Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91410

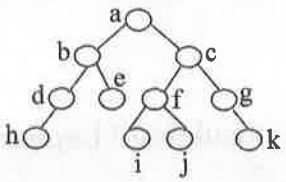
B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Seventh/Eighth Semester
Computer Science and Engineering
CS 6702 – GRAPH THEORY AND APPLICATIONS
(Common to Information Technology)
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

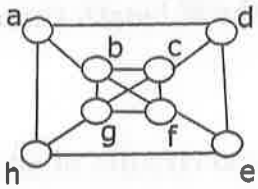
Answer ALL questions

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)**

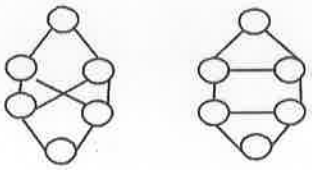
(OR)

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)**