14/12/18 (M)

Library copy.

Roll No. ....

Total Pages : 4

334102

Dec., 2018

B.Sc. (Animation) Ist Semester

MATHEMATICS-I

(BSC(A)-18-102)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

(i) *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

(ii) *Answer any four questions from Part-B in detail.*

(iii) *Different sub-parts of a question are to be attempted adjacent to each other.*

(iv) *Vectors are denoted by bold letters in question 4.*

PART–A

1. (a) Define following of matrices: Unit Matrix, Lower triangular matrix, null matrix. (1.5)

   (b) Identify the following operations as commutative or non-commutative: Matrix addition, matrix subtraction, matrix multiplication. (1.5)

   (c) What is purpose of directrix in ellipse? (1.5)

   (d) Find the equation of a circle with centre as (2,2) and passing through the point (4,5). (1.5)

(e) Find the equation of the line joining (2, 5) and (10, 20). (1.5)

(f) Find the ratio in which the line joining A(5,1,6) and B(3,4,1) is divided by yz plane. (1.5)

(g) Find the intercepts of the plane $5x - 3y + 6z - 60 = 0$ on coordinate axes. (1.5)

(h) Define following types of vectors: coplanar vectors, negative of vector, unit vector. (1.5)

(i) Write the matrix for the following transformation

(i) Rotation in 2D.

(ii) Reflection in 2D both across X and Y axis.

(iii) Scaling in 2D. (1.5)

(j) Write the transformation matrices for creating the projection in X, Y and Z planes. (1.5)

PART–B

2. (a) Write the DDA line drawing algorithm. (5)

(b) Find the equation of a circle with centre as (0,0) and the straight line $3x + y - 10 = 0$ as tangent. (5)

(c) Multiply the following matrices :

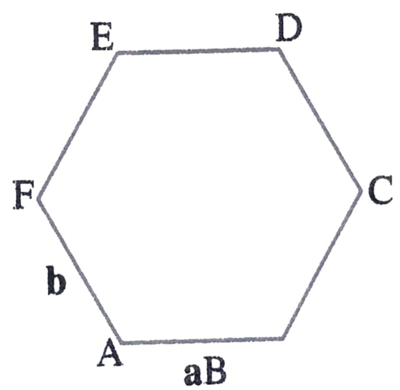
$$\begin{bmatrix} 1 & 2 & -1 \\ 2 & 0 & 1 \end{bmatrix} \begin{bmatrix} 3 & 1 \\ 0 & -1 \\ -2 & 3 \end{bmatrix}$$ (5)

3. (a) Define three types of Cartesian, spherical and cylindrical coordinate systems. How a point $p(x,y,z)$ in Cartesian coordinate system can be mapped (converted) in other two coordinate systems. (7)

(b) For the ellipse defined by the equation $4x^2 + 16y^2 - 24x - 32y - 12 = 0$ find centre, length of major and minor axes, eccentricity, length of latus rectum. (8)

4. (a) Let ABCD be a parallelogram with AC and BD as diagonals. Compute **AC–BD** in terms of **AB**. (4)

(b) Let ABCDEF be a regular hexagon with **AB** = **a** and **BC** = **b** then find **CE**. (4)



(c) Describe how isometric projection can be created in Z-plane. (7)

5. (a) Find the equation of the straight line perpendicular to $3x + 4y - 10 = 0$ and passing through the point (5, 6). (5)

(b) Find the coordinates of a point dividing the line joining (10,20) and (30,50) in the ratio 2:3. (3)

6. (a) Let $P(x,y,z)$ be a point in 3D coordinate system. For this point

   (i) Find the feet of its perpendicular drawn on XY, YZ and ZX plane.

   (ii) Find its distance from XY, YZ and ZX plane

   (iii) Find its reflection across the planes $z = 3$. (5)

   (b) Define direction cosines l, m, n. Show that $l^2 + m^2 + n^2 = 1$. (3)

   (c) Consider a rectangle with vertices as A(–1, –1), B(–1, 5), C(5, 5), D(5, –5). Rotate it by 600 about origin. (7)

7. (a) Write short notes on the following :

   (i) Isometric Projection.

   (ii) Perspective Projection.

   (iii) Anti-aliasing.

   (b) A cube in 3D is represented by points (2,2,2), (2, –1,2), (5, –1,2), (5,2,2), (2,2,5). (2, –1,5), (5, –1,5) and (5,2,5). Translate this cube by 3 units on X-axis and scale it two times around origin. (5)