(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2167 Roll No. | | | | | | | | | |

B.Tech.

(SEMESTER-V) THEORY EXAMINATION, 2012-13

COMPUTER GRAPHICS

Time : 2 Hours] *[Total Marks : 50*

Section – A

1. Attempt **all** parts each carry equal marks (2 marks each). **5 × 2 = 10**

   (a) Give window to viewport transformation matrix.

   (b) Where and why clipping is needed in graphics ?

   (c) Explain Phong illumination model in brief.

   (d) Give parametric and non-parametric representation of curve in 3-D.

   (e) We require large refresh rate mainly due to short persistence of phosphor. Why not use a long persistence of phosphor instead to reduce the frame rate ?

Section – B

(Solve 3 questions out of 5 questions.) **5 × 3 = 15**

2. (a) Explain Sutherland-Hodgman polygon-clipping algorithm. Why this algorithm works for only convex clipping region ?

   (b) Implement a back-face detection procedure using an orthographic parallel projection to view visible faces of a convex polyhedron. Assume that all parts of the object are in front of the view plane and provide a mapping onto a screen viewport for display.

   (c) Show that the composition of two rotations is additive by concatinating the matrix representations for $R(\theta_1)$ and $R(\theta_2)$ to obtain

$$R(\theta_1) * R(\theta_2) = R(\theta_1 + \theta_2)$$

(d) Design a parallel version of Bresenham's algorithm for straight liens of any slope.

(e) Write a procedure to transform the vertices of a polyhedron to projection coordinates using a parallel projection with a specified projection vector.

Section – C

(All questions are compulsory and carry equal marks.) **$5 \times 5 = 25$**

3. Explain with example – Warnock algorithm for hidden surface removal. Also draw the window tree structure for the same example.

OR

Consider three different raster systems, with resolutions of 640×400, 1280×1024 and 2560×2048. What size frame buffer (in byte) is needed for each of these systems to store 12 bits per pixel ? How, much storage is required for each system if 24 bits per pixel are to be stored ?

4. Write and explain with example Weiler and Atherton polygon clipping algorithm.

OR

Write a routine to perform both interior and exterior clipping, given a particular window system display. Input to the routine is a set of window positions on the screen, the objects to be displayed in each window, and the window priorities. The individual objects are to be clipped to fit into their respective windows, then clipped to remove parts with overlapping windows of higher display priority.

5. Write a program to shear an object with respect to any of the three coordinate axes, using input values for the shearing parameter.

OR

Draw the block diagram of implementation of 3-D viewing, while converting 3-D world coordinate output primitive to 2-D device coordinate. Also explain the functionality of each block.

6. Consider the four two-dimensional position vectors $P_1[\ 0\ \ 0]$, $P_2[\ 1\ \ 1]$, $P_3[-2\ \ -1]$, $P_4[3\ \ 0]$. Determine the piecewise cubic spline curve through them using the chord approximation for the t_k's. The tangent vectors at the ends are $P'_1[\ 1\ \ 1]$ and $P'_4[1\ \ 1]$. Calculate intermediate points at $\tau = 1/3, 2/3$ for each segment.

OR

Develop a program to implement the scan-line algorithm for displaying the visible surfaces of a given polyhedron. Use polygon and edge tables to store the definition of the object and use coherence techniques to evaluate points along and between scan lines.

7. Show that two successive reflections about either of the coordinate axes is equivalent to a single rotation about the coordinate origin.

OR

Explain in brief RGB, YIQ, CMY and HSV colour models in detail.
