Progressive Education Society's
Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16
Even Semester Examination: April 2023-2024
Faculty: Science and Technology

Program: BSc Comp05 **Semester: IV** **Set : B**
Program (Specific):B.Sc. Computer Science **Course Type: Core**
Class: S.Y.B.Sc(Comp. Sci.) **Max. Marks: 35**
Name of the Course: Computational Geometry **Course Code: 23-MTC-241**
Paper no.: I **Time: 2Hrs**

Instructions to the candidate:

1) ***There are 3 sections in the question paper. Write each section on separate page.***
2) ***All Sections are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Draw a well labelled diagram wherever necessary.***

SECTION: A

Q1. Attempt any five of the following: (10 marks)

a) Reflect the point [3 -2] through the line y=-x.
b) What is the transformation matrix of rotation about origin through an angle 45° in clockwise direction?
c) Write the transformation matrix for shearing in y- direction proportional to x and z co-ordinate by 1.5 and -2 units respectively, apply it on the point P[-2 5 7].
d) Is the following matrix [T] a solid body transformation? Justify.

$$[T]=\begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} \\ -1/\sqrt{2} & 1/\sqrt{2} \end{bmatrix}$$

e) Obtain the transformation matrix for a Cavalier projection for $\alpha = 45°$.
f) Define a foreshortening factor. Write the principal foreshortening factors for isometric projection.
g) Determine the value of y on the unit circle if x=0.866.

SECTION: B

Q2. Attempt any three of the following: (15 marks)

a) Find the combined transformation for following sequence of transformations:
   i. Reflection in XY-plane
   ii. Translate in x, y, z direction by 4,2,1 units respectively.
   iii. Shearing in x co-ordinate by a factor -4 units proportional to z-co-ordinate.

b) If If the line y=mx+h is transformed onto the line y* =m*x* + h* under the transformation matrix [T]=$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then prove that m*=($\frac{b+dm}{a+cm}$).

c) Find dimetric projection of the point P(2.5, 3.6, -5.1) with foreshortening factor $f_z = \frac{2}{3}$.

d) Rotate the triangle ABC about its centroid through an angle 45°, where A[2 -4], B[3 0] and C[-2 1].

e) Determine through what angles the plane X+Y+Z=0 be rotated about the X-axis and then about the Y-axis, so that it coincides with the Z=0 plane.

SECTION: C

Q3. Attempt any one of the following: (10 marks)

a) Find the equi-spaced points on the circle $x^2 + y^2 = 9$ (Take n=10).

b)

i) Find the parametric equation of Be'zier curve determined by control points $B_o[2\ 1]$, $B_1[4\ 3]$ and $B_2[6\ \ 0.5]$ and hence find the position vector of the point corresponding to the parametric values t=0.43.

ii) Write an algorithm for reflection through the line y=mx+c.