1. **The surfaces generated by cubic polynomials in both u and v parameters are called as**
   a. Quadric
   b. Bi-Quadric
   c. Cubic
   d. Bi-cubic

2. **Which of the following is not one of the polygon - mesh representation**
   a. Explicit representation
   b. Pointers to a vertex list
   c. Pointers to an edge list
   d. Pointers to a polygon list

3. **If P_1, P_2 and P_3 are points on a plane, then the plane's normal is computed as**
   a. $P_1P_2 \,.\, P_1P_3$
   b. $P_1P_2 \; X \; P_2P_1$
   c. $P_1P_2 \,.\, P_2P_1$
   d. $P_1P_2 \; X \; P_1P_3$

4. **Howmany polynomials in a parameter 't' are to be defined for identifying a point on a 3-D curve**
   a. One
   b. Two
   c. Three
   d. Number depends on complexity

5. **The surfaces which are defined implicitly by an equation are called as**
   a. Cubic surface
   b. bi-cubic surface
   c. Quadric surfaces
   d. Binomial surfaces

6. **Which of the following is not a common representation of 3D surface**
   a. Polygan mesh surface
   b. Parameteric surface
   c. Quadric surface
   d. Neural surface

7. **Which of the following is not a characterstic of parametric curves**
   a. Simple
   b. Possible to generalize
   c. Possible to identify any number of intermediate points
   d. Huge data base of intermediate points need to be explicitly stored

8. **A set of connected polygonally bounded planar surfaces is called as**
   a. Polygan mesh
   b. Solid object
   c. 3-D object
   d. mesh-cube

9. **A polynomial curve using a parameter t is called as**
   a. Parametric polynomial curve
   b. Cubic polynomial curve
   c. Quatric polynomial curve
   d. Solid polynomial curve

10. **The polynomial with maximum power 3, is called as**
   a. Cubic polynomial
   b. Quadric polynomial
   c. Binomial polynomial
   d. Acute polynomial

11. **Which of the following is not a reason for using cubic polynomials in parametric form**
   a. It gives sufficient flexibility
   b. does not introduce unwanted wiggles
   c. Polyonomials of degree 4 and above involve more computations
   d. It is not possible to generate curves and surfaces with other kinds of polynomials

12. **Which of the following is true about G^1 (Geometric continuty) and C^1 (Parametric first degree continuty)**
   a. C^1 continuty implies G^1
   b. G^1 continuity is generally more restrictive than is C^1
   c. C^1 and G^1 are identical
   d. G^1 continuity imples C^1

13. **Which of the following parametric curves are lowest-degree non-planar curves in 3D**
   a. Cubic
   b. Quadratic
   c. Curves with degree 4
   d. Curves with degree n

14. **If the directions of two segments' tangent vectors are equal at a joining point, the curve is said to have _ _ _ _ _ _ _ _ _ geometric continuety**
   a. G^0
   b. G^1
   c. G^2
   d. G^n

15. **In the case of curve joining, G^1 geometriccontinuty means**
   a. Only geometric points are same
   b. The geometric slopes of the segments are same
   c. The geometric slopes and lengths of the segments are same
   d. The geometric slopes are different but the lengths of the segments are same

16. **If the direction and magnitude of $\frac{d^n}{dt^n}[Q(t)]$ through the n^{th} derivative are equal at the joining point, the curve is called _ _ _ _ _ _ _ _ continuous**
   a. C^0
   b. C^1
   c. C^2
   d. C^n

17. **For two curves to join smoothly, the essential requirement is**
   a. Their tangent - vector directions must match
   b. Their magnitudes must match
   c. Both their tangent vector directions and magnitudes must match
   d. either tangent vector directions or magnitudes must match

18. **Howmany coefficients are there in a cubic polynomial**
   a. 3

b. 4
c. any number
d. 1

19. To deal with finite segments of the curve, without loss of generality, we resptrict the parameter t, to _ _ _ _ _ _ interval
a. $[-1,1]$
b. $[0,\alpha]$
c. $[0,1]$
d. $[-1,0]$

20. If Q(t) is a cubic polynomial, then the tangent vector of the curve is
a. $[Q(t)]^2$
b. Q'(t)
c. 1/Q(t)
d. $Q^2(t)$

21. The basis matrix for Hermites curve is
a. $\begin{bmatrix} 2 & -2 & 1 & 1 \\ -3 & 3 & -2 & -1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$
b. $\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 3 & 2 & 1 & 0 \end{bmatrix}$
c. $\begin{bmatrix} -1 & 3 & -3 & 1 \\ 3 & -6 & 3 & 0 \\ -3 & 3 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$
d. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ -3 & 3 & 0 & 0 \\ 0 & 0 & -3 & 3 \end{bmatrix}$

22. The property that the curves can be transformed by transforming the geometric vectors and then using it to generate the transformed curve makes the Hermites curves
a. Invariant under only rotation
b. Invariant under only scaling
c. Invariant under only translation
d. Invariant under rotation, scaling and translation

23. Out of the four blending functions of Hermites, howmany are non-zero at t=0
a. 1
b. 2
c. 3
d. 4

24. For two Hermite cubics to share a common end point with G^1 geometrical continuity, which of the following conditions must be satisfied
a. The magnutudes of the vectors must be same
b. The tangents at the end points must be same
c. Both the magnutuedes and tangents must be same
d. Both must have 4^{th} order continuty

25. The Horner's rule for factoring polynomial f(t) = at^3+bt^2+ct+d is
a. $((t+1)a+b)+c)+d$
b. $((at+b)t+c)t+d$
c. $((at+1)bt+c)t+d$
d. $((a+1)t+c)t+d$

26. The Hermite curves are not invariant under
a. rotation
b. scaling
c. translation
d. perspective projection

27. Which of the following require, for its definition, two end-points and two end-point tangent vectors
a. Hermite curve
b. Bezier curve
c. B-spline
d. β -spline

28. If M is a basis matrix and G is a matrix representing a vector of geometric constraints, then the Hermite's coefficent vector matrix $[c]$ is defined as
a. C=M.G
b. C=M+G
c. C=M G^{-1}
d. C=M-G

29. The Hermite form of the cubic polynomial curve segment is determined by
a. Any four control points
b. Either four control points or four tangents
c. Two end-points and the tangents at two end-points
d. Two end-points and any other two intermediate points

30. The cubic curves are _ _ _ _ _ _ _ _ _ _ combinations of the four elements of the geometry vectors
a. linear
b. non-linear
c. complex
d. higher-degree

31. The Bazier basis matrix M_B is defined as
a. $\begin{bmatrix} -1 & 3 & -3 & 1 \\ 3 & -6 & 3 & 0 \\ -3 & 3 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$
b. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ -3 & 3 & 0 & 0 \\ 0 & 0 & -3 & 3 \end{bmatrix}$
c. $\begin{bmatrix} 2 & -2 & 1 & 1 \\ -3 & 3 & -2 & -1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

d. $\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 3 & 2 & 1 & 0 \end{bmatrix}$

32. The general equation for Bernestein polynomials is given by

a. Q(t) = $(1-t)^3P_1 + 3t(1-t)^2P_2 + 3t^2(1-t)P_3 + t^3P_4$

b. Q(t) = $3(1-t)^3P_1 + t(1-t)^2P_2 + t^2(1-t)P_3 + 3t^3P_4$

c. Q(t) = $(3-t)^3P_1 + t(1-t)^2P_2 + t^2(1-t)P_3 + 3t^3P_4$

d. Q(t) = $(1-t)^3P_1 + t(3-t)^2P_2 + t^2(3-t)P_3 + t^3P_4$

33. Which of the following is false about Bazier curve

a. The blending functions are non negative

b. The blending function are sum to one

c. The output curve is completely within the convex hull

d. At t=0, all the Bernstein polynamials are zero

34. In the Bazier curve, the sum of all Bernstein polynomials at every point in the range of $0 \leq t < 1$ **is**

a. Unity

b. Zero

c. n units if there n control points

d. varies with position of control points

35. If the given four control points of Bazier curve forms a convex hull, the corresponding output curve is

a. completely inside the convex hull

b. completely outside the convex hull

c. oscillates between outside and inside

d. not a function of control points

36. At the joining of two Bezier curves, G^1 continuty is provided only if

a. $(P_3 - P_4) = K(P_4 - P_5), K > 0$

b. $(P_3 - P_4) > K(P_4 - P_5), K > 0$

c. $(P_3 - P_4) < K(P_4 - P_5), K > 0$

d. $(P_3 - P_4) <> (P_4 - P_5)$

37. If P_1, P_2, P_3 *and* P_4 are four control points, in the same order, given as input for Bazier curve, then the curve passes trough

a. all four control points

b. Only P_1 *and* P_2

c. Only P_1 *and* P_4

d. The control points influence, but curve does not pass through any control point

38. The property that the change of location of any control point will have influence on every point on the curve or surface is called as

a. Global control

b. Local control

c. Generic control

d. enfluence control

39. The range of parametric variable 't' used in Bazier curve is

a. $[0,1]$

b. $[-1,1]$

c. $[-\alpha,1]$

d. $[0,\alpha]$

40. In uniform nonrational B-splines, the curve segment Q_1 is defined in the parameter range of

a. $t_{i-1} \leq t < t_i$

b. $t_i \leq t < t_{i+1}$

c. $t_{i-1} \leq t < t_{i+1}$

d. $0 \leq t \leq 1$

41. In Uniform non-rational B-splines, the curve segment Q_3 is defined in the parameter range of

a. $t_2 \leq t \leq t_3$

b. $t_3 \leq t \leq t_4$

c. $t_2 \leq t \leq t_4$

d. $0 \leq t \leq 1$

42. If the B-spline curve is defined with m+1 control points, total number of curve segments in the B-spline curve is

a. m-2

b. m+1

c. m

d. 1

43. Which of the following is not a feature of local control

a. moving a control point effects only a part of a curve

b. time needed to compute the coefficients is greatly reduced

c. all cubic splines are chatacterised by local control

d. knot values are defined in algorithms

44. In uniform B-splines, the term uniform means

a. Knots are spaced at equal intervals

b. Knots are spaced at two end points of the curve

c. Knots are spaced at regular intervals

d. knots are spaced at steep curvatures

45. Which of the the following is not a characterstic of B-spline blending functions

a. Everywhere non negative

b. Sum to Unity

c. The output curve is constraned to a convex hull

d. Blending function is influenced by all m+1 control points

46. B-Splines consist of curve segments whose polynomial coefficents depend on just few control points. This property of B-Splines is called as

a. global control

b. local control

c. generic control

d. infinite control

47. If the parametric functions x(t),y(t) and z(t) each are defined as the ratio of two cubic polynomials, such splines are called as

a. rational

b. semi rational

c. non-rational

d. trivial

48. In the B-splines algorithm, the term B stands for

a. basic
b. basis
c. base line
d. bicubic

49. According to phase specular - reflection model, as the specular parameter 'n'$_s$ increases, the sharpness of specular reflection
a. increases
b. decreases
c. remain unchange
d. increase until n=256 and then decreases

50. The range of values for the reflection coeffients followed in illumination model is
a. 1 to 2
b. 0 to 1
c. -1 to 1
d. 0 to α

51. The amount of incident light specularly reflected is depending on angle between
a. incident light ray and the surface normal
b. reflected light ray and the surface normal
c. reflected light ray and the direction of view point
d. incident light ray and the direction of view point

52. At the sharp specular high-lights in Phong illumination model, what are the corresponding K_s and n values where K_s is specular reflection coefficent and 'n' is an integer constant used in $\cos^n \alpha$
a. Both K_s and n are large values
b. K_s is large and n is small value
c. K_s is small and n is large value
d. both K_s and n are small values

53. The light which is from a non-directional source of light, the product of multiple reflections from many sources of light is called as
a. ambient light
b. self-luminous light
c. specular light
d. diffuse light

54. If the Ip is the point light source intensity, then the diffuse illumination equation is given by
a. I = $I_p K_d \; cos\theta$
b. I = $I_p \; cos\theta$
c. I = $K_d \; cos\theta$
d. I = $I_p^2 \; K_d \; cos\theta$

55. Specular reflections are observed on
a. completely transperent objects
b. shiny surface objects
c. rough surface objects
d. course objects

56. Surfaces that are rough and grainy, tend to scatter the reflected light in all directions. This scattered light is called
a. Specular reflection
b. Diffuse reflection
c. Ambient reflection
d. Shiny reflection

57. Surfaces that are shiny and the light sources create highlights or bright spots called
a. specular reflection
b. distributed reflection
c. diffuse reflection
d. ambient reflection

58. To compute the final intensity at any arbitrary surface point, atmost howmany interpolations are to be performed
a. 1
b. 2
c. 3
d. 4

59. If the vertex V is surrounded by 'n' polygons and the surface normal of each of the surrounded polygon is N_k, $1 \leq K \leq n$ then the unit vertex normal N_v at V is given by
a. $\sum_{k=1}^{n} N_k$
b. $\sum_{k=1}^{n} N_k / \left| \sum_{k=1}^{n} N_k \right|$
c. $\frac{n}{\pi}_{k=1} N_k$
d. $\frac{n}{\pi}_{K=1} N_k / \left| \sum_{k=1}^{n} N_k \right|$

60. Incremental calculations are used to obtain intensity values between scan lines and along scan lines. Reason for following this approach is
a. It gives smooth intensities
b. It gives pleasant intensities
c. to make it frce mach-band effect
d. to make it computationally efficient

61. The principle of Gouraud shading is
a. vector interpolation
b. intensity interpolation
c. surface interpolation
d. one intensity for one surface

62. The principle of constant intensity shading is
a. vector interpolation
b. interisity interpolation
c. single intensity for complete polygon
d. surface interpolation

63. Which of the following draw back is observed in Gouraud shading
a. Mach bands
b. intensity discontinuities at the surface boarders
c. Computationally very expensive
d. incremental calculations are not applicable

64. In Gourand shading, the Mach band effect is reduced or eliminated by
a. dividing the surface into a greater number of polygon faces
b. Using encremental calculations
c. entersity inter polations
d. computing the entensities along the scan lives

65. In which of the following algorithms, these steps are followed in the same sequance:
1) determine average unit normal vector at each vertex

2) linearly interpolate the vertex normal and
3) apply illumination model for the surface points

a. Phong
b. Gouraud
c. Constant intersity shading
d. ray-tracing

66. Which of the following shading algorithms linearly interpolate the vertex normals over the surface of the polygon, before applying the illumination model.
a. Phang shading
b. Gouraud shading
c. constant - intensity shading
d. ray - tracing

67. The limitation of phong-shading algorthm is
a. It require more calculations
b. It causes mach-band effects
c. There are sharp change in shade values at the boarders
d. Encremental calculations are not applicable

68. The highlights in the polygon interiors caused by specular -reflection illumination model are clearly visible in
a. Gourand shading
b. Phong shading
c. Constant shading
d. Flat shading

69. The three-dimensional matrix transformation for translation with a units along x-axis and b units along y-axis and c units along z-axis is

a. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -a & b & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ a & b & c & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ a & -b & c & 1 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ b & a & 0 & 1 \end{bmatrix}$

70. In 3-D scaling transformation, the scalling factors s_x,s_y and s_z are
a. linearly dependent an each other
b. non-linearly dependent an each other
c. independent
d. independent only in case magnification

71. The three-dimensional matrix transformation for scaling with a units along x-axis and b units along y-axis and c units along z-axis is

a. $\begin{bmatrix} -a & 0 & 0 & 0 \\ 0 & -b & 0 & 0 \\ 0 & 0 & c & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} -a & 0 & 0 & 0 \\ 0 & -b & 0 & 0 \\ 0 & 0 & 0 & 1 \\ a & b & c & 0 \end{bmatrix}$

c. $\begin{bmatrix} -a & 0 & 0 & 0 \\ 0 & -b & 0 & 0 \\ 0 & 0 & -c & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} a & 0 & 0 & 0 \\ 0 & b & 0 & 0 \\ 0 & 0 & c & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

72. The direction and displacement of the translation is precribed by a vector V=aI+bJ+cK. The required trasnlation matrix given by

a. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ a & b & c & 1 \end{bmatrix}$

b. $\begin{bmatrix} a & 0 & 0 & 0 \\ 0 & b & 0 & 0 \\ 0 & 0 & c & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} a & 0 & 0 & 0 \\ 0 & b & 0 & 0 \\ 0 & 0 & c & 0 \\ a & b & c & 1 \end{bmatrix}$

d. $\begin{bmatrix} a & 0 & 0 & 0 \\ 0 & b & 0 & 0 \\ 0 & 0 & c & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix}$

73. If s_x,s_y and s_z are the sxaling factirs in x,y and z directions, then the required scaling transformation matrix in homogenous coordinate system is given by

a. $\begin{bmatrix} sx & 0 & 0 \\ 0 & sy & 0 \\ 0 & 0 & sz \end{bmatrix}$

b. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ sx & sy & sz & 1 \end{bmatrix}$

$\begin{bmatrix} sx & 0 & 0 & 0 \end{bmatrix}$

c. $\begin{bmatrix} 0 & sy & 0 & 0 \\ 0 & 0 & sz & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 & 0 & sx \\ 0 & 1 & 0 & sy \\ 0 & 0 & 1 & sz \end{bmatrix}$

74. A transformation system in which an object in created and described in coordinates with respect to its own and indipendent object coordinated space, and place an instance or copy of it within a larger scence, is called as
- a. geometric transformation
- b. coordinate transformation
- **c. instance transformation**
- d. complex transformation

75. If the axis of rotation is X, then the direction of positive rotation is
- **a. y to z**
- b. z to x
- c. x to y
- d. y to x

76. If the axis of rotation is Y, then the directionof positive rotation is
- a. y to z
- **b. z to x**
- c. x to y
- d. y to x

77. In 3-D space rotation of an object is done about
- a. a point
- **b. an axis**
- c. a plane
- d. a hyper plane

78. In 3-D space, the scaling is performed with respect to
- **a. a reference point**
- b. a reference plane
- c. a reference axis
- d. an hyper plane

79. In 3-D transformations, the two scalling operations are
- a. alwalys commutative
- b. always non- commutative
- **c. commutative only if all scalling parameters of atleast one of the two scaling matrices are same.**
- d. commutative only if all the scalling parameter of both the scalling matrices are same

80. In a 3-D scaling transformation, all the three scalling parameters
- a. must be positive and greater than one
- **b. must be positive**
- c. either positive or negative
- d. must be a combination of positive and negative

81. let v is a vertex of an object p. When the scaling operation is applied on the object p with respect to vertex v, which of the following is true
- **a. The cordinates of only vertex v are unchanged**
- b. The coordinates of all vertices are unchanged
- c. The coordinates of vertices are changed in magnification
- d. The coordinates of vertex v are unchanged only if all the scaling factors are same

82. If the axis of rotation is Z, then the directionof positive rotation is
- a. y to z
- b. z to x
- **c. x to y**
- d. y to x

83. The three minesional matrix transformation for rotation with an angle θ with respect to z-axis in the negative direction is

a. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & \sin\theta & 0 \\ 0 & -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} \cos\theta & \sin\theta & 0 & 0 \\ -\sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta & 0 \\ 0 & -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 & 0 \\ \cos\theta & \sin\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

84. The three dimensional matrix transformation for rotation with an angle θ with respect to y-axis is the negative direction is

a. $\begin{bmatrix} \cos\theta & 0 & -\sin\theta & 0 \\ 0 & 1 & 0 & 0 \\ \sin\theta & 0 & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} \cos\theta & 0 & \sin\theta & 0 \\ 0 & 1 & 0 & 0 \\ -\sin\theta & 0 & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & \sin\theta & 0 \\ 0 & -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} \cos\theta & \sin\theta & 0 & 0 \\ -\sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

85. The three dimensional matrix transformation for rotation with an angle θ with respect to x-axis in the positive direction is

a. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta & 0 \\ 0 & \sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 & 0 \\ \sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & \sin\theta & 0 \\ 0 & \sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} \cos\theta & \sin\theta & 0 & 0 \\ \cos\theta & -\sin\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

86. The three dimenesional matrix transformation for rotation with an angle θ with respect to z-axis in the positive direction is

a. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta & 0 \\ 0 & \sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 & 0 \\ \sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & \sin\theta & 0 \\ 0 & \sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} \cos\theta & \sin\theta & 0 & 0 \\ \cos\theta & -\sin\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

87. The three dimensional matrix transformation for rotation with an angle θ with respect to y-axis in the positive direction is

a. $\begin{bmatrix} \cos\theta & 0 & \sin\theta & 0 \\ 0 & 1 & 0 & 0 \\ -\sin\theta & 0 & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} \cos\theta & 0 & -\sin\theta & 0 \\ 0 & 1 & 0 & 0 \\ \sin\theta & 0 & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta & 0 \\ 0 & \sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 & 0 \\ \sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

88. The three dimensional matrix transformation for rotation with an angle θ with respect to x-axis in the negative direction is

a. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & \sin\theta & 0 \\ 0 & -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} \cos\theta & \sin\theta & 0 & 0 \\ -\sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta & 0 \\ 0 & -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} \cos\theta & -\sin\theta & 0 & 0 \\ \cos\theta & \sin\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

89. When looking towards the origin from a positive co ordinate position on each axis, which is the positive rotation direction

a. clock-wise
b. counter clock-wise
c. up side down
d. upward

90. The x-shear maintains the coordinates of which of the following directions constant

a. x
b. y
c. z
d. y and z

91. The y-shear maintains the coordinates of which of the following directions constant

a. y
b. x and z
c. x,y and z
d. only z

92. The z-shear maintains the coordinates of which of the following directions constant

a. z
b. y and z
c. only y
d. x and y

93. The three-dimensional matrix transformation for reflection of a point with respect to xy-plane

a. $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

$\begin{matrix} 0 & 0 & 0 & 1 \end{matrix}$

b. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

94. Two sucessive reflections about an axis

a. non-commutative
b. do not change the original object position
c. reflects the object to neigbhour quadrant
d. reflects the object to diogonally opposite quadrant

95. In 3-D space the reflections are performed about

a. a point
b. an axis
c. a plane
d. an hyper plane

96. If a given object is reflected about xy plane, the co-ordinates of which axis donot change.

a. x
b. y
c. z
d. x and y

97. If a given object is reflected about xy, plane the co-ordinates of which axis do change

a. x
b. y
c. z
d. x and y

98. Let A_V and A_N are the transformations for aligning the vectors V and N with vector K, passing through z-axis, respectively. Then the transformation which aligns the vector V with the vector N is

a. $A_N^{-1}\ A_V$
b. $A_N^{-1}\ A_V^{-1}$
c. $A_N\ A_V^{-1}$
d. $A_N\ .\ A_V$

99. Three-dimensional matrix transformation for reflection of a point with respect to yz-plane

a. $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

100. Three-dimensional matrix transformation for reflection of a point with respect to zx-plane

a. $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

b. $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

101. Basic transformation matrices for rotation, scaling and mirror reflection are defined to apply about _ _ _ _ _ _ _ _ _ _ , _ _ _ _ _ _ _ _ _ _ _ _ and _ _ _ _ _ _ _ _ _

a. axis, origin, plane
b. axis, axis, plane
c. plane, origin, plane
d. axis, origin, axis

102. To align an arbitrary vector with any one of the three principal axis, howmany basic rotations are to be performed

a. 3
b. 2
c. 1
d. 4

103. To make an arbitrary plane to be aligned with xy plane, the normal of the plane is to be aligned with

a. z-axis
b. x-axis
c. y-axis

d. both x and y axis

104. Which of the following transformation indirectly depends on Rotation operation
- a. shear
- b. scaling
- c. translation
- **d. reflection**

105. Concatenation of howmany basic transformation matrices is required to align an arbitrary vector with another vector is 3-D space, if both vectors pass through origin
- **a. 5**
- b. 2
- c. 1
- d. 7

106. Concatenation of howmany basic transformation matrices is required to align an arbitrary vector with another vector is 3-D space, if both vectors not pass through origin
- a. 5
- b. 2
- c. 1
- **d. 7**

107. To rotate an object about an arbitrary axis the following operations are required What is their correct sequence
i) Applying actual rotation
ii) Rotate the arbitrary vector such that it aligns with one of the principal axis
iii) Rotate the vector which is aligned with one of the principal axis to its original position
- a. i),ii) and iii)
- **b. ii),i) and iii)**
- c. ii), iii) and i)
- d. iii), i) and ii)

108. In a 3-D viewing pipeline following stage are needed. What is the correct sequence of these stages or subtasks
i) Modelling transformation
ii) Projection transformation
iii) Viewing transformation
iv) Work station transformation
- **a. i), iii), ii) and iv**
- b. i),ii), iii) and iv)
- c. iii), i),ii) and iv
- d. ii), iii), i) and iv)

109. In viewing pipeline, the world-cordinate positions are converted to viewing cordinates in
- a. modelling transformation
- **b. viewing transformation**
- c. projection transformation
- d. workstation transformation

110. With a perspective projection, the frant and back clipping planes truncate the infinite pyramidal view volume to form a
- **a. frustum**
- b. cone
- c. cube
- d. sphere

111. In graphics packages the viewing co-ordinate system is used for specifying the observer's
- a. viewing position
- b. Position of projection plane and its normal
- **c. viewing position and position of projection plane**
- d. viewing postion and normal of projection plane

112. To perform the scaling of a 3-D object, with respect to a selected fixed position, the following operations are required. What is their correct sequence
ii) Translate the fixed point back to its original position
ii) Translate the fixed point to the origin
iii) Scale the object relative to coordinate origin
- a. i), ii) and iii)
- b. i), iii) and ii)
- **c. ii), iii) and i)**
- d. ii), i) and iii)

113. To perform the mirror reflectionof a 3-D object about xy plane, the following operations are required. What is their correct requence
i) Perform the reflection
ii) Align the plane normal with z-axis
iii) Rotate back the plane normal to its original position
- **a. ii), i) and iii)**
- b. i), ii) and iii)
- c. iii), i) and ii)
- d. ii), iii) and i)

114. The general perspective-projection transformation $M_{perspective}$ can be expressed in matrix form as
- **a.** $M_{scale} \cdot M_{shear}$
- b. $M_{shear} \cdot M_{scale}$
- c. $M_{rotate} \cdot M_{shear}$
- d. $M_{shear} \cdot M_{rotate}$

115. The matrix representation for z-axis shear is
- **a.** $\begin{bmatrix} 1 & 0 & a & 0 \\ 0 & 1 & b & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$
- b. $\begin{bmatrix} 1 & 0 & 0 & a \\ 0 & 1 & 0 & b \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$
- c. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & c \\ 0 & 0 & 0 & 1 \end{bmatrix}$
- d. $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & c & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

116. The matrix corresponds to shearing the view volume such that the centerline of the frustum is perpendicular to the view plane, where a and b are shearing parameters, x_{prp} , y_{prp} and z_{prp} are prodection referance pointsin x, y and z directions
- **a.** $\begin{bmatrix} 1 & 0 & a & -az_{prp} \\ 0 & 1 & b & -bz_{prp} \\ 0 & 0 & 1 & 0 \end{bmatrix}$

$$\begin{bmatrix} 0 & 0 & 0 & 1 \end{bmatrix}$$

b. $\begin{bmatrix} 1 & a & 0 & -az_{prp} \\ 0 & 1 & b & -bz_{prp} \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & a & b & -az_{prp} \\ b & 1 & 0 & -bz_{prp} \\ a & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

d. $\begin{bmatrix} 1 & a & b & -az_{prp} \\ a & 1 & 0 & -bz_{prp} \\ b & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

117. The operations
i) shear the view colume so that the centerline of the frustum is perpendicular to the view plane and
ii) scale the view volume with a scaling factor that depends on 1/z in the same sequence, define
a. perspective - projection transformation
b. parallel - prodection transformation
c. isometric - projection transformation
d. orthogonal - projection transformation

118. The viewing coordinate description of the scene are projected onto the prodection pane in
a. modelling transformation
b. viewing transformation
c. projection transformation
d. workstation transformation

119. In the viewing pipeline, the visible surface identification and surface-rendering procedures are performed in
a. modelling transformation
b. viewing transformation
c. prodection transformation
d. workstation transformation

120. A class of visible surface detection algorthms compare objects and parts of objects to each other within the scene definition to determine which surfaces should be labelled as visible . This categoy of algorithms is called as
a. Object - space methods
b. image-space methods
c. imaginary methods
d. objective methods

121. A category of visible surface detection algorithms in which the visibility is decided point by point at each pixel position on the projection plane, are called as
a. object-space methods
b. image-space methods
c. imaginary methods
d. objective methods

122. Coherence property is used in visible surface detection algorithms to
a. speed-up the process
b. increase the precision
c. speed-up the process and to increase the precision
d. make the algorithm easy to understand

123. Coherence methods are used to take advantage of
a. regularities in a scene
b. irregularities in a scene
c. computational power of computer
d. precision of image capturing equipment

124. The equation of polygon surface is Ax +By+Cz+D=0. Examining of which coefficeant is sufficeant to determine the visibilityof polygon surface
a. A
b. B
c. C
d. D

125. In a right handed viewing system with viewing direction along the positive Z_v axis, the polygon is a back face if
a. c ;= ;0
b. c ;≤0
c. c ;≥ ;0
d. c ;< > ;0

126. The surface normal of a polygon surface is N, and V is a vector in the viewing direction from the eye, then this polygon is a back face if
a. V ; ;. ; ;N ; ;< ; ;0
b. V ; ;. ; ;N ; ;> ; ;0
c. V ; ;. ; ;N ; ;= ; ;0
d. V ; ;. ; ;N ; ;< > ; ;0

127. In a right handed viewing system with viewing direction along the negative Z_v axis, the polygon is a back face if
a. c ;= ;0
b. c ;≤0
c. c ;≥ ;0
d. c ;< > ;0

128. A point (x,y,z) is "inside" a polygon surface with plane parameters A,B,C and D if
a. Ax+By+Cz+D =0
b. Ax+By+Cz+D <0
c. Ax+By+Cz+D >0
d. Ax+By+Cz+D < >0

129. Another name for depth-buffer method for visible surface detection
a. z buffer algorithm
b. depth - sorting algorithm
c. scan - line algorithm
d. painter's algorthm

130. Howmany buffers are used in z-buffer (depth buffer) algorithm
a. 1
b. 2
c. 3
d. 0

131. In z - buffer algorithm referesh (frame) buffer stores the values of
a. depth
b. intensity
c. depth and intensity
d. entensity and enteration number

132. In which of the following algorithms, the object surfaces need not be polygons

- a. **Z-buffer**
- b. List - priority
- c. Depth - sort
- d. Binary space partitioning

133. In z-buffer algorthm, the z-buffer (depth buffer) stores the values of
- a. depth
- b. **intensity**
- c. depth and intensity
- d. intensity and interation number

134. Depth value for a surface position (x,y) are calculated from the plane equation Ax+By+Cz+D=0 as
- a. $Z = \frac{Ax+By+D}{C}$
- b. $Z = \frac{-Ax-By-D}{C}$
- c. $Z = \frac{-Ax-By+D}{C}$
- d. $Z = \frac{D}{C}$

135. If the depth value is z at position (x,y) an the plane Ax+By+Cz+D =0, then the z value at position (x+1, y) is determined by
- a. $Z^1 = Z - A/C$
- b. $Z^1 = Z + A/C$
- c. $Z^1 = Z + B/C$
- d. $Z^1 = Z - B/C$

136. In which of the following algorithm the polygons in the scene are grouped into clusters
- a. List priorty algorithm
- b. **BSP tree algorithm**
- c. scane-line algorithms
- d. Z-buffer algorithms

137. Which of the following algorithms, is well suited when the view point changes
- a. List priority algorithm
- b. **BSP tree algorithm**
- c. Scan-line algorithm
- d. Z-buffer algorithm

138. In BSP tree algorthm, the polygons in a cluster are displayed in
- a. **The order of increasing plane priority**
- b. the order of decreasing plane priority
- c. large clusters to small plane order
- d. small clusters to small plane order

139. Which of the following is false about BSP tree algorithm
- a. polygons in the scane are grouped into clusters
- b. suitable for varying view point
- c. algorithm uses recursive approach
- d. **space insentensive processing**

140. In BSP tree, the correct priority order polygon list can be obtained using
- a. **in-order tree walk**
- b. pre-order tree walk
- c. post-order tree walk
- d. Breadth first order tree walk

141. In the BSP trees, the internal nodes and the leaves respectively corrspond to
- a. **partitioning planes, regions**
- b. regions, partitioning planes
- c. visible regions, invisible regions
- d. invisible regions, visible regions

142. In BSP tree algorithm the clusters are displayed in
- a. **The order of increasing cluster priority**
- b. the order of decreasing cluster priority
- c. large clusters to small clusters order
- d. small clusters to large clusters order

143. Area sub division method for visible surface detection, is essentially a
- a. object space operation
- b. **image space operation**
- c. both object space and image space
- d. neither object space nor image space

144. In area - subdivision method, if the viewing area with a resolution of 1024 by 1024 is sub divided 10 times, the sub area reduces to
- a. 2 by 2
- b. 10 by10
- c. 11 by 10
- d. **a point**

145. Which of the following is not a possible relationship between polygon surfaces and a rectangular area defined in area-sub division method
- a. surrounding surface
- b. over lapping surface
- c. inside surface
- d. **cutting surface**

146. Which of the following is not a possible relationship between polygon surfaces and a rectangular area defined in area-sub division method
- a. inside surface
- b. outside surface
- c. **trivial surface**
- d. surrounding surface