Sr. No 324102

January 2023

B.Sc (Animation) 1ST Semester

Mathematics-I (BSC-AM-19-103)

Max. Marks: 75

Time: 3 Hours

Instructions: 1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.

2. Answer any four questions from Part-B in detail.

3. Different sub-parts of a question are to be attempted adjacent to each other.

PART-A

Q1: (a) Define following of matrices : Identity matrix, null matrix, equal matrices . (1.5)

(b) Construct a 3×3 matrix whose element are given by (1.5)

(i) a_{ij} = i+j (ii) $a_{ij=}$ i.j (1.5)

(c) Find the slope of the lines :

(i) passing through the points (3,-2)and (-1,4).

(ii) making inclination of 60° with the positive direction of x-axis . (1.5)

(d) Find the equation of line passing through the points (1,2) and (3,5). (1.5)

(e) Define the following transformations : translation, scaling , rotation . (1.5)

(f) Show that the points P(-2,3,5) , Q(1,2,3) and R(7,0,-1) are collinear. (1.5)

(g) If $B=\begin{bmatrix} 2 & 3 & 0 \\ 1 & -1 & 5 \end{bmatrix}$,$C=\begin{bmatrix} 1 & -2 & 3 \\ -1 & 0 & 2 \end{bmatrix}$. Find 2B+4C. (1.5)

(h) Find the distance between the following pair of points : (1.5)

(i) (2,3) , (4,1) (ii) (-5,7) , (-1,3)

(i) Define the following vector : unit vector, collinear vector , coplanar vector. (1.5)

(j) The position vectors of A,B,C and D are $\vec{a}$, $\vec{b}$, $2\vec{a}+3\vec{b}$, $\vec{a}-2\vec{b}$ respectively . Show that the vector (1.5)

$\overrightarrow{DB} = 3\vec{b} - \vec{a}$ and $\overrightarrow{AC} = \vec{a} + 3\vec{b}$

PART –B

Q2: (a) Write short note on Cartesian and polar coordinate system. (4)

(b) Find the coordinates of the Foci, the vertices, the length of major axis , the minor axis ,the (6)

Eccentricity and the length of latus rectum of the ellipse $\frac{x^2}{25}+\frac{y^2}{100}=1$.

(c) Find the equation of the circle passing through the points (4,1) and (6,5) and whose Centre is on the line 4x+y =16. (5)

Q3: (a) Write short note on the following : (10)

(i) Colour and grayscale levels
(ii) Area fill attributes
(iii) Character attributes
(iv) Anti aliasing
(v) Bundled attributes

(b) Find the coordinates of the point which divides the line segment joining the points (1,-2,3) and (3,4,-5) in the ratio 2:3 (i) internally and (ii) externally . (5)

Q4: (a) If $\begin{bmatrix} a+b & 2 \\ 5 & ab \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$, Find the value of a and b. (4)

(b) Verify that matrix multiplication is associative for the following matrices: (5)

$A=\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}$, $B=\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $C=\begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$.

(c) If $A=\begin{bmatrix} 3 & 9 & 0 \\ 1 & 8 & -2 \\ 7 & 5 & 4 \end{bmatrix}$, $B=\begin{bmatrix} 4 & 0 & 2 \\ 7 & 1 & 4 \\ 2 & 2 & 6 \end{bmatrix}$; Verify that 2(A +B) = 2A+2B and hence show that matrix (6)

Multiplication of matrices is distributive over the addition of matrices.

Q5: (a) Explain the concept of Three Dimentional Display methods and 3D Transformations ie. Parallel projection and Perspective projection . (10)

(b) Verify the following (0,7,-10), (1,6,-6), and (4,9,-6) are the vertices of a right angle triangle. (5)

Q6. (a) If $\vec{a}=\hat{\imath}+2\hat{\jmath}+3\hat{k}$, $\vec{b}=2\hat{\imath}+4\hat{\jmath}-\hat{k}$ and , $\vec{c}=\hat{\imath}+2\hat{\jmath}+\hat{k}$, then find (6)

(i) $\vec{a}\cdot\vec{b}$ (ii) $\vec{a}\cdot\vec{c}$ (iii) $(\vec{a}+\vec{b})\cdot\vec{c}$ (iv)) $(\vec{a}+\vec{c})\cdot\vec{b}$

(b) Find the magnitude of the vector $\vec{a}\times\vec{b}$ if $\vec{a}=2\hat{\imath}+\hat{\jmath}+\hat{k}$, and $\vec{b}=\hat{\imath}-2\hat{\jmath}+\hat{k}$. (5)

(c) Write the direction ratios of the vector $\vec{a}=2\hat{\imath}+3\hat{\jmath}-2\hat{k}$, and hence calculate its direction cosines. (4)

Q7: (a) Find the adjoint of the following matrices : (7)

$$A=\begin{bmatrix} 1 & -1 & 2 \\ 3 & 1 & -2 \\ 1 & 0 & 3 \end{bmatrix}$$

(b) Find the coordinates of the focus ,axis of the parabola , the equation of directrix and length Of latus rectum (i) $x^2=-16y$. (ii) $y^2=-8x$ (8)