NP – 313

I Semester B.C.A. Degree Examination, March/April 2023
(NEP) (2021 – 22 and Onwards) (F+R)
COMPUTER SCIENCE
Discrete Structures

Time : 2½ Hours | Max. Marks : 60

***Instruction** : Answer **any 4** questions from **each** Section.*

SECTION – A

I. Answer **any 4** questions. **Each** question carries **2** marks. **(4×2=8)**

1) Find x and y if $(x + 3, 7) = (4, 2x - y)$.

2) Define reflexive and symmetric relation.

3) How many 3 digit numbers can be formed by using digits 1 to 9 if no digit is repeated ?

4) Find Adjoint of $A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$.

5) Define scalar matrix with an example.

6) Define Binary tree.

SECTION – B

II. Answer **any four** questions. **Each** question carries **5** marks. **(4×5=20)**

7) Out of 20 members in a family, 12 like to take tea, 15 like coffee. Assume that each one like at least one of the two drinks how many like

   i) Both coffee and tea.

   ii) Only tea and not coffee. **5**

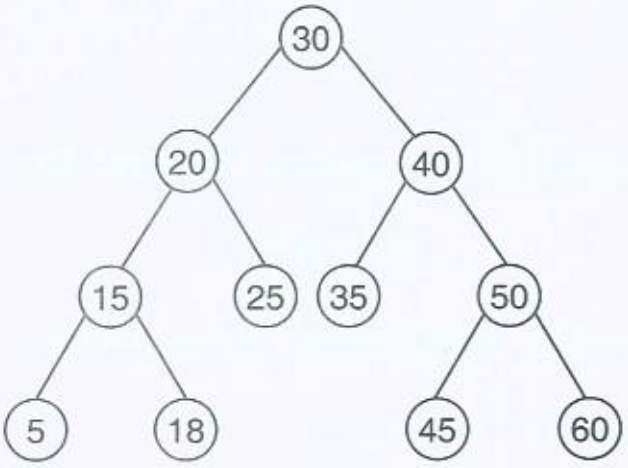
8) Prove that $\sim(p \leftrightarrow q) \equiv \sim [(p \rightarrow q) \wedge (q \rightarrow p)]$. **5**

P.T.O.

9) Find the value of n if ${}^{n}p_{2} = 12$. **5**

10) If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 4A + 3I = 0$. **5**

11) Traverse the following tree in preorder, postorder and inorder. **5**



12) Solve using Cramer's rule. **5**

$3x + 4y = 7$ and $7x - y = 6$.

SECTION – C

III. Answer **any 4** questions. **Each** carries **8** marks. **(4×8=32)**

13) a) Consider $f : R \to R$ given by $f(x) = 4x + 3$ show that f is invertible. Find inverse of f.

b) Prove that $(p \wedge q) \wedge \sim (p \vee q)$ is contradiction. **(4+4)**

14) a) How many words with or without meaning can be made from the letter of the word "MONDAY" assuming that no letter is repeated if

i) 4 letters are used at a time

ii) All letters are used at a time.

b) Find the co-efficient of x^6y^3 in the expansion of $(x + 2y)^9$. **(4+4)**

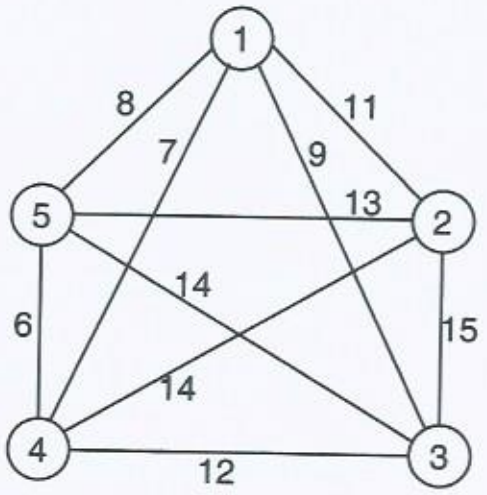
15) a) Explain tower of Hanoi problem with 3 discs.

b) Show that $1 + 3 + 5 + \ldots + (2n - 1) = n^2$ by mathematical induction. **(4+4)**

16) a) Find the inverse of the matrix $A = \begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}$.

b) If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$ verify $(AB)' = B'A'$. **(4+4)**

17) a) Find the minimum weighted spanning tree by Prim's algorithm.



b) Define minimum spanning tree. **(6+2)**

18) a) Construct binary search tree

56, 38, 10, 65, 72, 44, 50.

b) Define Hand shaking lemma theorem with an example. **(5+3)**