



NP – 162

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I Semester B.C.A. Degree Examination, May 2022  
(NEP – 2021-2022 and Onwards)  
COMPUTER SCIENCE  
Paper – 1.1 : Discrete Structures



Time : 2½ Hours

Max. Marks : 60

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

## SECTION – A

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

1) Find the intersection  $A \cap B$  and set difference  $A - B$  if

$$A = \{1, 3, 5, 7, 9\} \text{ and } B = \{2, 3, 4, 5, 6, 8\}.$$

2) Prove that  $(p \rightarrow q) \leftrightarrow (7q \rightarrow 7p)$  is a tautology.

3) Find the values of i)  $4P_3$     ii)  $6C_3$ .

4) Find  $A^{-1}$  if  $A = \begin{bmatrix} 6 & 3 \\ 2 & 4 \end{bmatrix}$ .

5) Define the terms :

i) Graph    ii) Adjacency Matrix.

6) What is a minimum cost spanning tree ?

## SECTION – B

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

7) Prove that for any three propositions  $p, q$  and  $r$  show that

$$p \rightarrow (q \wedge r) \equiv [(p \rightarrow q) \wedge (p \rightarrow r)].$$

8) Consider the functions  $f$  &  $g : R \rightarrow R$  defined by  $f(x) = x^2 + 5$  and  $g(x) = 5x - 2$   
Find the composite functions.

i)  $f \circ g$

ii)  $g \circ f$

iii)  $f \circ f$

P.T.O.

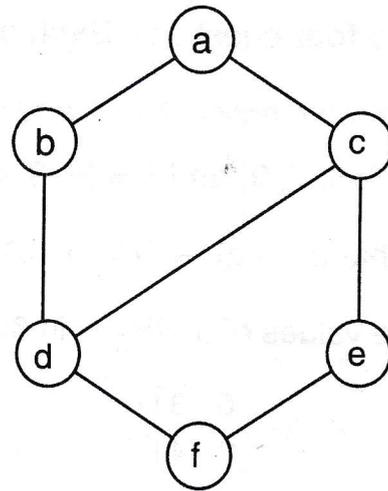
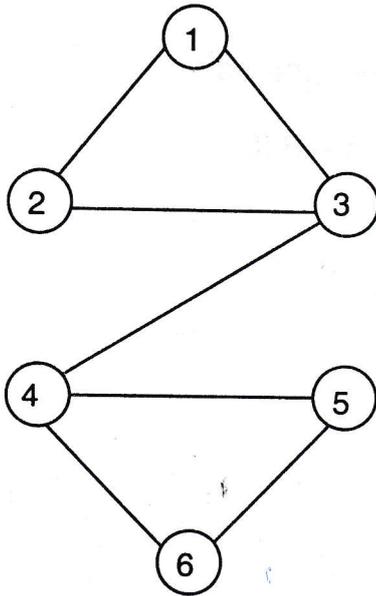


9) How many ways are there to form a committee, if the committee consists of 3 women and 4 men if there are 6 women and 7 men ?

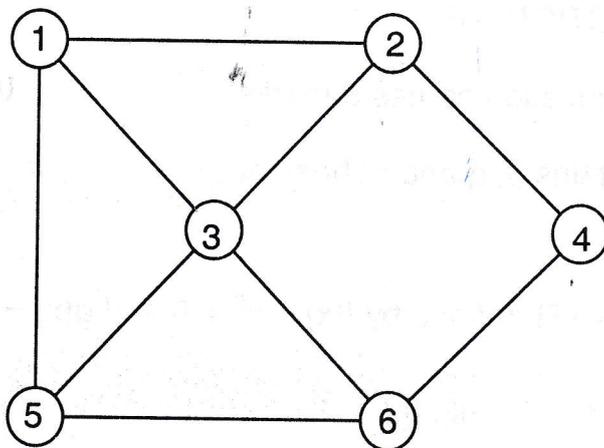
10) Define rank and nullity of a matrix. Find the rank of the following matrix

$$A = \begin{bmatrix} 3 & -1 & 4 \\ 6 & 1 & -1 \\ 1 & 5 & 8 \end{bmatrix}$$

11) Define isomorphism of graphs. Verify that the two graphs shown below are isomorphic or not.



12) What is a Hamiltonian circuit ? Check whether the following graph contains Hamiltonian circuit. Justify your answer.





SECTION – C

III. Answer **any four** questions. **Each** question carries **8** marks.

(4×8=32)

13) Let A and B non-empty sets. Define :

i) One-to-one function

ii) Onto function

iii) Bijective function

iv) if  $|A| = 4$  and  $|B| = 7$  find the number of functions from A to B.

14) Using Mathematical induction prove that  $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$  where n is a natural number ?

15) a) In how many ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together ?

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b) A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if atleast one black ball is to be included in the draw ?

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16) Solve the following system of linear equations using Cramer's rule.

$$x + y + z = 6$$

$$2x + 3y - z = 5$$

$$6x - 2y - 3z = -7$$

17) a) If  $2A + B = \begin{bmatrix} 4 & 4 & 7 \\ 7 & 3 & 4 \end{bmatrix}$

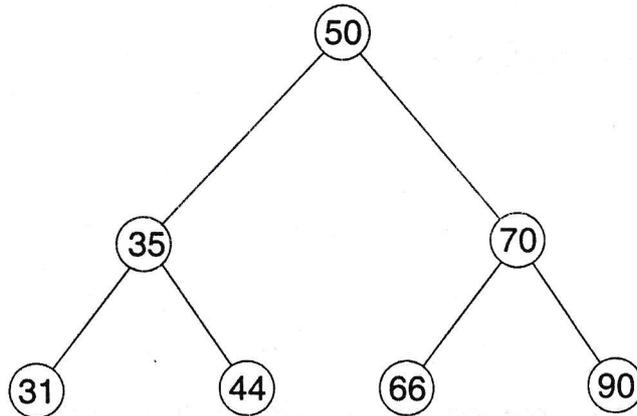
$A - 2B = \begin{bmatrix} -3 & 2 & 1 \\ 1 & -1 & 2 \end{bmatrix}$  then find A and B.

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b) Find the in order, preorder and post order traversal of the following tree.

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18) Obtain the minimum cost spanning tree for the following graph using Kruskal's algorithm.

