

2022

COMPUTER SCIENCE

[HONOURS]

(CBCS)

(B.Sc. Third Semester End Examination-2022)

PAPER-C5T

*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 $R = \{(1,1), (1,2), (2,1), (2,2), (2,3), (1,3), (3,3)\}$.

Find the range set of this relation.

b) Suppose a function is specified as $f = \{(1,1), (2,8), (3,27), (4,64)\}$.

Is this function bijective? Justify your answer.

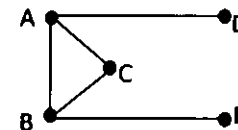
c) What is a non planar graph? Show one graph which is non planar.

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

e) Find the characteristic roots for the recurrence relation

$$f_n = f_{n-1} + 2 \cdot f_{n-2}, f_0 = 1, f_1 = 3$$

f) Show all the spanning trees for the following graph?



(2)

- g) Define bipartite graph.
h) Suppose that the relation R on the set is represented by the

$$\text{matrix } M_R = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{pmatrix} \text{ is R is reflexive.}$$

- i) Consider that a,b are two atomic propositions. Show the truth table of the proposition $a \leftrightarrow b$.
j) Find the total number of 5 digit numbers which are > 62500 that can be formed only with digits 1,2,3,4,5,6,8,0. Consider that repetition of digit is not allowed.
k) There are huge number of pens of blue, Green, red and magenta colors in a box. At max how many pens need to be drawn forgetting two pens of same color?
l) Characteristics equation of a recurrence relation is $r^2 - 5 \cdot r + 2 = 0$. Find the corresponding recurrence relation. Assume that first two terms of the sequence defined by this recurrence relation are 1,2.
m) Show that $7x^2$ is $O(x^2)$
n) Find the generating function of the finite sequence 2,2,2,2,2,2.
o) If $f : R \rightarrow R$ be defined by $f(x) = x^2 + 3$ where R is the set of real number. Show that $f^{-1}(28) = \{-5, 5\}$.

(3)

Group-B

Answer any four questions of the following: 4x5 = 20

2. Suppose $D_{48} = \{d \mid d \in \mathbb{N} \text{ and } d \mid 48\}$.
Find D_{48} and draw the Hasse Diagram of poset D_{48} 1+4
3. Suppose there are total 140 students in a class. Out of these, 35 students failed in mathematics, 45 failed in Computer Science, 25 students failed in Statistics. 20 students failed in exactly two these three subjects. Total 20 students passed in all the three subjects. Find the number of students who failed in all these three subjects. 5
4. Prove that $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1) \cdot 2n+1}{6}$ using principle of mathematical induction. 5
5. Suppose, $g(x) = 2x^2 + 4x + 5$. Find $f(x), c, n_0$ such that $g(x) = O(f(x))$. 5
6. Define tautology. Prove that $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology. 2+3
7. Show that $3x^2 + 8x \log x$ is $\theta(x^2)$.

Group -C

Answer any two questions: 2x10 = 20

8. a) Consider a connected graph $G=(V,E)$. $D(v_i)$ represents degree of vertex $v_i \in V$. Prove that $\sum d(v_i)$ is even. 5