SUBJECT NAME : Graph Theory and Application

SUBJECT CODE : CS 6702

MATERIAL NAME : Part – A questions

REGULATION : R2013

UPDATED ON : November 2017 (Upto N/D 2017 Q.P)

(Scan the above Q.R code for the direct download of this material)

Unit – I (Introduction to Graph Theory)

1. Define simple graph.
2. Define Pseudo graph.
3. Define complete graph and give an example.
4. Draw the complete graph K_5.
5. Define a regular graph. Can a complete graph be a regular graph?
6. How many edges are there in a graph with 10 vertices each of degree 5?
7. State the handshaking theorem.
8. Define bipartite graph.
9. When is a simple graph G bipartite? Give an example.
10. Draw a complete bipartite graph of $K_{2,3}$ and $K_{3,3}$.
11. Define complementary graph.
12. Define isomorphism of two graphs.
13. Define self-complementary graph.
14. Determine the number of vertices for a graph G, which has 15 edges and each vertex has degree 6. Is the graph G be a simple graph?
15. Suppose G is a finite cycle-free connected graph with at least one edge. Show that G has at least two vertices of degree 1.
16. Define walk, path and circuit in a graph.
17. Define a connected graph and a disconnected graph with examples.

18. Define strongly connected graph.

19. Give an example of an Euler graph.

20. Give an example of a non-Eulerian graph which is Hamiltonian.

21. Give an example of a graph which is Eulerian but not Hamiltonian.

22. State the necessary and sufficient conditions for the existence of an Eulerian path in a connected graph.

23. Let G be a graph with ten vertices. If four vertices has degree four and six vertices has degree five, then find the number of edges of G.

24. Define complementary graph $\bar{G}$ of a simple graph G. If the degree sequence of the simple graph is 4, 3, 3, 2, 2, what is the degree sequence of $\bar{G}$.

25. For which value of *m* and *n* does the complete bipartite graph $K_{m,n}$ have an (i) Euler circuit (tour) (ii) Hamilton circuit (cycle).

26. Is the directed graph given below strongly connected? Why or why not?

Unit – II (Trees, Connectivity and Planarity)

1. Define tree with example.

2. In a tree, every vertex is a cut-vertex. Justify the claim.

3. Define planar graph.

4. What are the applications of planar graph?

5. A simple planar graph to which no edge can be added without destroying its planarity (while keeping the graph simple) is a maximal planar graph. Prove that every region in a maximal planar graph is a triangle.

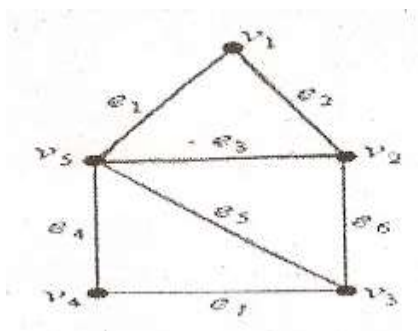
6. Define 1-isomorphic and 2-isomorphic.

Unit – III (Matrices, Colouring and Directed Graph)

1. Define minimal dominating set and maximal independent set.

2. Draw the graph represented by the given adjacency matrix $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$.

3. Obtain the adjacency matrix of the graph given below.



4. Find the chromatic number of a complete graph on n vertices.

5. Prove that a graph of n vertices is a complete graph iff its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda-1)(\lambda-2)...(\lambda-n+1)$.

6. Define the two types of connectedness in digraphs. Give examples.

Unit – IV (Permutations and Combinations)

1. In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

2. A committee including 3 boys and 4 girls is to be formed from a group of 10 boys and 12 girls. How many different committees can be formed from the group?

3. In how many ways can all the letters in MATHEMATICAL be arranged.

4. How many different words are there in the word ENGINEERING?

5. What is the number of arrangements of all the six letters in the word PEPPER?

6. How many permutations are there in the word M I S S I S S I P P I ?

7. THALASSEMIA is a genetic blood disorder. How many ways can the letters in THALASSEMIA be arranged so that all three A's together?

8. How may permutations of $\{a,b,c,d,e,f,g\}$ and with a ?

9. How many different bit strings are there of length seven?

10. Determine the number of positive integers n, $1 \le n \le 100$, that are not divisible by 3 or 7.

Unit – V (Generating Functions)

1. Define recurrence relation.

2. Define generating function.

3. Write the generating function for the sequence $1, a, a^2, a^3, a^4, \ldots$.

4. Find the recurrence relation for the Fibonacci sequence.

5. Find the recurrence relation satisfying the equation $y_n = A(3)^n + B(-4)^n$.

6. Solve the recurrence relation $y(k) - 8y(k-1) + 16y(k-2) = 0$ for $k \ge 2$, where $y(2) = 16$ and $y(3) = 80$.

7. Solve: $a_k = 3a_{k-1}$, for $k \ge 1$, with $a_0 = 2$.

8. Find the coefficient of x^6 in $(3-5x)^{-8}$.

---- *All the Best* ----