Reg. No. :

Question Paper Code : 71691

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 — GRAPH THEORY AND APPLICATIONS

(Common to Information Technology)

(Regulations 2013)

Time : Three hours — Maximum : 100 marks

Answer ALL questions.

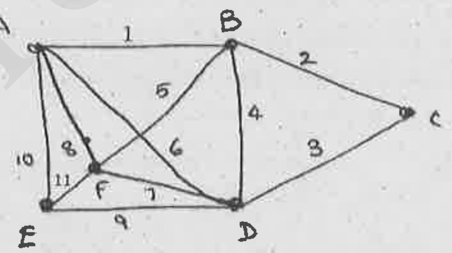
PART A — (10 × 2 = 20 marks)

1. Define Euler graph. Show that an Euler graph is connected except for any isolated vertices the graph may have.

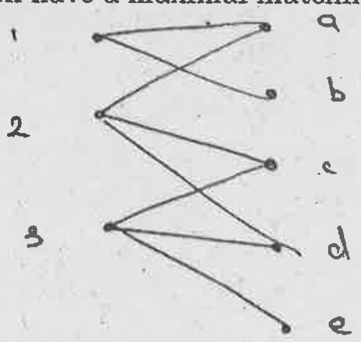
2. Can there be a path longer than a Hamiltonian path (if any) in a simple, connected, undirected graph? Why?

3. Define planar graphs.

4. Identify two spanning trees for the following graph :



5. Does the following graph have a maximal matching? Give reason.



6. Draw K_8 and K_9 and show that thickness of K_8 is 2 while thickness of K_9 is 3.

7. State the rule of sum, the first principle of counting.

8. Use Venn diagram to represent the following scenario :

If S : a set, C_1 = condition 1 and C2 – condition 2 satisfied by some elements of S, indicate on the diagram – S, $N(C_1)$, $N(C_2)$ $N(C_1, C_2)$ and $N(\overline{C}_1, \overline{C}_2)$.

9. Give explanation for the following : Generating function for the no. of ways to have n cents in pennies and nickels $= (1 + x + x^2 + ...)(1 + x^5 + x^{10} + ...)$

10. Solve the recurrence relation $a_{n+1} - a_n = 3n^2 - n \quad n \geq 0 \; a_0 = 3$.

PART B — (5 × 16 = 80 marks)

11. (a) Define the following terms :

(i) Walk

(ii) Euler path

(iii) Hamiltonian path

(iv) Subgraph

(v) Circuit

(vi) Complete graph (6)

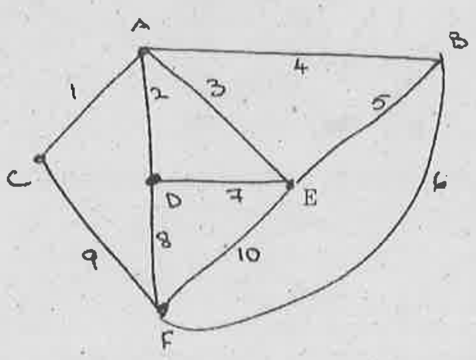
From the given graph draw the following :

(vii) Walk of length 6

(viii) Is this an Euler graph? Give reasons

(ix) Is there a Hamiltonian path for this graph? Give reasons

(x) Find atleast two complete subgraphs (10)



Or

(b) (i) List any five properties of trees. (6)

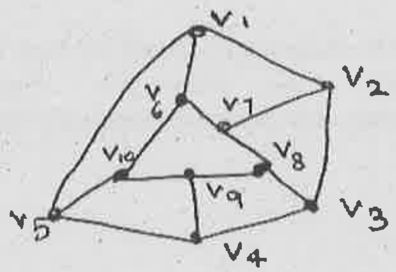
(ii) Define eccentricity of a vertex V in a tree T and give an example tree and its eccentricity from the root. (10)

12. (a) (i) Define spanning tree and give an example.

(ii) A farm has six walled plots full of water. The graph representation of it is given below. Use the concepts of spanning tree, cutsets appropriately to determine the following :

(1) How many walls will have to be broken so that all the water can be drained out?

(2) If only one plot was full of water and this had to be drained into all other plots, then how many walls need to be broken?



Or

(b) State the Eulers formula relating the number of vertices, edges and faces of a planar connected graph. Give two conditions for testing for planarity of a given graph. Give a sample graph that is planar and another that is non-planar.

13. (a) Describe the steps to find adjacency matrix and incidence matrix for a directed graph with a simple example.

Or

(b) Write a note on chromatic polynomials and their applications.

14. (a) In how many ways can the 26 letters of the alphabet be permuted so that the patterns car, dog, pun or byte occures? Use the principle of inclusion and exclusion for this.

Or

Reg. No. :

Question Paper Code : 40918

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 – GRAPH THEORY AND APPLICATIONS

(Common to : Information Technology)

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define the terms with respect to graph : walk and path.
2. State two properties of binary tree.
3. Define fundamental circuit in a graph.
4. State Kuratowski's theorem.
5. Let a graph G is 2 – chromatic, then prove that it is bipartite.
6. Define minimal covering.
7. Find the number of ways in which the letters of the word TRIANGLE can be arranged such that vowels occur together ?
8. Find the number of non-negative integral solutions to $x_1 + x_2 \; x_3 + x_4 = 20$.
9. Find the exponential generating function of the sequence 0!, 1!, 2!, 3!, . . .
10. Determine the coefficient of x^{15} in $f(x) = (x^2 + x^3 + x^4 + \ldots)^4$.

PART – B (5×16=80 Marks)

11\. a) i) Prove that the number of vertices of odd degree in a graph is always even. (6)

ii) Prove that a connected graph G is an Euler graph if and only if it can be decomposed into circuits. (10)

(OR)

b) i) Prove that a tree with n vertices has (n – 1) edges. (6)

ii) State and prove Dirac's theorem. (10)

12\. a) i) Prove that every circuit has an even number of edges in common with a cut-set. (8)

ii) Prove the following :

With respect to the given spanning tree T, a branch b_i that determines a fundamental cut-set S is contained in every fundamental circuit associated with the chords in S and in no others. (8)

(OR)

b) i) Explain max-flow min-cut theorem. (8)

ii) Define 2-isomorphism and prove that the rank and nullity of a graph are invariant under 2-isomorphism. (8)

13\. a) i) If G is a tree with n vertices, then prove that its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$. (8)

ii) Define chromatic number. Prove that a graph with at least one edge is 2-chromatic if and only if it has no circuits of odd length. (8)

(OR)

b) i) State and prove five-colour theorem. (8)

ii) Discuss about any four types of digraph with suitable examples. (8)

14\. a) i) Using the principle of inclusion and exclusion find the number of prime numbers not exceeding 100. (8)

ii) Show that if n and k are positive integers, then $C(n+1, k) = \frac{n+1}{k} C(n, k-1)$. Use this identity, construct an inductive definition of the binomial co-efficient. (8)

(OR)

b) i) A survey of 150 college students reveals that 83 own cars, 97 own bikes, 28 own motorcycles, 53 own a car and a bike, 14 own a car and motorcycle, 7 own a bike and a motorcycle and 2 own all the three. How many students own a bike and nothing else and how many students do not own any of the three ? (8)

ii) Five professors P_1, P_2, P_3, P_4, P_5 are to be made class advisor for five sections C_1, C_2, C_3, C_4, C_5, one professor for each section. P_1 and P_2 do not wish to become the class advisors for C_1 or C_2, P_3 and P_4 for C_4 or C_5 and P_5 for C_3 or C_4 or C_5. In how many ways can the professors be assigned the work (without displacing any professor) ? (8)

15\. a) i) Obtain the fractional de-composition and identify the sequence having the expression $\frac{3-5z}{1-2z-3z^2}$ as a generating function. (8)

ii) Find the generating function of the sequence 7, 8, 9, 10, . . . (4)

iii) Find the number of distinct summands of the integer 6. (4)

(OR)

b) i) Solve the recurrence relation $y_{n+2} - 6y_{n+1} + 8y_n = 3n+5$. (8)

ii) If a_n denotes the sum of the first n positive integers, find a recurrence relation for a_n and then solve it. (8)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Show that a Hamiltonian path is a spanning tree. (5)

(ii) Prove that in a tree every vertex of degree greater than one is a cut-vertex. (5)

(iii) Prove that a connected planar graph with n vertices and e edges has $e - n + 2$ regions. (5)

Or

(b) (i) Solve the recurrence relation $F_n = 5F_{n-1} - 6F_{n-2}$ where $F_0 = 1$ and $F_1 = 4$. (8)

(ii) Solve the recurrence relation $a_n - 3a_{n-1} = 5(3^n)$ where $n \geq 1$ and $a_0 = 2$. (7)

———————

02/05/19

Reg. No. :

Question Paper Code : 52875

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 — GRAPH THEORY AND APPLICATIONS

(Common to Information Technology)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

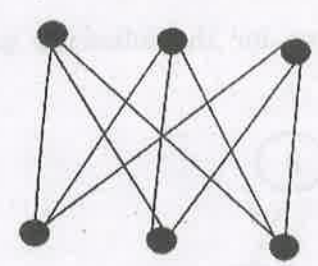
Answer ALL questions.

PART A — (10 × 2 = 20 marks)

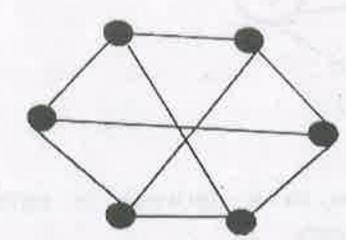
1. Define pendant vertex.

2. Verify that the two graphs (a) and (b) in the following figure are isomorphic. Mention the reasons for it.

(a)



(b)



3. What is meant by edge connectivity?

4. Give an example for planar graph.

5. Define maximal independent set.

6. Give an example for transitive relation.

7. In how many ways can the letters of the word APPLE be arranged?

8. In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?

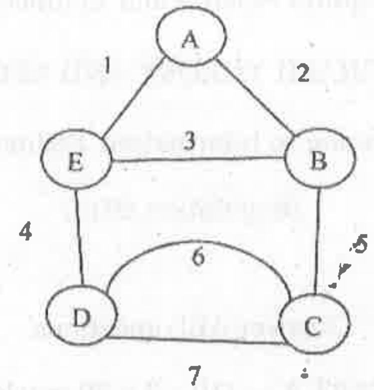
9. Find the generating functions for 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, ...

10. Find a recurrence relation and initial conditions for 1, 5, 17, 53, 161, 485.....

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain some of the applications of graphs. (7)

(ii) Write down the adjacency and incidence matrices for the following graph. (6)

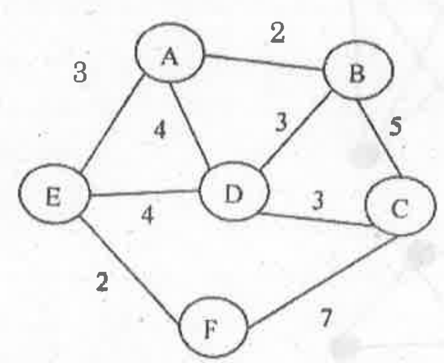


Or

(b) (i) List some of the properties of tree. (7)

(ii) Prove that a connected graph G is an Euler graph iff all vertices of G are of even degree. (6)

12. (a) (i) Find the minimum spanning tree for the following graph using Prim's algorithm. Explain it. (7)



(ii) Prove that the maximum flow in a network is equal to the minimum of capacities of all cut-sets. (6)

Or

(b) (i) Prove that the complete graph of five vertices is non-planar. (6)

(ii) List the properties of cut-set. (7)

13. (a) (i) With example, explain various types of digraphs. (6)

(ii) How will you find all maximal independent sets? Explain. (7)

Or

(b) (i) Why is chromatic polynomial? Explain. (6)

(ii) How is covering of a graph verified? Discuss about it. (7)

14. (a) (i) A box contains three white balls, four black balls and three red balls. Find the number of ways in which three balls can be drawn from the box so that at least one of the balls is black. (5)

(ii) How many ways are there to choose 3 people to receive Rs. 1,000 prize from a group of 9, assuming no one receives more than one prize? (5)

(iii) How many words can be formed by using all letters of the word 'BIHAR'? (3)

Or

(b) (i) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there? (5)

(ii) How many arrangements can be made out of the letters of the word 'ENGINEERING'? (5)

(iii) In how many ways can three boys be seated on five chairs? (3)

15. (a) Find the coefficient of x^{2005} in the generating function $G(x)$

(i) $G(x) = (1-2x)^{5000}$ (4)

(ii) $G(x) = \dfrac{1}{1+3x}$ (4)

(iii) $G(x) = \dfrac{1}{(1+5x)^2}$. (5)

Or

(b) (i) Find the coefficient of x^{60} in $\left(x^8 + x^9 + x^{10} + ...\right)^7$. (5)

(ii) Find the recurrence relation for the sequence 3, 7, 11, 15, 19,.... (3)

(iii) Find the unique solution of the recurrence relation (5)

$$6a_n - 7a_{n-1} = 0,\ n \geq 1, a_3 = 343$$

ii) Find the value of sum if the given program segment is executed.

```
main ()
{
   int  inc = 0, sum = 0;
   int i, j, k;
   for (i=1; i≤10; i++)
     for (j=1; j≤i; j++)
        for (k=1; k≤j; k++)
        {
          inc = inc + 1;
          sum = sum + inc;
        }
}
```

(10)

(OR)

b) i) Determine the coefficient of x^9y^6 in the expansion of $(4y - x)^{15}$. (4)

ii) How many integer solutions are possible for $x_1 + x_2 + x_3 + x_4 + x_5 < 40$ where $x_i \geq -3$, $1 \leq i \leq 5$. (6)

iii) In a survey of the chewing gum tastes of a group of baseball players, it was found that 22 liked juicy fruit, 25 liked spearmint, 39 like bubble gum, 9 like both spearmint and juicy fruit, 17 liked juicy fruit and bubble gum, 20 liked spearmint and bubble gum, 6 liked all three and 4 liked none of these. How many baseball players were surveyed ? (6)

15. a) i) Two cases of soft drinks, 24 bottles of one type and 24 bottles of another, are distributed among five surveyors who are conducting taste tests. In how many ways can the 48 bottles be distributed so that each surveyor gets at least two bottles of each type ? And in how many ways can they be distributed so that each surveyor gets at least two bottles of one type and three of other type ? Use generating function. (12)

ii) Find all partitions of integer 6 and find the number of partitions with distinct summands. (4)

(OR)

b) i) A person invests Rs. 50,000 at 6% interest compounded annually.

1) Find the amount at the end of 1st, 2nd, 3rd year.

2) Write the general explicit formula.

3) How long will it take to double the investment ? Use recurrence relation. (10)

ii) Derive an explicit formula for the Fibonacci sequence using recurrence relation. (6)

01/11/17 FN

Reg. No. :

Question Paper Code : 50400

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 – GRAPH THEORY AND APPLICATIONS

(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. 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 ?

2. 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.

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

4. 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.

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

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

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

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

10. The number of virus affected files in a system is 500 (approximately) and this doubles every four hours. Using a recurrence relation, determine the number of virus affected files in the system after one day.

PART – B (5×16=80 Marks)

11. a) i) The Figure 1 represents a floor plan with the doors between the rooms and the outside indicated. The real estate agent would like to tour the house, starting and ending outside, by going through each door exactly once. What is the fewest number of doors that should be added, and where should they be placed in order to make this tour possible ? Give reasons for your answer.

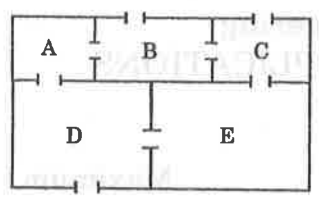


Fig. 1

(8)

ii) Define closed-walk, open-walk, path and circuit. Take a graph of your choice and give an example to each one. (8)

(OR)

b) i) Nine members of committee have their dinner in round table. If no member sits near to the same neighbour more than once, how many days can this arrangement possible ? Write all possible arrangements. (8)

ii) State four properties of a tree graph and prove them. (8)

12. a) i) Show that starting from any spanning tree of a graph G, every other spanning tree of G can be obtained by successive cyclic interchanges. (6)

ii) Prove that the ring sum of any two cut-sets in a graph is either a third cut-set or an edge disjoint union of cut-sets. (6)

iii) Define edge vertex connectivity and edge connectivity. Give the relation between them. (4)

(OR)

b) i) Show, by drawing the graphs, that two graphs with the same rank and the same nullity need not be 2-isomorphic. (4)

ii) State Kuratowski's Theorem and use it in order to prove the graph in Fig. 2 is non-planar. (8)

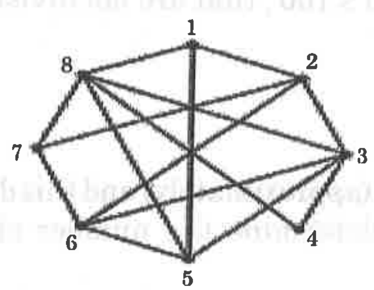


Fig. 2

iii) State minimum cut maximum flow theorem. Using it calculate the maximum flow between the nodes D and E in the graph (Fig. 3). The number on a line represents the capacity. (4)

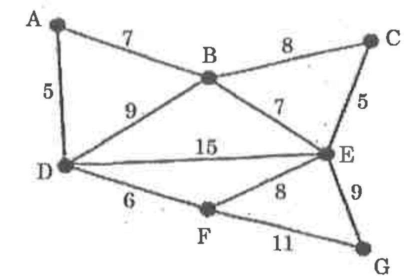


Fig. 3

13. a) i) Obtain the chromatic polynomial of the graph G in Fig. 4 using the theorem. $P_n(\lambda)$ of $G = P_n(\lambda)$ of $G' + P_n(\lambda)$ of G''. (8)

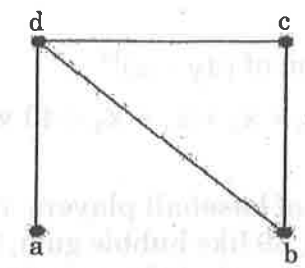


Fig. 4

ii) State and prove five-color theorem. (8)

(OR)

b) i) Define the following and give one example to each :

Complete Matching

Minimal Covering

Balanced Digraph

Strongly Connected Digraph

Fragment in a digraph. (10)

ii) Prove that a digraph G is an Euler digraph if and only if G is connected and is balanced. Draw an example Euler digraph of 6 vertices. (6)

14. a) i) There are five students in a group and their roll numbers are S1, S2, S3, S4, S5 and S6. They are given with five assignments numbered 1 to 6. Each has to solve one assignment. How many ways the assignments can be distributed such that a student is not getting an assignment number same as his roll number ? (6)

15. (a) (i) What is Ferrer's graph? Give an example Ferrer's graph and its transposition graph. (5)

(ii) Explain exponential generating function with an example. (8)

Or

(b) (i) Explain the summation operator with an example. (5)

(ii) What is meant by a recurrence relation? Write one applications of each first order and second order linear homogeneous recurrence relation with examples. (8)

PART C — (1 × 15 = 15 marks)

16. (a) Can the kolams shown in figure 16 (a) (i) and (ii) be drawn without lifting your hands and not overdrawing any part of the kolam? Substantiate your answers with graph theory knowledge. If not possible, make it possible by adding some curves. (8+7)

Figure – 16 (a) (i)

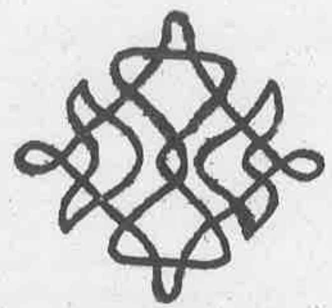


Figure – 16 (a) (ii)

Or

(b) (i) Stack the blocks shown in figure 16 (b) (i) in a pile of 4 in such a way that each of the colors appears exactly once on each of the four sides of the stack. (7)

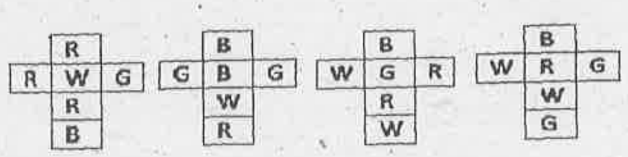


Figure – 16 (b) (i)

(ii) A young pair of rabbits, one of each sex, is placed on an island. A pair of rabbits does not breed until they are 2 months old. After they are 2 months old, each pair of rabbits produces another pair each month. Assume that none of the rabbits die. How many rabbits are there after n months? (8)

12/11/18

Reg. No. :

Question Paper Code : 20376

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 — GRAPH THEORY AND APPLICATIONS

(Common to Information Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. For which of the following does there exist a simple graph $G = (V, E)$ satisfying the specified conditions?

   (a) It has 3 components 20 vertices and 16 edges

   (b) It is connected and has 10 edges 5 vertices and fewer than 6 cycles.

   (c) It has 7 vertices, 10 edges and more than two components.

2. The maximum degree of any vertex in a simple graph with n vertices is $n-1$. Give reasons.

3. Calculate the maximum flow between the nodes A and F in the graph Fig 3. The number on a line represents the capacity.

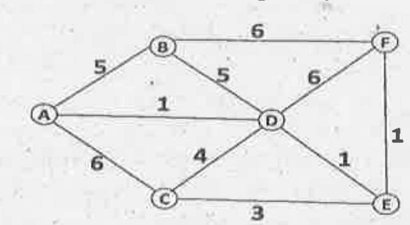


Figure – 3

4. Define Homeomorphic graphs and give example graphs.

5. What is meant by independent set and maximal independent set of a graph?

6. What is meant by regularization of a planar graph? Give an example.

7. How many ways can the letters in ENGINEERING be arranged so that all three E's together?

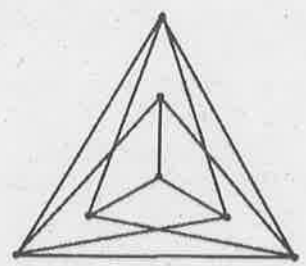
8. Determine the number of positive integers n, $1 \le n \le 500$, that are not divisible by 5 or 5.

9. Define generating function. Give an example to a polynomial and a power series.

10. Write a homogeneous and a non-homogeneous recurrence relations.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Draw a graph isomorphic to the graph G shown in Figure 11(a) (i) such that no edge is crossing others. (5)



G

Figure – 11 (a) (i)

(ii) Define walk, circuit, path and subgraph. From the graph shown in figure 11(a)(ii), draw a walk of any length, a path of length 5, a circuit of length 4 and subgraph of 4 vertices and 5 edges. (8)

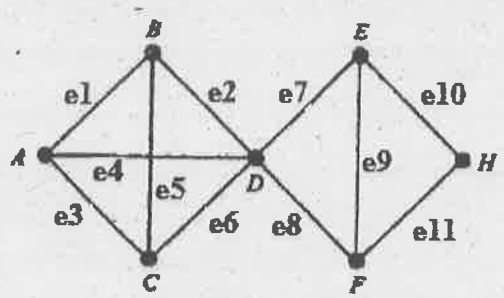


Figure – 11 (a) (ii)

Or

(b) (i) Seven children in a street play a game in a circular arrangement. If no child holds hands with the same playmate twice, how many times can this arrangement possible? Write all possible arrangements. (5)

(ii) Prove that there are at least two pendant vertices in a tree with two or more vertices. Also prove that every tree has one or two centers. (8)

12. (a) (i) Prove that the distance between any two spanning trees is a metric. Find two different minimum spanning trees of a graph with $V = \{1, 2, 3, 4\}$ is described by

$$\varphi = \begin{pmatrix} a & b & c & d & e & f \\ \{1,2\} & \{1,2\} & \{1,4\} & \{2,3\} & \{3,4\} & \{3,4\} \end{pmatrix}.$$ It has weights on its edges given by $\lambda = \begin{pmatrix} a & b & c & d & e & f \\ 3 & 2 & 1 & 2 & 4 & 2 \end{pmatrix}$. (7)

(ii) Prove that an Euler graph cannot have a cut-set with an odd number of edges. (6)

Or

(b) (i) Construct a graph G with the following properties: Edge connectivity of G = 4, vertex connectivity of G = 3, and degree of every vertex of $G \ge 5$. (7)

(ii) Derive the formula for the number of regions in a planar graph, G with n vertices and e edges. Also prove that a planar graph with triangle regions can have at most $(3n-6)$ edges. (6)

13. (a) (i) Define chromatic polynomial and write the chromatic polynomial of a graph with n vertices. (5)

(ii) Define complete matching and minimal covering in a graph G. Give one application example to each. (8)

Or

(b) (i) Define the following and give one example to each.

(1) Complete symmetric digraph

(2) Balanced digraph

(3) Equivalence graph

(4) Accessibility in a digraph. (8)

(ii) When is a digraph an Euler digraph? Draw an Euler digraph. (5)

14. (a) Determine the number of six digit integers (no leading zeros) in which

(i) No digit may be repeated;

(ii) Digits may be repeated. Answer parts

(i) and (ii) with the extra condition that the six digit number even; Also do the same with the condition that the number is divisible by 5. (13)

Or

(b) At a nursery, Reshmi wants to arrange 15 different plants on five shelves for a window display. In how many ways can she arrange them so that each shelf has at least one, but no more than four plants? (13)

Reg. No. :

Question Paper Code : 91410

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 – GRAPH THEORY AND APPLICATIONS

(Common to Information Technology)

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

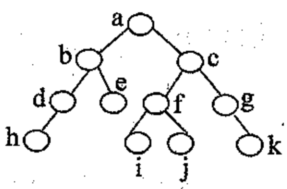
Answer ALL questions

PART – A

(10×2=20 Marks)

1. Define circuit.

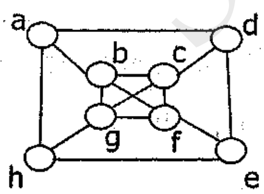
2. Find path length of the following tree.



3. How will you calculate rank of a graph ?

4. Is K_6 is a planar graph ? Justify it.

5. Find at least two dominating set for the following graph.



6. Define asymmetric digraphs.

7. In how many ways can a president, a treasurer and a secretary be chosen among 7 candidates ?

8. How many arrangements of the letter ARRANGE can be made ?

9. Find the generating function for the sequence of numbers 4, 4, 4, 4, 4 . . . . . .

10. Find the recurrence relation for the numbers 1, 5, 17, 53, 161, 485, ...

PART – B **(5×13=65 Marks)**

11. a) i) Show that the maximum number of edges in a simple graph with n vertices is n(n – 1)/2. **(7)**

ii) Prove that any two simple connected graphs with n vertices, all of degree two, are isomorphic. **(6)**

(OR)

b) i) Prove that a simple graph with n vertices and k components can have at most (n – k) (n – k+1)/2 edges. Give an example. **(6)**

ii) Prove that if a connected graph G is decomposed into subgraph g_1 and g_2, there must be at least one vertex common between g_1 and g_2. **(7)**

12. a) i) Show that a Hamiltonian path is a spanning tree. Explain. **(6)**

ii) A connected planar graph with n vertices and e edges has e – n +2 regions. **(7)**

(OR)

b) i) What does cyclomatic number represent ? How it will be calculated ? Explain it ? **(6)**

ii) Prove that the vertex connectivity of any graph can never exceed the edge connectivity. **(7)**

13. a) i) A graph of n vertices is a complete graph iff its chromatic polynomial is $P_n(\lambda) = \lambda(\lambda - 1)(\lambda - 2) \ldots(\lambda - n + 1)$ **(7)**

ii) A covering g of a graph is minimal iff g contains no paths of length three or more. **(6)**

(OR)

b) i) A graph with atleast one edge is 2-chromatic iff it has no circuits of odd length. **(7)**

ii) Prove that any digraph, the sum of the in-degrees of all vertices is equal to sum of its out-degrees. **(6)**

14. a) i) In how many ways can an interview panel of 3 members be formed from 3 Engineers, 2 Psychologists and 3 Managers if atleast 1 Engineer must be included ? **(6)**

ii) Find the number of positive integers not exceeding 100 that are not divisible by 5 or 7. **(7)**

(OR)

b) i) How many binary strings of length 8 that do not contain atleast 8 consecutive 0's ? **(7)**

ii) How many words can be formed by using the letters from the word "DRIVER" such that all the vowels are never together ? **(6)**

15. a) i) The sequence 1, 3, 7, 15, 31, 63,... satisfies the recurrence relation $a_n = 3a_{n-1} - 2a_{n-2}$ Find the generating function for it. **(7)**

ii) Find the sequence generated by the following generation function

$$\frac{1}{1-4x}.$$ **(6)**

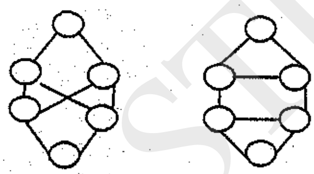
(OR)

b) i) Find the generating function for the sequence 1, –2, 4, –8, 16,.... **(6)**

ii) Find the generating function for the Fibonacci sequence using recurrence relation. **(7)**

PART – C **(1×15=15 Marks)**

16. a) i) How can you verify the graphs are isomorphic ? Are the following graphs are isomorphic ? Justify it. **(6)**



ii) Explain Kruskal's method with suitable example. **(9)**

(OR)

b) i) Write short notes on Dimer problem. **(7)**

ii) Discuss about exponential generating functions with suitable example. **(8)**