Total No. of printed pages = 4

SUBJECT CODE MAT024103

Roll No. of candidate

2017

End Semester M.Tech. Examination

1st Semester

MATHEMATICAL FOUNDATIONS FOR COMPUTING-I

Full Marks- 70 Pass Marks: 21 Time- 3 hours

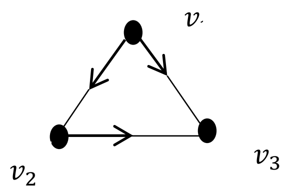
The figures in the margin indicate full marks for the questions.

PART – A

Marks: 16

Q.1. Answer all questions: $[\mathbf{16 \times 1 = 16}]$

a) Give an example of reflexive relation.
b) Give an example of additive group.
c) Define a lattice.
d) Define a linear transformation.
e) What do you mean by conditional proposition?
f) Write the definition of disjunctive normal form.
g) Write the definition of Tautology.
h) What is the difference between propositional calculus and predicate calculus?
i) Write the no. of vertices of a Hamiltonian cycle in a graph with n vertices.
j) If $K_{9,r}$ has 72 edges, what is r ?
k) What is the connectivity of K_7 ?
l) What is the number of edges in a tree with 5 vertices?
m) The number of labeled trees with 4 vertices is---------------
n) Write the chromatic numbers of an even and an odd cycle.
o) What is the line covering number of K_{10}?
p) Write the Adjacency matrix for the following graph:



PART – B

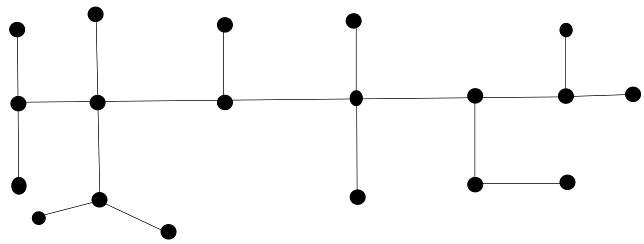
Marks: 14

Q.2. Answer all question:

a) Show that the set Z^{+} of all positive integers under divisibility forms a poset. **[5]**

b) Obtain principal disjunctive normal form of $((p \wedge \sim q) \wedge \sim r) \vee (q \wedge r)$ using truth table. **[5]**

c) Find diameter , radius & center of the following tree: **[4]**



PART – C

(All questions are compulsory)

Marks: 40

Q.3.

a) i. Show that in a Boolean algebra B, $a + a = a$ for all $a \in B$. **[5]**

ii. If $a \equiv b \ (mod\ m)$ and c is any integer, then prove that $a + c \equiv b + c \ (mod\ m)$ and $ac \equiv bc \ (mod\ m)$. **[5]**

OR

b) i. Prove that the fourth roots of unity $1, -1, \ i, -i$ form a multiplicative group. **[5]**

ii. Let V be a vector space over a field F and 0 be the additive identity of V, then prove that $\alpha 0 = 0$ for all $\alpha \in F$. **[5]**

Q.4.

a) i. Using truth table, verify whether the proposition $\sim(p \rightarrow r) \wedge (r \wedge (p \rightarrow q))$ is a tautology. **[5]**

ii. Show that $(t \wedge s)$ can be derived from the premises $p \rightarrow q, q \rightarrow \sim r, \ r, \ p \vee (t \wedge s)$. **[5]**

OR

b) i. Obtain the disjunctive normal form of the statement $p \rightarrow ((p \rightarrow q) \wedge \sim(\sim q \vee \sim p))$. [5]

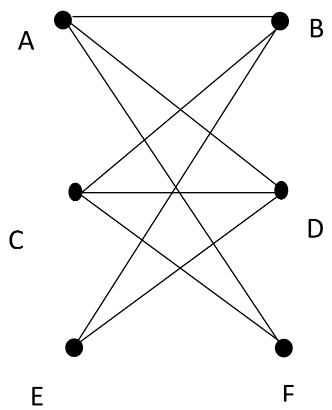
ii. Test the validity of the following argument: [5]

All integers are irrational numbers.
Some integers are powers of 2.
Therefore, some irrational numbers is a power of 2.

Q.5.

a) i. Prove that the number of points of odd degree in a graph is even. [5]

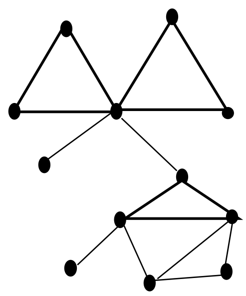
ii. Find Eulerian path and Hamiltonian path from the following graph, if it exists. If it does not, why not? [5]



OR

b) i. Prove that a tree with n vertices has $n-1$ edges. [5]

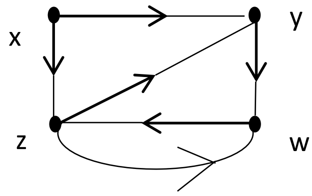
ii. Draw block graph and cut point graph of the following graph: [5]



Q.6.

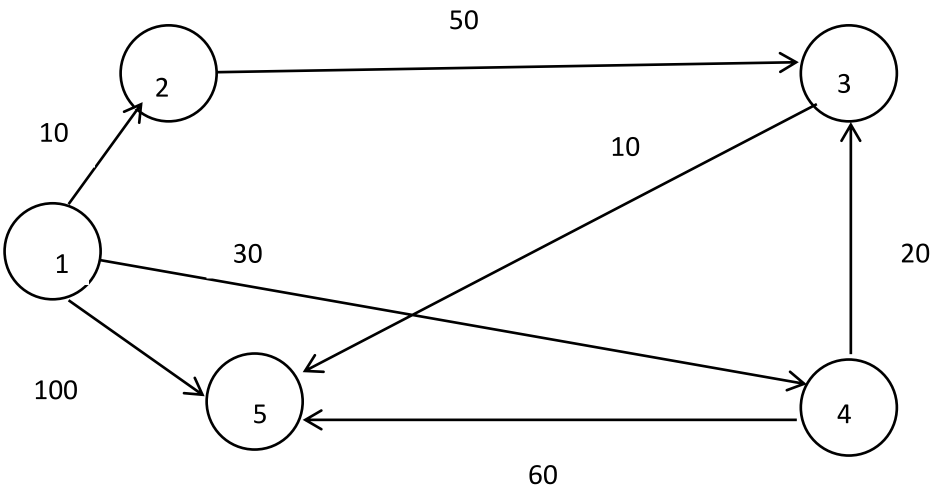
a) i. Show that a graph is bipartite if and only if it can be coloured with two colours. [5]

ii. Draw the graph corresponding to the adjacency matrix: $A = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 2 & 1 \\ 0 & 2 & 0 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix}$. Also find the path matrix P of the graph G: [**5**]



OR

b) i. Compute the shortest distance between source 1 and destination 5 using Dijkstra's algorithm for the following network: [5]



ii. If a digraph D is Eulerian, Prove that it is connected and balanced. Also check the following digraph is Eulerian or not. Justify your answer. [**5**]