 End Sem (I) – MCA (IV)

2016

Time: 3 hours

Full Marks: 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer from **all** the Groups are directed.

Group – A

(**Compulsory)**

1. Choose the correct answer of the following: 1x15=15
   a) The number of elements in the power set P(S) where S = {1, 2, 3, 4) is:
      i. 2
      ii. 6
      iii. 8
      iv. 16
   b) The set A = {1, 2, 4, 8} with a divide by relation forms:
      i. Equivalence relation
      ii. Partial ordered set
      iii. Totally ordered set
      iv. Binary relation

c) A relation R on the set A = {1, 2, 3, 4} is given by {(1, 2), (2, 1), (1, 3), (3, 1), (2, 4), (4, 2)} is:
   i. Symmetric
   ii. Reflexive
   iii. Transitive
   iv. None of the above

d) A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is:
   i. N – 1
   ii. N
   iii. 2n
   iv. $Log_2 n$

e) The number of different words form from the letters BANANA:
   i. 300
   ii. 60
   iii. 720
   iv. 100

f) The number of functions from an m element set to n element set is:
   i. m + n
   ii. m^n
   iii. n^m
   iv. m*n

g) (p ⇒ q) ^ (q ⇒ r) ⇒ (p ⇒ r) is a:
   i. Contradiction
   ii. Tautology
   iii. Modus ponen

iv. Indirect Method

h) The value of (gof) (3) where f : A → B, g : B → C defined by f(a) = 2^a and f(b) = b^2 + 2 is:

i. 66
ii. 38
iii. 64
iv. None of the above

i) The number of edges of a complete graph having n vertices is:

i. n + 1
ii. n (n + 1) / 2
iii. n (n – 1) / 2
iv. None of the above

j) Chromatic number of a binary tree:

i. 2
ii. 3
iii. 4
iv. None of the above

k) Degree of each node of binary tree is at most:

i. 1
ii. 2
iii. 3
iv. None of the above

l) If 8 people are selected then at least how many of them are born on the same day of week?

i. 2

ii. 3
iii. 4
iv. 5

m) Multiplicative inverse of 2 in mod 5 arithmetic is:

i. 3
ii. 4
iii. 2
iv. 5

n) Two graph should be said to be isomorphic if:

i. Both have same number of vertex
ii. Both have same number of edges
iii. Equal number of vertices with a given degree

o) Which one of the following is true for planar graph:

i. Every complete graph more than 4 vertices is planar graph
ii. The chromatic number of planar graph is 5
iii. Every bipartite graph is a planar graph
iv. All of the above

Group – B

Answer any **five** questions of the following: 4x5=20

2. Compute truth table for the following:

   $(p \Rightarrow q) \Leftrightarrow (\sim q \Rightarrow \sim p)$

3. Prove that the number of odd degree in a graph is always even.
4. Find the explicit formula for the sequence defined by $b_{n+1} = 2b_n + 1$ with initial condition $b_1 = 7$ and find b_4.

5. Prove that cube root of unity forms Abelian group.
6. Write short notes on any **two** of the following:
    a) Equivalence relation
    b) Lattice
    c) Growth of function
7. Prove the following by principle of induction:

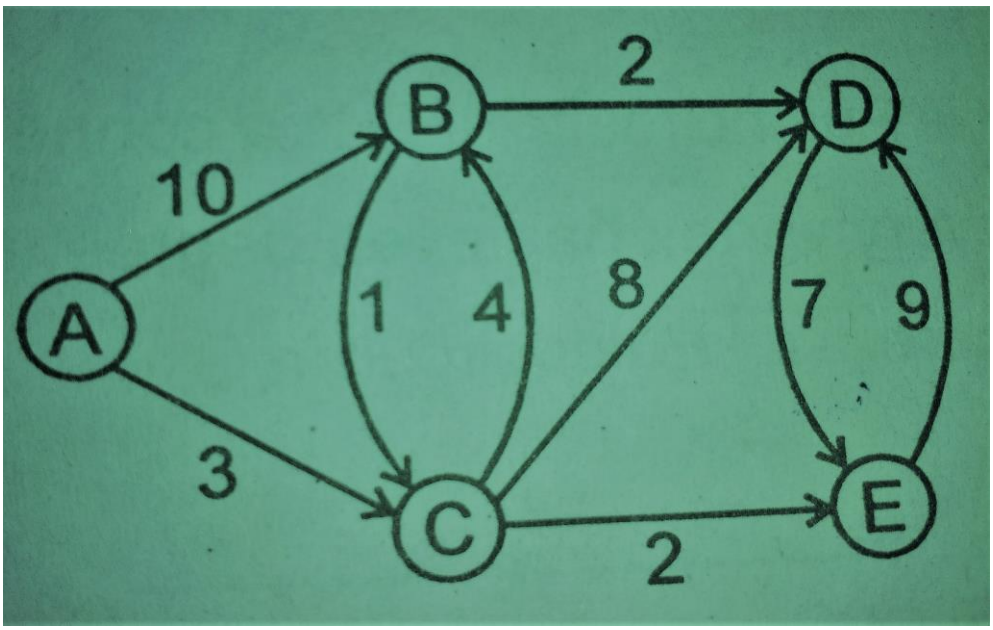
$$\sum_{k=1}^{n} K^2 = \frac{n(n+1)(2n+1)}{6}$$

8. Write Depth First Search Algorithm.

Group – C

Answer any **five** questions of the following: 7x5=35

9. Let A = {1, 2, 3, 4} and let R = {(1, 2), (2, 3), (3, 4), (2, 1)}. Find transitive closure using Warshall's algorithm.
10. Using Dijkstra algorithm find shortest path from source A to all Vertex in the following figure:



11. Explain Kruskal's Algorithm to find the minimum spanning tree using suitable example.
12. Draw the binary tree using the following tree traversal (write each steps:

Preorder	**Inorder**
A	D
B	B
D	F
E	E
F	A
C	C
G	G

Find post order traversal from the binary tree.

13. Explain the difference between Homomorphism and Isomorphism with a suitable example.
14. What is Euler circuit? If G is a connected graph and every vertex has even degree, then prove that there is an Euler circuit in G.

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