1. Which of the following statements for a simple graph is correct.

   (a) Every trail is a path
   (b) Every path is a trail
   (c) path
   (d) Path and trail have no relation

2. What is the number of edges present in complete graph K_n having n vertices.

   (a) $\frac{n(n+1)}{2}$
   (b) $\frac{n(n-1)}{2}$
   (c) n^2
   (d) None of the above

3. What is the maximum number of edges in a bipartite graph having 12 vertices.

   (a) 24
   (b) 38
   (c) 36
   (d) 32

4. what is the determinant of the adjacency matrix of C_4 .

   (a) 1
   (b) -1
   (c) 0
   (d) None of the graph

5. what is the regularity of K_n .

   (a) n
   (b) n-1
   (c) 0
   (d) 1

6. Total number of regular graphs of degree 2 on 12 vertices.

   (a) 6
   (b) 7
   (c) 8
   (d) 9

7. Which of the following is true for any simple connected graph with more than 2 vertices.

   (a) No two vertices have same degree
   (b) At least two vertices have same degree
   (c) At least 3 vertices have same degree
   (d) All vertices have same degree

8. A graph is self complementary if it is isomorphic to it's complement.For all self complementary graphs on n vertices , n is

   (a) A multiple of 4
   (b) even
   (c) odd
   (d) congruent to 0 mod 4, or 1 mod 4

9. Which of the following will be an upper bound for minimum degree of a graph with 10 vertices.

   (a) 9
   (b) 8
   (c) 7
   (d) 6

10. A vertex which is not adjacent to every other vertex is called_____vertex.

    (a) Isolated
    (b) Pendant
    (c) Incident
    (d) Simple

11. Let n_1 and n_2 be the number of edges of graphs G_1 and G_2 respectively, then the number of edges of $G_1 \lor G_2$ is

(a) $n_1 + n_2$ (b) $n_1 + n_2 - 1$ (c) n_1 (d) n_2

12. For a given graph G having v vertices and e edges which is connected and has no cycles, which of the following statements is true?

(a) $v = e$ (b) $v = e + 1$ (c) $v + 1 = e$ (d) $v = e - 1$

13. Which of the following statements is/are TRUE for undirected graphs?
P:Number of odd degree vertices is even.
Q:Sum of degrees of all vertices is even.

(a) P only   (b) Q only   (c) Both P and Q   (d) Neither P and Q

14. A cycle on n vertices is isomorphic to its complement. The value of n is

(a) 3   (b) 4   (c) 5   (d) 6

15. A connected undirected graph containing n vertices and $n - 1$ edges _____
(a) Cannot have cycles   (b) Must contain at least one cycle
(c) Can contain at most two cycles   (d) Must contain at least two cycles

16. A graph is_____if it has at least one pair of vertices without a path between them.

(a) Complete   (b) Connected   (c) Disconnected   (d) Trivial

17. What is the total number of edges of a $k-$ regular graph with n vertices
(a) kn (b) $\frac{kn}{2}$ (c) $k + n$ (d) kn^2

18. Which of the following statements is/are TRUE for Tree?
P: Every two points of G are joined by a unique path.
Q: G is connected and $p = q - 1$
(a) P only   (b) Q only   (c) Both P and Q   (d) Neither P and Q

19. Let *G* be a simple graph with every pair of vertices is connected. Then *G* is

    (a) trivial   (b) complete

    (c) disconnected   (d) self complementary

20. Let $G = C_n$. Then

    (a) There is path of length 5   (b) There is a closed path of length 5

    (c) G is bipartite   (d) none of the above

21. Let $G = P_n$. Then

    (a) Every sub graph of G is path   (b) Every proper sub graph of G is path

    (c) Every spanning sub graph of G is path (d) Every induced sub graph of G is path

22. Let $G = K_n$ where $n \geq 5$. Then number of edges of any induced sub graph of G with 5 vertices

    (a) 10   (b) 5   (c) 6   (d) 8

23. Which of the following statement is/are TRUE ?
    P:A cycle is a walk with end vertices are same.
    Q:A cycle is a path with end vertices are same.

    (a) P only   (b) Q only   (c) Both P and Q   (d) Neither P and Q

24. A graph is called a_____if it is a connected acyclic graph

    (a) Cyclic graph   (b) Regular graph   (c) Tree   (d) Trivial graph

25. A Sub graph H of a graph G is called a clique if

    (a) $V(G) = V(H)$ (b) $V(H) \subseteq V(G)$

    (c) H contain all edges of G   (d) H is also a complete graph

26. Number of edges incident with the vertex V is called?

    (a) Degree of a graph   (b) Handshaking lemma

    (c) Degree of a vertex   (d) None of the above

27. A graph with all vertices having equal degree is known as a _____

    (a) Multi graph   (b) complete graph   (c) Regular graph   (d) Simple graph

 28. Which of the following properties does a simple graph not hold?

   (a)   Must be connected   (b) Must be
               unweighted

   (c) Must have no loops or multiple edges (d) Must have no edges

29. A graph with n vertices will definitely have a parallel edge or self loop if the total number of edges are

(a) Greater than $n - 1$

(b) Less than $n(n - 1)$

(c) Greater than $\frac{n(n-1)}{2}$

(d) Less than $\frac{n^2}{2}$

30. The number of elements in the adjacency matrix of a graph having 7 vertices is _____

(a) 7   (b) 14   (c) 36   (d) 49

31. The graph in which, there is a closed trail which includes every edge of the graph is known as?

(a) Hamiltonian graph

(b) Euler graph

(c) Directed graph

(d) Planar graph

32. If G is the forest with 54 vertices and 17 connected components, G has _____ total number of edges.

(a) 37   (b) 71   (c) 17   (d) 54

33. Let G be a simple graph. Which of the following statements is true?
P: Adjacency matrix is symmetric.
Q: Trace of adjacency matrix is 1.

(a) P only   (b) Q only   (c) Both P and Q   (d) Neither P and Q

34. What is the maximum number of possible non zero values in an adjacency matrix of a simple graph with n vertices?

(a) n^2 (b) $\frac{n(v-1)}{2}$ (c) $\frac{n(n+1)}{2}$ (d) n

35. How many of the following statements are correct?
1. All cyclic graphs are complete graphs.
2. All complete graphs are cyclic graphs.
3. All paths are bipartite.
4. All cyclic graphs are bipartite.
5. There are cyclic graphs which are complete.

(a) 1   (b) 2   (c) 3   (d) 4

36. The degree sequence of a simple graph is the sequence of the degrees of the nodes in the graph in decreasing order. Which of the following sequences can not be the degree sequence of any graph?
1. 7, 6, 5, 4, 4, 3, 2, 1
2. 6, 6, 6, 6, 3, 3, 2, 2
3. 7, 6, 6, 4, 4, 3, 2, 2
4. 8, 7, 7, 6, 4, 2, 1, 1

(a) 1 and 2   (b) 3 and 4   (c) 4 only   (d) 2 and 4

37. Let G be a simple undirected planar graph on 10 vertices with 15 edges. If G is a connected graph, then the number of bounded faces in any embedding of G on the plane is equal to

    (a) 4   (b) 5   (c) 6   (d) 7

38. Let G be a Null graph. Then

    (a) $V(G) = \phi$ (b) $E(G) = \phi$ (c) $|E(G)| = Even$ (d) $|E(G)| = Odd$

39. G is a simple undirected graph. Some vertices of G are of odd degree. Add a node v to G and make it adjacent to each odd degree vertex of G. The resultant graph is sure to be

    (a) Regular   (b) Complete   (c) Hamiltonian   (d) Euler

40. Radius of a graph, denoted by rad(G) is defined by_____?

    (a) Max$\{e(v) : v \in V(G)\}$ (b) Min $\{e(v) : v \in V(G)\}$

    (c) Max $\{d(v, v) : v, u \in V(G)\}$ (d) Min $\{d(u, v) : v, u \in V(G)\}$

41.   I. Every bipartite graph contains an odd cycle.

    II. Every tree is a bipartite graph.

    (a) I is true and II is false   (b) I is false and II is true

    (c) I and II are false   (d) I and II are true

42. If a graph is planar, then it is embeddable on a

    (a) Circle   (b) Square   (c) Sphere   (d) Triangle

43. In a 2-connected graph *G*, any two longest cycles have at least —— vertices in common.

    (a) 0   (b) 1   (c) 2   (d) 3

44. A simple graph has ——

    (a) loops   (b) parallel edges

    (c) loops and parallel edges   (d) None of the above

45. P:Let G_1, G_2 and G_3 be simple graphs. If $G_1 \cong G_2$ and $G_2 \cong G_3$ then $G_1 \cong G_3$. Q: If G_1 and G_2 are isomorphic then they have a common edge.

    (a) P is true and Q is false   (b) P is false and Q is true

    (c) P and Q are false   (d) P and Q are true

46. Total number of edges of a complete graph $K_{m,n}$

    (a) $m + n$ (b) $m - n$ (c) mn (d) $\frac{mn}{2}$

47. Let *G* be a bipartite graph. P: Any vertex deleted graph *G — v* is also a bipartite graph.

    Q: There exist two disjoint trivial induced subgraphs of *G*.

    (a) P is true and Q is false   (b) P is false and Q is true

    (c) P and Q are false   (d) P and Q are true