 **Shree H.N. Shukla College of Science**

**M. Sc (Mathematics) (Sem-4)**

**Preliminary Exam**

**MATH.EMT-4004: Graph Theory**

## [Time: 2.5 Hours] [Total Marks: 70]

## **Instructions :** (1) All questions are compulsory.

##  (2) There are 5 questions.

##  (3) Figures on right side indicate full marks .

**1** **Attempt any seven :** **2X7=14**

1. Define following terms :

 Self loops , null graph , Parallel edges and simple graph.

1. Define an Eulerian graph.Draw an Eulerian graph G, which is a simple graph but it is not a k-regular graph for ant k$\in ${ 1,2,…,|V(G)|-1 }.
2. Define Hamiltonian cycle and Hamiltonian graph .Draw a wheel graph Wn with its Hamiltonian cycle , for some integer n$\geq $ 3 .
3. Write down all the spanning trees of the following graph G.



1. Draw a simple connected graph G=(V,E) with |V|= 5 and G is a Hamiltonian graph as well as an Eulerian graph .
2. Define isomorphism of graphs .
3. Define closed walk and cycle .Give an example of a closed walk of a graph G which is not a cycle in G.



(9)Draw a simple connected graph G=(V,E) with |V| = 5 and G is a Hamiltonian graph as well as G is an Eulerian graph .

(10) Draw a dual graphs of K3 and K4 .

1. **Answer any two 7X2=14**
2. For a connected graph G, prove that G is an open eulerian graph if G has exactly two odd vertices and remaining all vertices are even vertices if exist
3. Let T be a tree.Prove that any two distict vertices u and v of T,there is a unique path between u and v in T.
4. State and prove Euler’s theorem .
5. Define closure of a graph G .For a simple graph G , prove that G is Hamiltonian iff its closure C(G) is hamiltonian.

 **3 Attempt the following** :  **1X14 =14**

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4**. Attempt the following** : **1X14= 14**

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1. **Attempt the following :**  **7X2 =14**

 

 



Best Of Luck