2024

BCA

BCA First Semester End Examination - 2024

PAPER - CC101T

Mathematics Foundation for Computer Science I

Full Marks : 70 *Time : 3 hours*

The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Group-A

Attempt any ten questions : **10×2=20**

1. a) Suppose, a relation R={(10,11), (10,12), (11,11), (11,12), (12,13), (11,13)}. Determine the domain and range set of this relation.

   b) Suppose, a function is specified as f= {(1,2), (1,3), (2,3)}. Is this functin injective? Justify your answer.

   c) What do you mean by graph $K_{m,n}$? Show one examle of $K_{3,2}$ graph.

d) Find the total number of 4-digit numbers which are >6500 that can be formed only with digits 1, 2, 3, 4, 5, 6, 8, 0. Consider that repeation of digit is not allowed.

e) Consider a complete graph of 7 vertices. How many colors are required to properly color this graph?

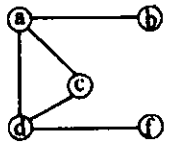
f) Find the characteristic roots for the recurrence relation $f_n = f_{n-1} + 2f_{n-2}$, $f_0=1$, $f_1=2$.

g) What do you mean by planar graph?

h) Consider the word *intellegence*. Using all letters of this word, how many distinct words can be constructed?

i) State Carley-Hamilton theorem.

j) Find the degree of vartices a, b, c of the following graph.



k) State the pigeon-hole principle.

l) Can any two arbitrary matrices be multiplied?

m) What is the significance of rank of a matrix?

n) What is Euler graph? Show one example of Euler graph.

o) Suppose, A = {1, 3, 6, 8}, B = (1, 4, 6, 9, 10}. Find (A–B)∩(B–A).

Group-B

Attempt any four questions : **4×5=20**

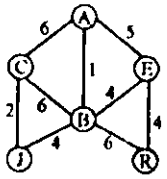
2. Find determinant of the matrix $A=\begin{bmatrix} 1 & 1 & 2 & 5 \\ 0 & 2 & 1 & 2 \\ 1 & 0 & 2 & 3 \\ 0 & 1 & 4 & 3 \end{bmatrix}$ 5

3. Suppose, there are total 110 students in a class. Out of these, 40 students passed in biology, 50 passed in computer science, 35 students passed in chemistry, 30 students passed in exactly two of these three subjects. Total 5 students failed in all the three subjects. Find the number of students who passed in all these three subjects. 5

4. Prove that *sum of degree of odd-degree vertices is even.* 5

5. Solve the recurrence relation $f_n = f_{n-1} + f_{n-2}$, $n \geq 0$, $f_0=0$, $f_1=1$. 5

6. What do you mean by spanning tree? Find the adjacency matrix for the following weighted graph. 2+3



7. Suppose, $h(x)=6x^2+5x-2$, $f(m)=2m-1$, and $g(x) = x^2+2.x-2$. What will be the composition function $f(h(x) + g(x))$? 5

Group - C

Attempt any three questions : **3×10=30**

8. a) What is adjacency matris, A, of a graph? Is the square of adjacency matrix, A^2, signify any thing? 2+(1+2)

   b) Determine the rank of the following matrix. 5+1

$$A = \begin{bmatrix} 0 & 1 & 3 & 2 & 0 \\ 1 & 5 & 1 & 2 & 1 \\ 1 & 3 & 2 & 4 & 0 \\ 0 & 2 & -1 & -2 & 1 \\ 0 & 2 & 6 & 4 & 0 \end{bmatrix}$$

9. a) Show the graphs or exponential function and logarithm function. 4

   b) Consider the following recurrence relation :

   $f(n)=2 . f(n-1) + f(n-2)$, $n\geq 2$, $f(0) =2$, $f(1) =3$

   Solve this recurrence relation using characteristic equation. 6

10. a) Using the letters of word *"success"*, how many unique 7-character strings can be formed? 2

    b) Explain Hamiltonian circuit graph with an example. 4

    c) Define walk, path with example. 4

11. a) What do you mean by equivalence relation? Show an example of equivalence relation. 3+2

    b) What do you mean by isomorphic graph? Give example of two isomorphic graphs. 2+3

12. a) Why do we use Warshall's algorithm? Illustrate this algorithm with an example. 2+4

    b) What do you mean by bipartile graph? Show an example of bipartile graph. 2+2