Computer Science [Honours]

[CBCS]

B.Sc. Third Semester End Examination-2023

(Regular & Supplementary Paper)

PAPER- C5T

[Discrete Structure]

Full Marks: 60 ***Time: 03 Hrs***

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

1) Answer any TEN questions of the following: 10x2= 20

a) Suppose a relation R = {(10.11), (10.12), (11.11), (11.12), (12.13), (11.13)} Find the domain and codomasin set of this relation.

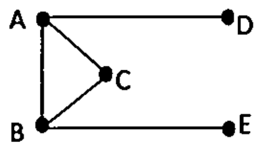
b) What do you mean by the graph $K_{m.n}$? Show one example of $K_{3.2}$ graph

c) Find the total number of 5digit number which are >62500 that can be formed only with digits 1,2,3,4,5,6,8,0. Consider that repeation of digit is not allowed.

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

e) Find the characteristics roots for the recurrence relation $f_n = f_{n-1} + 2 \cdot f_{n-2} \cdot f_0 = 1, f_1 = 3$.

f) Whatr is the minimum number of colors required for properly coloring in the following graph?



g) State the pigeon-hole principle.

h) What are tautology and contradiction?

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

j) Given A={1,2,3} and B={a,b}. Find A x B and B x B.

k) Let R and S be the following relations on A={1,2,3} and R = {(1,1), (1,2), (2,3), (3,1), (3,3)}, S = {(1,2), (1,3), (2,1), (3,3)} Find R_0S and $S^2 = S_0S$

l) Let $f : R \to R$ be defined by $f(x) = 2x-3$. Find a formula for f^{-1}.

m) Draw a simple graph with five vertices having degree 3,3,3,3,,4.

n) Let R be a relation in A. Then define reflexive closure and Transitive closure of R.

o) Show that the following poset is not tattice.({2,3,5,30, 60, 120, 360},1)

Group B

Answer any FOUR questions of the following: **4x5 = 20**

2) Suppose, there are total 100 students in a class. Out of these, 40 students passed in biology, 30 passed in computer science, 35 students passed in chemistry. 20 students passed in exactly two of these three subjects. Total 10 students failed in all the three subjects. Find the number of students who passed in all these three subjects. 5

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

4) Prove that $1+2+3+\cdots+n = \frac{n,(n+1)}{2}$ using principle of mathematical induction. 5

5) A tree with n vertices contains exactly (n-1) edges.

6) Find the number of integer solution of the equation $a+b+c=17$, where a,b,c are positive integers with $2 \leq a \leq 5, 3 \leq b \leq 6$ and $4 \leq c \leq 7$

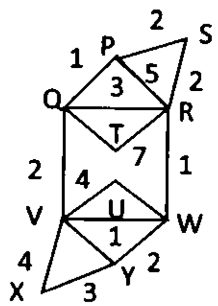
7) If f and g are functions form z to z defined by $f(n) = n-1$ and $g(n) = n^2$ find $g_0 f, f_0 g$ are they one to one? Onto?

Group C

Answer any TWO question of the following: **2x10 = 20**

8) a) What is adjacency matrix, A, of a graph? What does square of adjacency matrix A^2, signify 2+2

b) Find the minimum spanning tree (MST) for the following graph obtained using Kruskal's algorithm. What is the total weight of this MST? 5+1



9) a) State Master's theorem. 2

b) Consider the following recurrence relation:

$$T(n) = 4.T\left(\frac{n}{2}\right) + n^3$$

Solve this recurrence relation using Master's theorem. 4

c) Check if $P \rightarrow (Q \wedge R) \equiv (P \rightarrow Q) \vee (p \rightarrow R)$ holds 4

10) a) State the pigeonhole principle. 2

b) What do you mean by equivalence relation? Show an example of equivalence relation. 4

c) What do you mean by least upper bound and greatest lower bound in partial order set? Give one example to illustrate your answer. 4

11) a) Prove by induction:

$$2 + 6 + 12 + ... + (n^2 - n) = \frac{n(n^2 - 1)}{3}$$

b) A simple graph with n vertices and m components can have atmost $(n-m)(n-m+1)/2$ edges.
