Shivaji University, Kolhapur
Question Bank For Mar 2022 (Summer) Examination

Subject Code: 81665 Subject Name: Discrete Mathematics

Question Bank

Multiple Choice questions

1) In a disjunction, even if one of the statements is false, the whole disjunction is still _____

A) false B) negated C) true D) both true and false

2) The proposition (p→ q) ∧ (q → p) is a _____.

A) tautology B) contradiction C) contingency D) absurdity

3) If p & q are two statements then $q \rightarrow p$ is called _____ of$p \rightarrow q$.

A) inverse B) converse C) contrapositive D) none of these

4) p → q is logically equivalent to _____.

A) $\sim p \vee \sim q$ B) $p \vee \sim q$C) $\sim p \vee q$ D) $\sim p \wedge q$

5) The kind of inference $p \rightarrow q,\ \sim q \ \therefore \ \sim p$ is called _____.

A) Generalization B) Modus Tollens

C) Specialization D) Modus Ponens

6) The base or radix of the quintal number system is _____.

A) 6 B) 11 C) 5 D) 7

7) The decimal equivalent of hexadecimal number 3CF is _____.

A) 975 B) 865 C) 1110 D) 795

8) The binary addition 1101_2 + 1011_2 = _____.

A) 11010_2 B) 10110_2 C) 11000_2 D) 11001_2

9) The binary subtraction 111.01_2 – 011.10_2 = _____.

A) 010.01_2 B) 100.11_2 C) 011.11_2 D) 100.01_2

10) A set of points in a graph are called_____ .

A) nodes B) edges C) fields D) lines

11) Multi graph is a graph which contains _____.

A) Parallel edges but no loops B) Loops but no Parallel edges

C) Parallel edges &Loops D) No parallel edges & No loops

12) A complete graph on 'n' vertices has_____number of edges.

A) $\frac{n(n+1)}{2}$ B) $\frac{(n-1)}{2}$ C) $\frac{(n+1)}{2}$ D) $\frac{n(n-1)}{2}$

13) A vertex on which no edges are incident is called _____.

A) pendent vertex B) centre of vertex

C) isolated vertex D)diameter

14) The number of edges in a regular graph of degree 46 and 8 vertices is_____

A) 347 B) 230 C) 184 D) 186

15) The kind of inference p $\therefore$ $p \vee q$ is called _____.

A) GeneralizationB) Modus Tollens

C) Specialization D) Contradiction Rule

16) The inverse of "if p then q" is _____.

A) "If q then p"B) "If $\sim p$ then $\sim q$"

C) "If $\sim q$ then $\sim p$"D)$\sim p \wedge q$

17) The kind of inference $p \wedge q$ $\therefore$ q is called _____.

A) Generalization B) Modus Tollens

C) Specialization D) Contradiction Rule

18) The binary equivalent of octal number 5073is_____.

A) 101 000 101 011 B) 101 010 111 011

C) 101 001 011 011 D) 101 000 111 011

19) Every complete graph on 'n' vertices is an _____.

A) (n − 1)-regular graph B) n-regular graph

C) (n + 1)-regular graph D) $n/2$-regular graph

20) Total degree of a graph G with **'6'**vertices and**'8'** edges is _____

A) 12 B)16 C) 8 D)6

21)A graph that does not have loops as well as parallel edges is called _____

A)multigraph B)pseudograph C)simple graph D) trivial graph

22) A circuit that includes every vertex of a graph is called _____ .

A)Hamiltonian circuit B)Euler circuit

C)simple circuit D) none of these

23) The kind of inference $\sim p \rightarrow c \ \therefore \ p$ is called _____.

A) Generalization B) Modus Tollens

C) Specialization D) Contradiction Rule

24) The base or radix of the octal number system is _____.

A) 2 B) 16 C) 10 D) 8

25) A Null graph has_____.

A) no nodesB) no edges C) no even vertex D) none of these

26) The maximum degree of any vertex in a simple graph with n vertices is_____

A)$n - 1$ B) $n + 1$ C) $2n - 1$ D) n

27) The complete graph with four vertices has k edges where k is_____

A) 3 B) 4 C) 5 D) 6

28) Number of circuits in any tree is exactly _____

A) 1 B) 0 C) infinite D) none of these

29) A vertex of degree one in any tree is called_____

A) Internal Vertex B) Leaf C) Forest D) Isolated Vertex

30) Level of root in any rooted tree is _____

A) 0 B) 1 C) 2 D) 3

31) A tree with 21 vertices has _____ edges

A) 22 B) 20 C) 40 D) 21

32) Total degree of a tree with 25 vertices is _____

A) 24 B) 26 C) 48 D) 12

33) The graph $K_{2,n}$ has _____ edges.

A) $2n$ B) n C) 2 D) 3

34) A 5-regular graph with 7 vertices _____.

A) is a simple graph B) is a multigraph

C) can not be drawn D) is a tree

35) Which of the following is not a proposition ?

A) Is mathematical boring?

B) Man landed on the sun last year

C) Diamond is harder than graphite

D) he finished his work and went away

36) The symbols $\wedge, \vee, \rightarrow$ and $\leftrightarrow$ are called _____

A) Propositions B) connectives C) statements D) None of these

37) which of the following Is logically equivalent to $-(-p \rightarrow q)$?

A) $p \wedge q$ B) $p \wedge -q$ C)$-p \wedge q$ D)$-p \wedge -q$

38) Let p be a statement then $'p \vee (\sim p)'$ is _____ .

A) always tautology B) always contradiction

C) contingency D) not a statement

39) Sum of weights of all edges involved in graph is called _____of graph

A) Total length B) Total weight

C)Total degree D) Total distance

40) The law $\sim(p \vee q) \equiv \sim p \wedge \sim q$ is known as _____.

A) Idempotent law B) De-Morgan's law

C) Associative law D) Distributive Law

Questions for 8 Marks

1. Assume x is Particular real number and determine whether following statements $(a)\ and\ (b)$are logicallyEquivalent or not

(a) $x < 2$or it is not same case that $1 < x < 3$

(b) $x \geq 1$or either $x < 2$ or $x \geq 3$

2.Write each of the following statements in symbolic form and determine which pairs arelogically equivalent ,Include truth tables

i) If it walks like a duck and it talks like a duck, then it is a duck.

ii) Either it does not walk like a duck or it does not talk like a duck, or it is a duck

iii) If it does not walk like a duck and it does not talk like a duck, then it is not a duck.

3. Define Converse and Inverse of conditional statement and write the converse and inverse of given statement 'If today is New Year's Eve,then tomorrow is January'

4. Define Valid Argument. Test the validity of set of premises and conclusion given below $(\sim p \vee q) \rightarrow r\ ,\ s \vee \sim q\ ,\ \sim t\ ,\ p \rightarrow t\ ,(\sim p \wedge r) \rightarrow \sim s \therefore \sim q$

5. Define Valid Argument. Test the validity of following argument using truth table

If the sum of the digits of 371,487 is divisible by 3, then 371,487 is divisible by 3.

The sum of the digits of 371,487 is divisible by 3

$\therefore$ 371,487 is divisible by 3.

6. You are about to leave for school in the morning & discover that you didn't have your glasses, you know the following statements are true:

(a) If I was reading the newspaper in the kitchen, then my glasses are on the kitchen table

(b) If my glasses are on the kitchen table, then I saw them at breakfast

(c) I did not see my glasses at breakfast.

(d) Either I was reading the newspaper in the kitchen or in living room

(e) If I was reading the newspaper in living room then my glasses are on the coffee table.

Where are the glasses ?

7. State and prove Hand shaking lemma

8. Define Degree of Vertex and show that number of odd degree vertices in any graph is always even

9. Define 'Euler circuit' and prove that if a graph has an Euler circuit then every vertex of graph has positive even degree

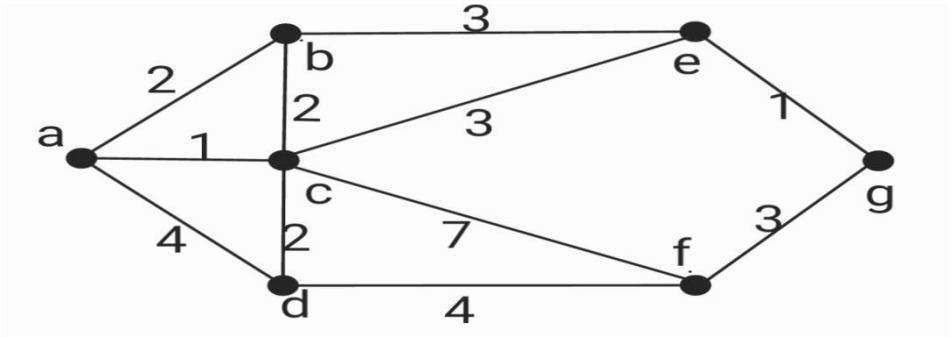
10.If a graph G is connected and the degree of every vertex of G is a positive even integer, then prove that G has an Euler Circuit

11. Define ‘Tree’ and show that a tree with ‘n’ vertices has ‘$n-1$’ edges where n is positive integer

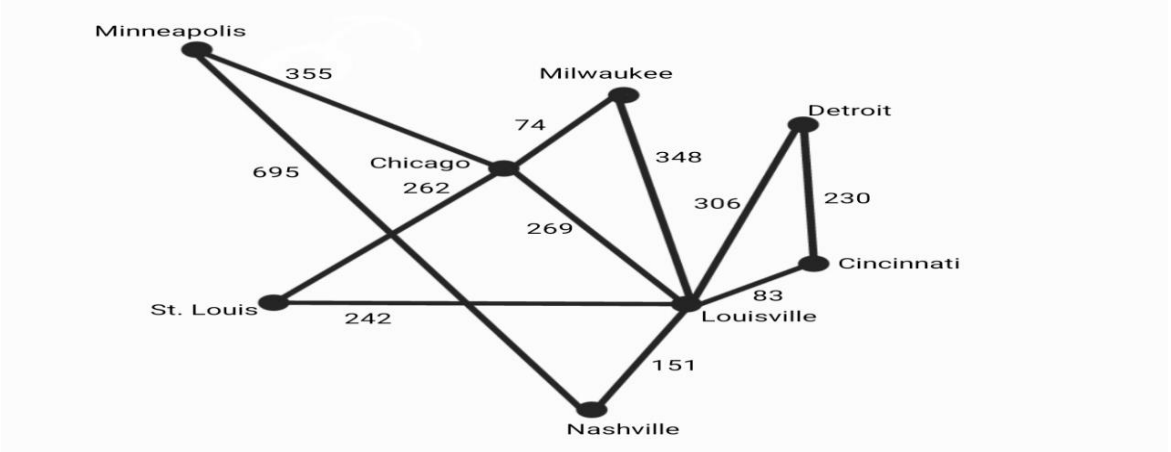
12. Define ‘Circuit’ and prove that If G is any connected graph, C is any circuit in G, and any one of the edges of C is removed from G , then the graph that remains is connected

13.Define ‘Tree’ and prove that for any positive integer , if G is a Connected graph with n vertices and $n-1$edges, then G is a tree.

14. find the shortest path from vertex ‘a’ to remaining vertices of graphG given below using Dijkstra’s algorithm



15. Define ‘Minimum Spanning Tree’ Find the minimum spanning tree and its total weight for graph G given below using Kruskal’s Algorithm



Questions for 4 Marks

1. Define a) Disjunction of two statements b) Conjunction of two statements

2. Prepare truth table for $(p \vee q) \wedge \sim (p \wedge q)$

3. Prepare truth table for $(p \wedge q) \wedge \sim r$

4. Assume x is real number and Use De Morgan's laws to write the negation of $-1 < x \leq 4$

5. Define a) Tautology b) Contradiction

6. Determine whether the statements $\sim (p \wedge q)$ and $\sim p \wedge \sim q$ are logically equivalent or not

7. Determine whether the statements $p \wedge (q \vee r)$ and $(p \wedge q) \vee (p \wedge r)$ are logically equivalent or not

8. Assume x is real number and Use De Morgan's laws to write the negation of $-2 < x < 7$

9. Check whether the statement $(p \wedge q) \vee [\sim p \vee (p \wedge \sim q)]$ is Tautology or Contradiction

10. Using truth table show that $(p \oplus q) \oplus r \equiv p \oplus (q \oplus r)$

11. Write the converse, inverse and contra positive of following statement

'If Howard can swim across the island, then Howard can swim across the lake'

12.Rewrite the following statements as conjunction of two if - then statements

'This Quadratic equation has two distinct real roots if and only if, its discriminant is greater than zero'

13. Rewrite the following sentences in if – then form and explain logical relation between themi) I say what I mean ii) I mean what I say

14. Using method of contradiction show that $\sqrt{5}$ is an irrational number

15. Represent given decimal integers into binary notations i) 55 ii) 287

16. Convert given binary number to decimal number i) 110101_2 ii) 1100101_2

17. Evaluate i) $101001_2 + 10011_2$ ii) $101101_2 - 10011_2$

18.Convert given Hexadecimal number to decimal number i) $3CF_{16}$ ii) $E0D_{16}$

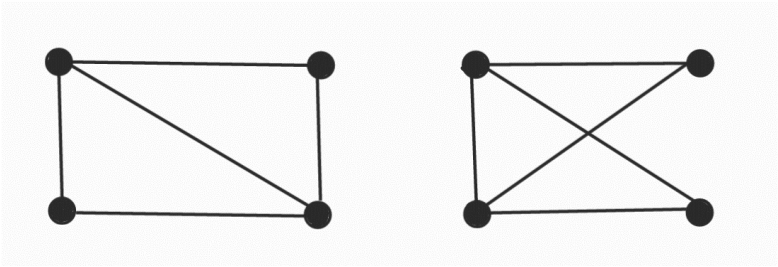
19. Convert given Hexadecimal number to binary number i) $4FA_{16}$ ii) $B53DF8_{16}$

20. Evaluate i) $1001_2 + 1011_2$ ii) $1010100_2 - 10111_2$

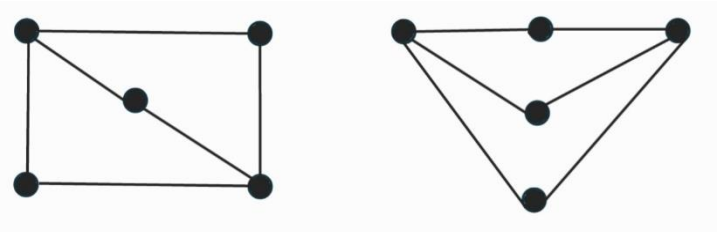
21. Define i) Complete Graph ii) Complete Bipartite Graph

22. if G is graph having p vertices of which r vertices have degree 'k' while remaining vertices have degree '$k+1$' then show that $r = (k+1)p - 2q$ where q is the number of edges in G

23. Check whether the following graphs are isomorphic or not



24. Check whether the following graphs are isomorphic or not



25. Draw a graph with 5 vertices having degrees 1, 2, 3, 3, 5 respectively

26. Draw i) $K_{4,2}$ ii) K_5

27. Write a short note on konigsberg seven bridge problem.

28. Define 'Adjacency matrix' for a directed graph and draw a directed graph corresponding

To given adjacency Matrix $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 2 \\ 0 & 0 & 1 & 1 \\ 2 & 1 & 0 & 0 \end{bmatrix}$

29. Define 'Adjacency matrix' for aundirected graph and draw a undirected graph

corresponding to given adjacency Matrix $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 1 & 2 & 1 \\ 0 & 2 & 0 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix}$

30. Verify Handshaking Lemma For the following graph