Model Question Paper:-

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CSE 5-3
ASSIGNMENT-2

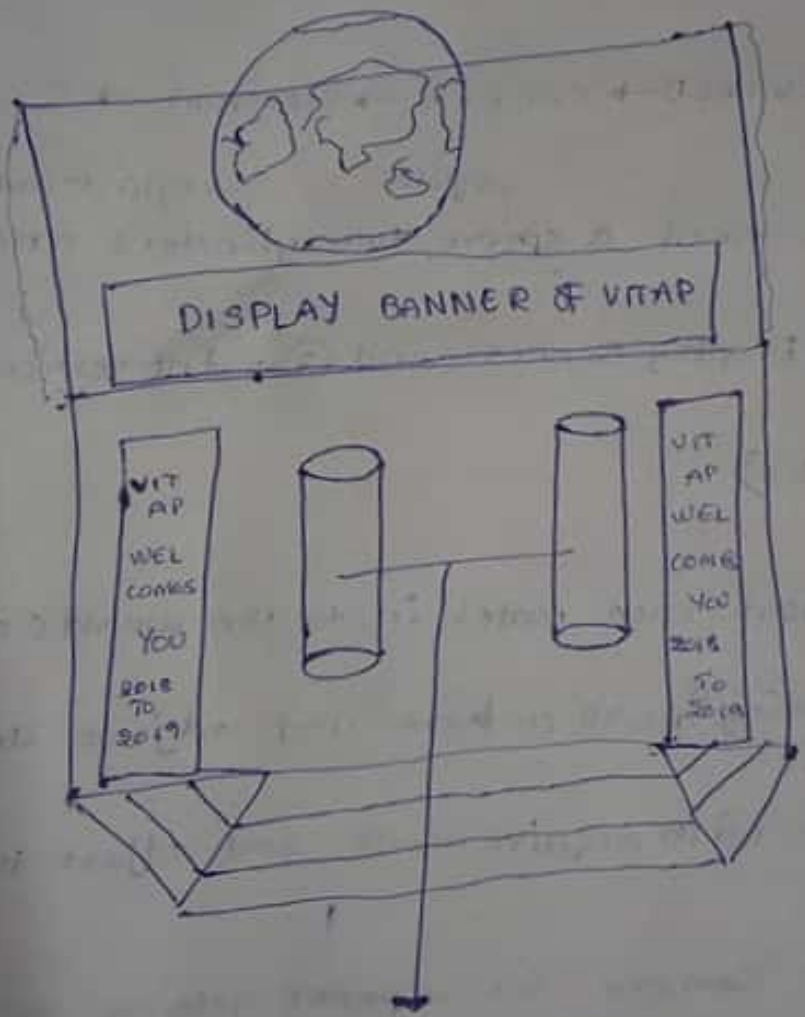
1 (a) Basic Primitives:-

Circle/Ellipse/sphere → for Globe

Rectangles → Pillars and all other items

Cylinders → Cylendrical beam.

(b) Front view



Top view:-

© Graphical pipeline:-

MODEL → WORLD → CAMERA → VIEWPORT → SCREEN

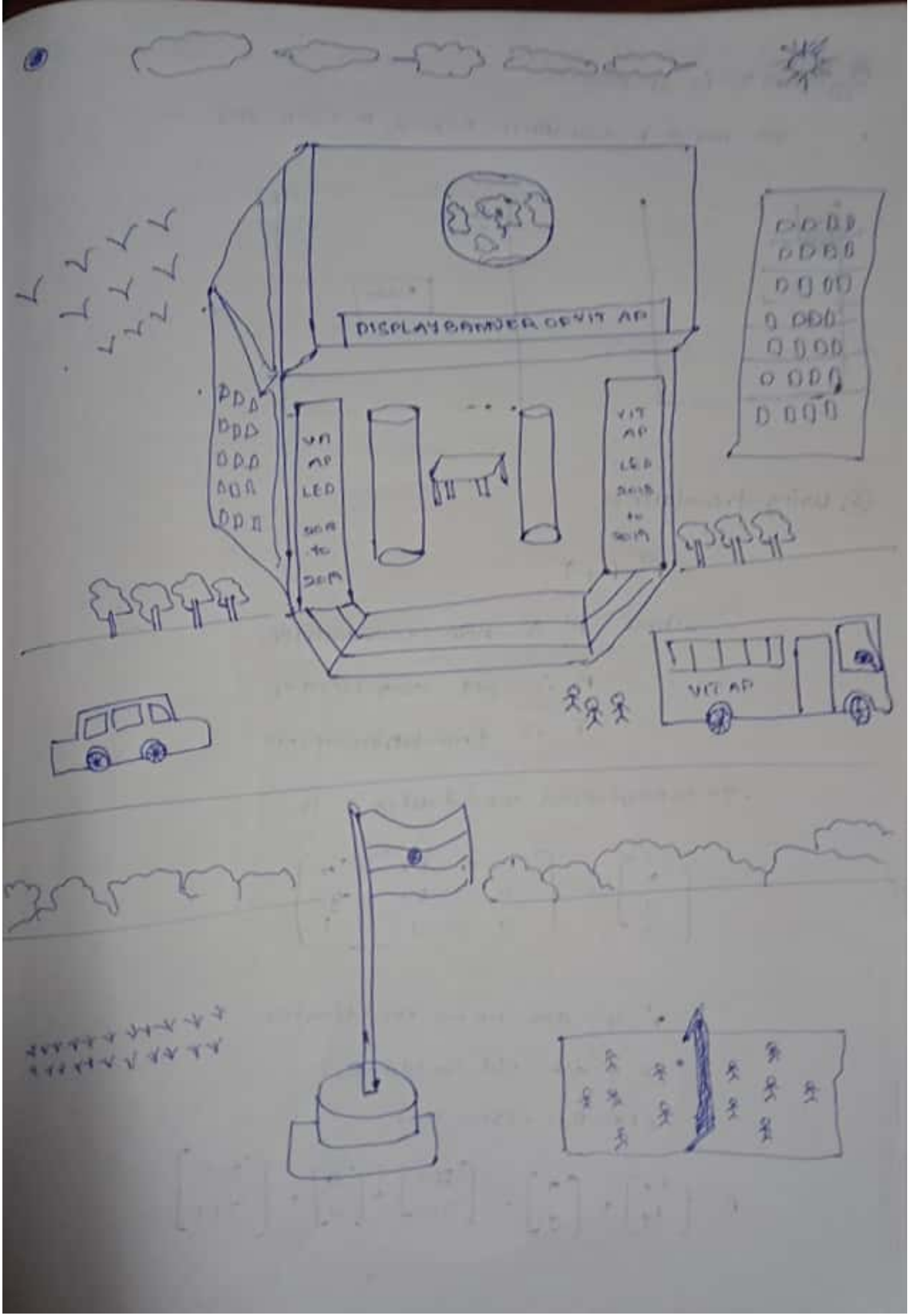
(i) MODEL :- We need a sphere (→ globe), two cylinders (→ cylindrical beams) and 3 rectangular surfaces ((1) Display Banner and (2) : Flat vertical surface to display LEDs)

(ii) World:- Import each model in to the world (surrounding) And surranding port co here and adjust its positions in accordance with requirements and adjust the size

(iii) CAMERA :- Camera for ~~accept~~ getting a proper view and set it to get suitable position.

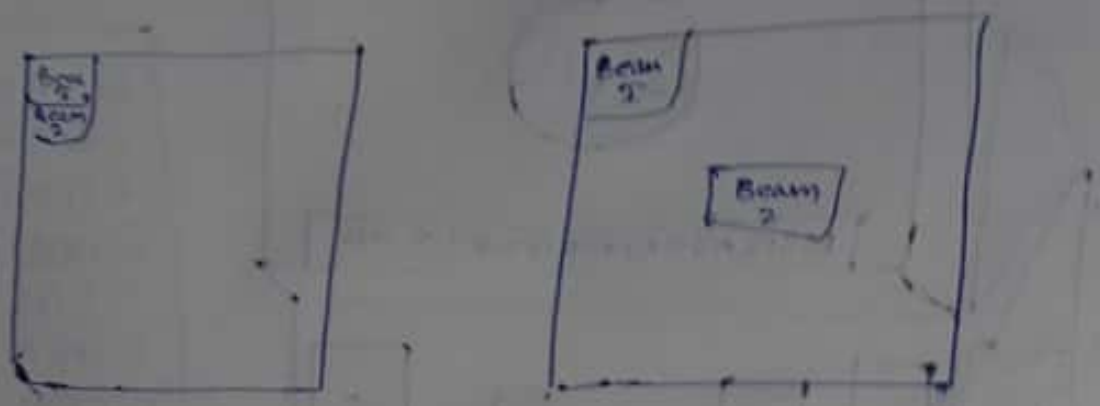
(iv) viewport:- we have to set view port.

(v) Screen:- Viewport is projected on the screen. That is flush everything to the screen.



(3) (1) Beam I is at origin.

we need to transform beam 2 to (300, 300)



(2) using translation

$$P' = P + T$$

where P' is new coordinates

P is old coordinates

T is translation vector.

- In homogeneous coordinates, it is

$$\begin{bmatrix} x' \\ y' \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & t_x \\ 0 & 1 & t_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

x', y' are new coordinates

x, y are old coordinates

$(t_x, t_y) = (300, 300)$

$$P = \begin{bmatrix} t_x \\ t_y \end{bmatrix} + \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 300 \\ 300 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 300 \\ 300 \end{bmatrix}$$

④ The size of canvas is known and its ratio is 1:1

So its better to choose ratio of 1:1

⑤ (i) Aspect ratio

(ii) Camera position

(iii) Depth of field

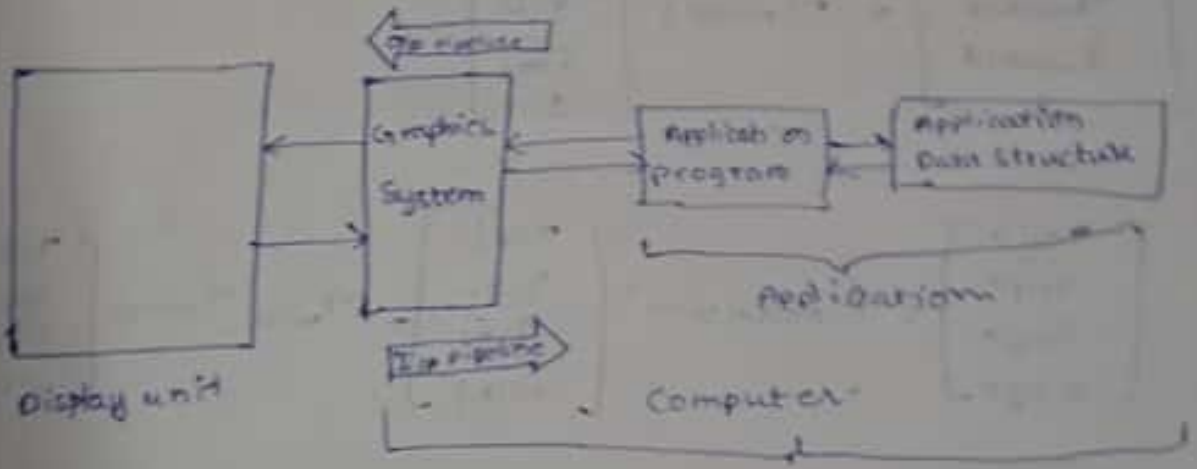
(iv) Lighting & exposure

(v) field of view

⑥ Rendering pipeline

Rendering

- projection
- Shade etc
- occlusion (lighting exposure)
- Reflection (Refraction
- colour
- Indirect illumination



After rendering process a vector image is processed which is composed of points and paths rather than pixels this image contains the image of building with in top view of front view as defined with all the requirements

(g) This can be done by ray tracing which is a rendering technique for generating an image by tracing the path of light as pixels in an image plane and simulating the effects of its encounters with vertical objects.

(h) By using pushMatrix() and popMatrix(), we can apply transformations on beam 2 without effecting beam 1 and other objects. PushMatrix saves the current coordinate system in stack where as pop matrix restore it.

(i)
$$\begin{bmatrix} x_{world} \\ y_{world} \\ z_{world} \\ 1 \end{bmatrix} = M_{model} \cdot \begin{bmatrix} x_{obj} \\ y_{obj} \\ z_{obj} \\ 1 \end{bmatrix}$$

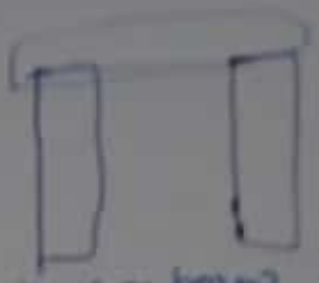
$$\begin{bmatrix} x_{eye} \\ y_{eye} \\ z_{eye} \\ w_{eye} \end{bmatrix} = M_{modelview} \cdot \begin{bmatrix} x_{obj} \\ y_{obj} \\ z_{obj} \\ w_{obj} \end{bmatrix} = M_{view} \cdot M_{model} \begin{bmatrix} x_{obj} \\ y_{obj} \\ z_{obj} \\ w_{obj} \end{bmatrix}$$

$$\begin{bmatrix} x_{clip} \\ y_{clip} \\ z_{clip} \\ w_{clip} \end{bmatrix} = M_{projection} \begin{bmatrix} x_{eye} \\ y_{eye} \\ z_{eye} \\ w_{eye} \end{bmatrix}$$

(j) No, it can't be done unless you restore the picture. Because any operation such as colour correction, adding texture etc can be done only through pixels which is a primitive of raster picture. This can be easily found in Photoshop where you would rasterise picture for applying some color correct and all.

(x) Since clipping is cutting out a portion of an object after

Clipping beams you can only see beams



(y) When we apply culling to beam 1, it has no effect on beam 2 but beam 1 will be completely excluded out of the pipeline.

(m) RGB stands for Red, green and blue and ranges from 0 to 255 for R, G & B

(i) (0,0,0) → Beams will be filled with black colour

(ii) (255,255,255) → Beams will be filled with white color

So we will get BLACK and WHITE