RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, MAY 2016

SECOND YEAR [BATCH 2014-17]

Date : 27/05/2016 **COMPUTER SCIENCE (General)**

Time : 11 am – 1 pm **Paper :** IV Full Marks : 50

[Use a separate Answer Book for each group]

Group – A

Answer <u>any one</u> question from question nos. <u>1 & 2</u> : [1×5]

1. What is NAT? How it is useful in preventing address depletion problem? 1+4
2. Compare IPV4 and IPV6. 5

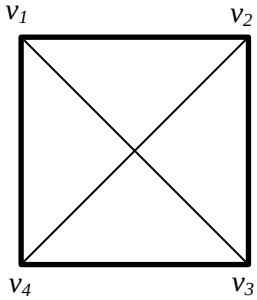
Answer <u>any two</u> questions from question nos. <u>3 to 6</u> : [2×10]

3. a) Explain in brief different modes of data transmission. 3
   b) Can 17.17.32.0 be the beginning address of a block containing 1024 addresses? Explain. 2
   c) What are the restrictions on classless address blocks? 3
   d) Why IP Address is unique and universal? 2
4. a) What is a protocol? How it is different from standard? Explain its key elements. 1+1+3
   b) What do you mean by peer-to-peer process? 1
   c) Explain any four different tasks performed by physical layer. 4
5. a) Explain CRC. 2
   b) Explain different fields present in a routing table. 6
   c) Explain different parts of email address with example. 2
6. a) Define QAM. 3
   b) An organization is granted the block 211.17.180.0/24. The administrator wants to create 32 fixed length subnets.
      i) Find the subnet mask.
      ii) Find the number of addresses in each subnet
      iii) Find the first and last addresses in subnet 1.
      iv) Find the first and last addresses in subnet 32. 1+1+1+1+1+1
   c) What is Baud Rate? 1

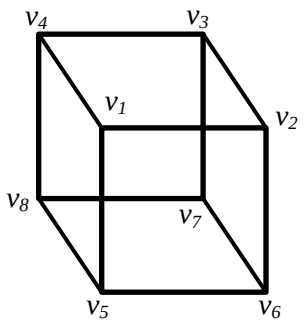
Group – B

Answer <u>any one</u> question from question nos. <u>7 & 8</u> : [1×5]

7. a) Find the number of edges of the graph whose degree of the vertices are 5, 2, 2, 2, 2, 1. Is the graph complete? 3½
   b) How many vertices are there in a regular graph with degree 4 if it contains 10 edges? 1½
8. a) Draw a graph that has a Hamiltonian path but does not have a Hamiltonian circuit. 2½
   b) Check whether the following two graphs are planner or not. Justify your answer. 2½



G_1



G_2

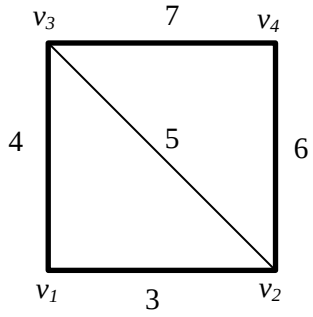
Answer <u>any two</u> questions from question nos. <u>9 to 12</u> : [2×10]

9. a) What do you mean by Fundamental cutset? 2

   b) Prove that every circuit has an even number of edges in common with any cutset. 4

   c) Show that an infinite graph with a finite number of vertices (i.e. a graph with a finite number of vertices with infinite number of edges) will have at least one pair of vertices (or one vertex in case of parallel self-loops) joined by an infinite number of parallel edges. 4

10. a) An undirected graph G(V,E) contains n ($n > 2$) nodes named $v_1, v_2, \ldots v_n$. Two nodes v_i, v_j are connected iff $0 < |i - j| \leq 2$. Each edge (v_i, v_j) is assigned a weight $i + j$.
   A sample graph with $n = 4$ is shown below:



   i) What will be the cost of the minimum spanning tree of such a graph with n nodes? Give justification.

   (*option* 1) $\frac{1}{12}(11n^2 - 5n)$

   (*option* 2) $n^2 - n + 1$

   (*option* 3) $6n - 11$

   (*option* 4) $2n + 1$

   ii) What will be the length of the path from v_5 to v_6 in the minimum spanning tree with n=10? 2+2

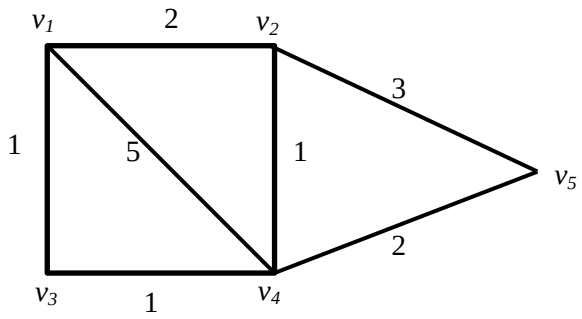
   b) Discuss the Prim's algorithm to find the maximal spanning tree of a graph. 6

11. a) What is vertex cover and Chromatic Number? 2+2

   b) What do you mean by center of a graph? Show that every tree has either one or two centers. 2+4

12. a) What do you mean by bi-partite graph? 2

   b) Consider the following graph G(V,E):



   Use Dijkstra's algorithm to find the shortest distance between v_1 and v_5. 6

   c) Draw all trees of n labelled vertices for n = 1, 2, 3, 4 and 5. 2

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