Second Semester B.C.A. Examination, July/August 2024
(NEP Scheme)
(Freshers and Repeaters)
COMPUTER APPLICATIONS (Paper – II)
Discrete Mathematical Structures

Time : 2½ Hours

Max. Marks : 60

Instruction : *Answer all Sections.*

SECTION – A

(6×2=12)

I. Answer **any six** questions :

1) Write the truth table for implication.

2) Find the Union and Intersection of A = {1, 2, 5} and B = {2, 3, 4}.

3) What is unit matrix ? Give an example.

4) If $\begin{bmatrix} 3x & -1 \\ 2 & 4y \end{bmatrix} = \begin{bmatrix} 6 & -1 \\ 2 & 12 \end{bmatrix}$, find x and y.

5) Find the value of $^{11}C_7$.

6) Write the recurrence relation for tower of Hanoi problem.

7) State the principle of Mathematical Induction.

8) Define reflexive relation and symmetric relation.

9) State Handshaking property of a graph.

SECTION – B

(4×6=24)

II. Answer **any four** questions :

10) i) Write the converse, inverse and contra positive of the conditional statement.
   "If I Study hard then I get good marks".

   ii) Prove that $(p \wedge q) \wedge [\sim(p \vee q)]$ is a contradiction.

P.T.O.

11) Find the rank of the matrix $A = \begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$

12) i) Show that the function $f : R \to R$ defined by $f(x) = 2x + 5$ is one-one and onto.

ii) Find how many arrangements can be made with the letters of the word "MATHEMATICS". In how many of them the vowels occur together ?

13) A committee of 9 has to be formed from 7 boys and 5 girls. In how many ways this can be done when the committee consists of
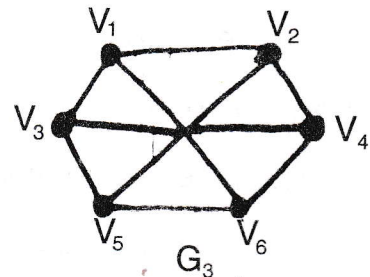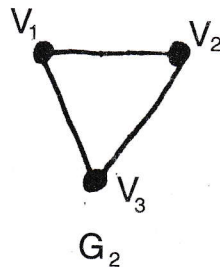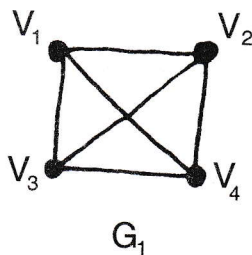
i) Exactly 3 boys

ii) At least 3 boys

iii) At most 3 boys

14) i) Find the co-efficient of $x^4 y^2$ in the expansion of $(x + y)^6$.

ii) Which of the following are Regular graphs and why ?


G_1 G_2 G_3

15) Among a group of students, 49 study physics, 37 study English and 21 study Biology. 9 of the students study Physics and English, 5 study English and Biology, 4 study Physics and Biology and 3 study Physics, English and Biology. Find the number of students in the group.

SECTION – C

III. Answer **any three** questions :

16) i) Determine whether the relation with the digraph is an equivalence relation.
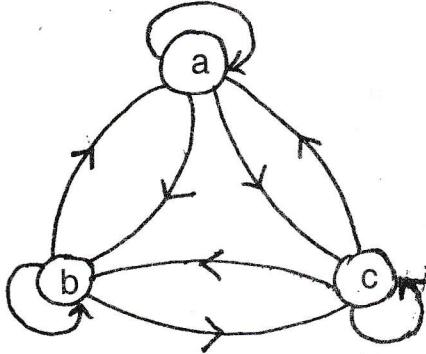
ii) Let $f : R \rightarrow R$ and $g : R \rightarrow R$ be defined by $f(x) = x + 1$ and $g(x) = 2x - 1$.
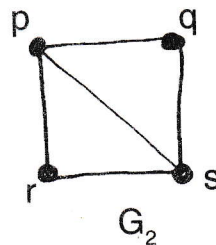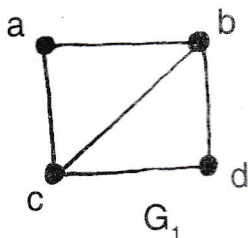
Find fog and gof.

17) Solve the Recurrence relation $a_n - 4a_{n-1} + 4a_{n-2} = 0$ where $a_0 = 1$, $a_1 = 3$.

18) Prove by Mathematical Induction, for all positive integers $n \geq 1$.

$$1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}.$$

19) i) Verify whether the following graphs are Isomorphic to each other or not.

ii) Define Euler path and Euler circuit with an example.

20) i) Draw the digraph for the following matrix.

$$\begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

ii) Find the shortest distance and shortest path from source vertex 'a' to vertex 'z' using Dijkstra's algorithm for the following graph :

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