

## BCA-4-04T: Computer Graphics

Total Marks: 100  
External Marks: 70  
Internal Marks: 30  
Credits: 4  
Pass Percentage: 40%

### INSTRUCTIONS FOR THE PAPER SETTER/EXAMINER

1. The syllabus prescribed should be strictly adhered to.
2. The question paper will consist of three sections: A, B, and C. Sections A and B will have four questions from the respective sections of the syllabus and will carry 10 marks each. The candidates will attempt two questions from each section.
3. Section C will have fifteen short answer questions covering the entire syllabus. Each question will carry 3 marks. Candidates will attempt any ten questions from this section.
4. The examiner shall give a clear instruction to the candidates to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.
5. The duration of each paper will be three hours.

### INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt any two questions each from the sections A and B of the question paper and any ten short questions from Section C. They have to attempt questions only at one place and only once. Second or subsequent attempts, unless the earlier ones have been crossed out, shall not be evaluated.

<b>Course: Computer Graphics</b>	
<b>Course Code: BCA-4-04T</b>	
<b>Course Outcomes (COs)</b> After the completion of this course, the students will be able to:	
CO1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO2	Demonstrate proficiency in 2D graphics programming, including concepts like 2D transformations.
CO3	Analyze and implement key computer graphics algorithms, such as line drawing algorithms, polygon filling algorithms, and clipping algorithms.
CO4	Extract scene with different clipping methods and its transformation to graphics display device.
CO5	Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

## Detailed Contents:

Module	Module Name	Module Contents
Module 1	<b>Introduction to Computer Graphics</b>	Applications areas, Components of Interactive Computer Graphics System. Video Display Devices: Refresh cathode ray tube systems – raster scan CRT displays, random scan CRT displays, colour CRT-monitors, direct view storage tube. Flat panel displays – emissive vs non emissive displays, LCD displays, plasma panel displays, 3-D viewing devices, virtual reality.
Module II	<b>Scan conversion and 2D Graphics</b>	Scan converting a Point, Line (Direct, DDA and Bresenham line algorithms), Circle (Direct, Polar, Bresenham and Mid-point circle algorithms), Ellipse (Direct, Polar and Midpoint ellipse algorithms), Area filling techniques (Boundary fill, Flood fill, scan line area fill algorithm), Limitations of scan conversion. 2D Cartesian and Homogeneous co-ordinate system, Geometric transformations (Translation, Scaling, Rotation, Reflection and Shearing), Composite transformations, 2D dimensional viewing transformation and clipping (Cohen –Sutherland, Liang-Barsky, Sutherland-Hodgeman algorithms).
Module III	<b>3D Graphics</b>	3D Cartesian and Homogeneous co-ordinate system, Geometric transformations (Translation, Scaling, Rotation, Reflection), Composite transformations. Mathematics of Projections: Perspective Projections - Mathematical Description and Anomalies of perspective projections. Parallel Projections – Taxonomy of Parallel Projections and their Mathematical Description. Introduction to 3D viewing pipeline and 3D clipping.
Module IV	<b>Hidden surface elimination algorithms</b>	Z-buffer, scan-line, sub-division, Painter's algorithm. Illumination Models: Diffuse reflection, Specular reflection, refracted light, texture surface patterns, Halftoning, Dithering. Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading.

## Books

1.	R.A. Plastock and G. Kalley, “Computer Graphics”, McGraw Hill.
2.	Donald Hearn and M. Pauline Baker, “Computer Graphics”, Pearson Education.

3. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes, R.L Phillips, "Introduction to Computer Graphics", Addison Wesley Publishing.