

S.Y.B.SC. (COMPUTER SCIENCE) SEM –IV (2014 COURSE) :
SUMMER - 2018
SUBJECT : COMPUTATIONAL GEOMETRY

Day : **Tuesday**
Date : **17/04/2018**

S-2018-0851

Time : **03.00 PM TO 05.00 PM**
Max. Marks : 40

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.

Q.1 Attempt any **TWO** of the following: **(10)**

- a) Define solid body transformation. Prove that the transformation matrix [T] preserves magnitude and angle between two vectors if it is orthogonal matrix of determinant.
- b) Find the point of intersection of transformed lines L'_1 & L'_2 if lines $L_1 : x + 2y = 2$ and $L_2 : x - y = 4$ are transformed to lines L'_1 and L'_2 by using the transformation matrix $[T] = \begin{bmatrix} 2 & 1 \\ -1 & 2 \end{bmatrix}$
- c) Rotate the line segment between the points A[1 2] and B[3 6] by an angle 90° about the midpoint of the segment AB.

Q.2 Attempt any **TWO** of the following: **(10)**

- a) Write the transformation matrix for each of following:
 - i) Scaling in x and z co-ordinates by the factor of 2 and 3 respectively.
 - ii) Overall scaling by a factor of $1/2$.
 - iii) Shear in y co-ordinate proportional to z co-ordinate by factor 1.5.
 - iv) Shear in z co-ordinate proportional to x co-ordinate by a factor 2.
 - v) Translation in 'x' co-ordinate by 2 units, in 'y' co-ordinate by 5 units and in 'z' co-ordinate 4 units.
- b) Reflect the pyramid OABC with O[0 0 0], A[1 0 0], B[0 1 0], C[0 0 1] in the plane $z = -5$
- c) Explain isometric projection briefly.

P.T.O.

Q.3 Attempt any **TWO** of the following: **(10)**

- a) Obtain an algorithm to generate uniformly spaced n points on a parabolic segment in the first quadrant for the given range of x co-ordinate where equation of parabola is $y^2 = 4ax$.
- b) Generate uniformly spaced 8 points on the ellipse $\frac{x^2}{16} + \frac{y^2}{1} = 1$.
- c) If $B_0[1 \ 1]$, $B_1[2 \ 3]$, $B_2[4 \ 3]$ and $B_3[3 \ 1]$ are vertices of a Be'zier polygon, then determine the point $P(1/2)$ of the Be'zier curve.

Q.4 Attempt any **FIVE** of the following: **(10)**

- a) Write the transformation matrix for reflection through line $y = -x$.
- b) Write transformation matrix for rotation about y -axis through an angle θ .
- c) Define Cavalier projection.
- d) Write recursion equation for circle.
- e) Write two properties of Be'zier curve.
- f) Write parametric equation of B-spline curve.
- g) Write transformation matrix for scaling in x co-ordinate by factor $1/3$.

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