

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**End Semester Examination – Winter 2018**

**Course:** B. Tech in Computer Science and Engg

**Sem:** III

**Subject Name:** Discrete Mathematics

**Subject Code:** BTCOC302

**Date:** 03/12/2018

**Max Marks:** 60

**Duration:** 3 Hrs.

**Instructions to the Students:**

1. Solve **ANY FIVE** questions out of the following.
2. Use of non-programmable scientific calculators is allowed.
3. Assume suitable data wherever necessary and mention it clearly.

Marks

**Q. 1 Solve Any Three of the following.**

- A) Let p and q be the propositions “Swimming at the New Jersey shore is allowed” and “Sharks have been spotted near the shore” respectively. Express each of these compound propositions as an English sentence. **4M**
- a)  $\neg q$                       b)  $p \rightarrow \neg q$                       c)  $p \leftrightarrow \neg q$                       d)  $\neg p \vee q$
- B) Explain with example, notations used and mathematical expression to describe the following terms. **4 M**
- i) Membership                      ii) Subset                      iii) Equality of two sets                      iv) Union
- C) Use mathematical induction to show that  $1+5+9+\dots+(4n-3) = n(2n-1)$ ,  $\forall n \geq 1, n \in \mathbb{Z}$  **4M**
- D) Explain Universal quantifiers and Existential quantifiers with example. What is De Morgan’s law for quantifiers? **4M**

**Q.2 Solve the following.**

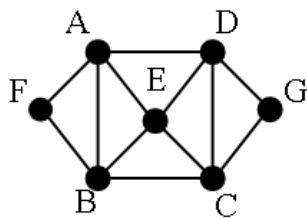
- A) Check whether the relation R defined in the set  $\{1, 2, 3, 4, 5, 6\}$  is **6 M**  
 $R = \{(a, b) : b = a+1\}$  is reflexive, symmetric or transitive. Justify your answer. Find the relation Matrix.
- B) Explain surjective, injective, bijective and inverse function each with example. **6M**

**Q. 3 Solve Any three of the following.**

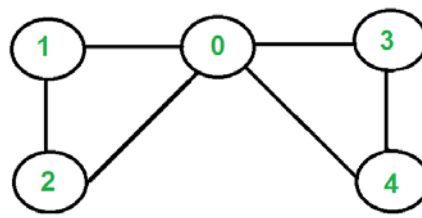
- A) Explain the pigeonhole principle with example. **4M**
- B) Find how many symbol codes can be formed if the first two symbols are letters and the next three are digits but no symbol is repeated? **4M**
- C) What is the expansion of  $(3x + y)^4$ ? **4M**
- D) Determine the sequence  $\{a_n\}$  where  $a_n = 3n$  for every non-negative integer, n is a solution of the recurrence relation  $a_n = 2a_{n-1} - a_{n-2}$  for  $n = 2, 3, 4, \dots$  **4M**

**Q.4 Solve the following.**

- A) Define Euler graph and Hamiltonian Graph. **6M**
- i) For a given graph G :
- (a) Find a Hamiltonian path that begins at A and ends at E.
- (b) Find a Hamiltonian circuit that starts at A and ends with the pair of vertices E, A.
- (c) Find a Hamiltonian path that begins at F and ends at G.
- ii) For a given graph I find Eulerian path and Eulerian cycle.



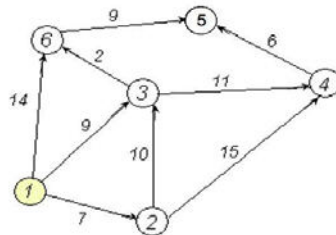
Graph: H



Graph: I

- B) Find the shortest path in the given graph using Dijkstra shortest path algorithm.

6M



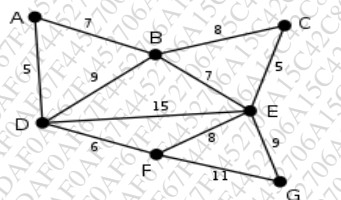
**Q. 5 Solve Any three of the following.**

- A) Show that a tree with  $n$  vertices has  $n-1$  edges.

4M

- B) Find minimum spanning tree for the given graph using Prim's algorithm?

4M



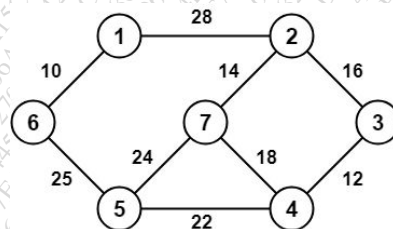
- C) Define the following terms with reference to tree with example.

4M

i) Level and Height of a tree      ii) M-ary Tree      iii) Eccentricity of a vertex

- D) Construct the minimum spanning tree (MST) for the given graph using Kruskal's Algorithm.

4M



**Q. 6 Solve the following.**

- A) Define the following terms.

6M

i) Algebraic Structures      ii) Semi Groups      iii) Monoids      iv) Ring  
v) Field      vi) Group

- B) For each of the following, determine whether the binary operation  $*$  is commutative or associative?

6M

- i)  $N$  is the set of natural numbers and  $a * b = a + b + 2$  for  $a, b \in N$   
ii) On  $N$  where  $a * b = \min(a, b+2)$   
iii) On  $R$  where  $a * b = a^b$

\*\*\* End \*\*\*