

2011**M.Sc.****1st Semester Examination****DISCRETE STRUCTURE****PAPER—COS-101***Full Marks : 50**Time : 2 Hours**The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.**Illustrate the answers wherever necessary.**All notations have their usual meaning.***Module—1****(Set Theory)**

Answer any two questions :

1. (a) A, B are two sub set of Universal Set S then prove that if $A \Delta B = \varnothing$, then $A = B$. 3
- (b) Prove that if $n(A)$ and $n(B)$ are denotes the number of elements in the finite set A and B respectively then
$$n(A) + n(B) = (A \cup B) + n(A \cap B).$$
 4
- (c) Prove that $(A \cap B)$ and $(B - A)$ both the sets are disjoint. 3

(Turn Over)

2. (a) If n be an integer and $n \geq 4$ then prove that $n^2 < \lfloor n \rfloor$.
(by Method of induction). 3
- (b) Find a number of Permutation of the alphabet of the word "CONSTANT" such that two vowels will be situated together 3
- (c) By method of Induction Prove that

$$\cos \theta + \cos 2\theta + \cos 3\theta + \dots + \cos n\theta = \frac{\cos\left(\frac{n+1}{2}\theta\right) \sin \frac{n\theta}{2}}{\sin \frac{\theta}{2}} \quad 4$$

3. Among the first 500 positive integers :

(i) Determine the integers which are divisible by 2, not by 3, not by 5.

(ii) Determine the integers which are exactly divisible by one of them. 5+5

4. (a) A five person committee having members Ankit, Arijit, Sonu, Monu and Nonu is to select a president, vice-president and secretary.

(i) How many selection exclude None ?

(ii) How many selection include Sonu and Monu ?

(iii) How many selection exclude Sonu and Monu ?

(iv) How many selection are there in which Ankit is president.

- (b) How many 16-bit strings are there containing exactly five O's ? 2+4+2

[Internal Assessment — 05]

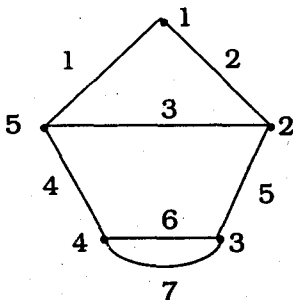
Module—2
(Graph Theory)

Answer any two questions :

1. (a) What is dual graph? Give an example of it. 2
(b) Write down the Dijkstra's algorithm for shortest path problem. 4
(c) What is Hamiltonian Path? 2
(d) What is eccentricity of a vertex? And explain. 2
2. (a) Describe isomorphic graph with example. 2
(b) Show that a simple graph with n vertices and k components can have at most $(n - k)(n - k + 1)/2$ edges. 4
(c) What is Planar graph give an example. 2
(d) Give an application of graph theory. 2
3. Define with example —
Null graph, cycle graphs, Bipartite graph, complement of a graph.

$2\frac{1}{2} \times 4$

4. (i) Write down the adjacency and incidence matrices of the graph —



$$2\frac{1}{2} + 2\frac{1}{2}$$

- (ii) Prove that —

If G is a graph in which the degree of each vertex is at least 2, then G contains a cycle. 5

[Internal Assessment — 05]

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