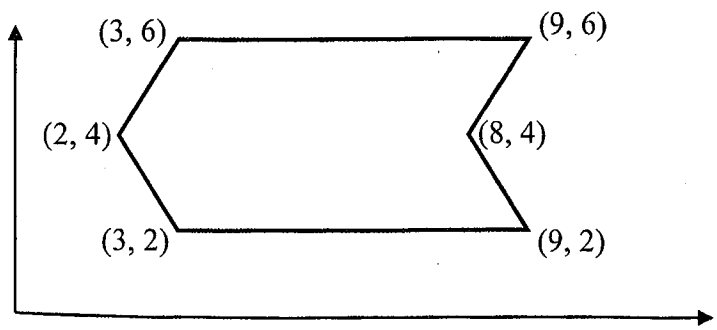


Fig. 01

(8 mark)

4.

a.

i. List the steps to be followed in order to perform a rotation of an object about its axis 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. Reflex it through y-z plane.
iii. Scale the object by scale factors $S_x = S_y = S_z$.
iv. Rotate by an angle of α about z-axis.

(10 mark)

c. Transform the position vector [2 -3 2 1] according to the above 4.b. sequence of operations. ($t_x = 3$, $t_y = 4$, $t_z = 5$, $S_x = S_y = S_z = 2$, $\alpha = +45°$)

(8 mark)

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