2024

COMPUTER SCIENCE — HONOURS

Paper : SEC-A-1 and SEC-A-2

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Paper : SEC-A-1

(Computer Graphics)

Full Marks : 80

Answer *question no.* 1 and *any four* questions from the rest.

1. Answer *any ten* questions : 2×10

   (a) Define world coordinate system.

   (b) Define aspect ratio.

   (c) Name the three major components present inside a CRT.

   (d) Differentiate between image resolution and screen resolution.

   (e) What are the keyframes used in animation?

   (f) Why is translation known as rigid body transformation?

   (g) What feature of the liquid crystal material is used to produce image in LCD display?

   (h) Write the 2D transformation matrix for shear transformation with respect to X direction.

   (i) What is affine transformation?

   (j) What is oblique projection?

   (k) Mention the physical significance of vanishing point.

   (l) When can a series of transformation be termed as commutative?

   (m) What is a true colour system?

   (n) Differentiate between animation and morphing.

2. (a) What are the elements that maintain the stability of an image display in a CRT?

   (b) "2D rotation with scaling is commutative."— Justify your answer.

   (c) Derive the transformation matrix for scaling with respect to an arbitrary point. 4+5+6

3. (a) Consider an object ABC with coordinates A (1, 1), B (10, 1) and C (5, 5). Rotate the object by 90° in counter clockwise direction about the point A. Give the coordinates of the transformed object.

   (b) Write a short note on beam-penetration method used in colour CRT monitors.

   (c) Explain DDA line drawing algorithm. Mention its drawback. 5+5+5

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4. (a) Differentiate between window port and view port.

 (b) Clip a line with end points A (3, 20) and B (13, 3) against rectangular window (5, 5) and (25, 15).
 Use Cohen-Sutherland clipping algorithm to solve the problem.

 (c) Derive and discuss the mid point circle drawing algorithm with an example.   3+5+(4+3)

5. (a) Prove that the rotation transformation depends on reference point and reference axis.

 (b) Discuss Sutherland-Hudgemar polygon clipping algorithm with an example.

 (c) Differentiate between cavelier projection and cabinet projection.   5+5+5

6. (a) Mention and discuss the steps to design an animation sequence.

 (b) Discuss the different types of computer art.

 (c) Write briefly about two different types of retrace techniques used in Raster scan display system.
      5+5+5

7. (a) If reflection along the line y = x is equivalent to the reflection along the x-axis followed by anticlockwise rotation by 'α' degrees, then find the value of 'α'.

 (b) Magnify the triangle ABC, where A = (0, 0), B = (1, 1), C = (5, 2) to twice its size while keeping C (5, 2) fixed.

 (c) Differentiate between parallel and perspective projection.   6+5+4

8. (a) What is the advantage of Homogeneous co-ordinate system in 2D transformation?

 (b) Distinguish between interior and exterior clipping.

 (c) What is morphing? Describe three applications of morphing.

 (d) Prove that two successive rotations are additive.   3+3+(2+3)+4

Paper : SEC-A-2

(IoT)

Full Marks : 80

Answer *question no.* 1 and *any four* questions from the rest.

1. Answer *any ten* questions :   2×10

   (a) What is Zigbee?

   (b) What do you mean by MQTT?

   (c) List the functions and goals of APIs.

   (d) What is the difference between sensor and actuators?

   (e) What is the meaning of IoT analytics?

   (f) Give example of any two IoT tools.

   (g) State the characteristics of Embedded Systems.

   (h) State any two challenges of Wireless Sensor Network (WSN).

   (i) Define the term — 'things' in context of IoT.

   (j) Why is security a critical concern in IoT systems?

   (k) Provide an overview of the key features of IoT.

   (l) What is UART and how does it work in serial communication?

   (m) Define SDN.

   (n) What role do IoT platforms play in data analytics?

2. (a) What is SPI, and how does it facilitate communication between devices?

   (b) Explain the exposed and hidden node problem in Wireless Sensor Network (WSN).   7+8

3. (a) Describe Cloud Computing for IoT technology.

   (b) State the different deployment of Cloud Models.   8+7

4. (a) Describe the IoT Ecosystem.

   (b) Define RTOS.

   (c) Explain the different types of Sensors used in IoT. Give examples.   6+3+6

5. (a) Explain sensor node with suitable diagram.

   (b) Discuss the different operating systems for IoT.   7+8

6. (a) Illustrate the IoT reference model and provide a concise explanation of each layer.

(b) Discuss the different IoT routing protocols. 7+8

7. (a) Explore IoT as an example of smart home automation.

(b) Discuss the physical IoT design. 8+7

8. (a) State the difference between M2M and IoT.

(b) What is Edge connectivity and how does it differ from Fog connectivity?

(c) What do you mean by Data Aggregation in IoT? 4+6+5

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