

# Graph Theory

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## **Subject**

Discrete Mathematics Graph Theory

## **Guided By**

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## ➤ About Project :

In this project we are preparing learning module. We have cover maximum graph theory concepts. We have also include gate questions so learner can self-check the learning. We have used Java for this project. This will be used as Learning Module for Graph theory learners.

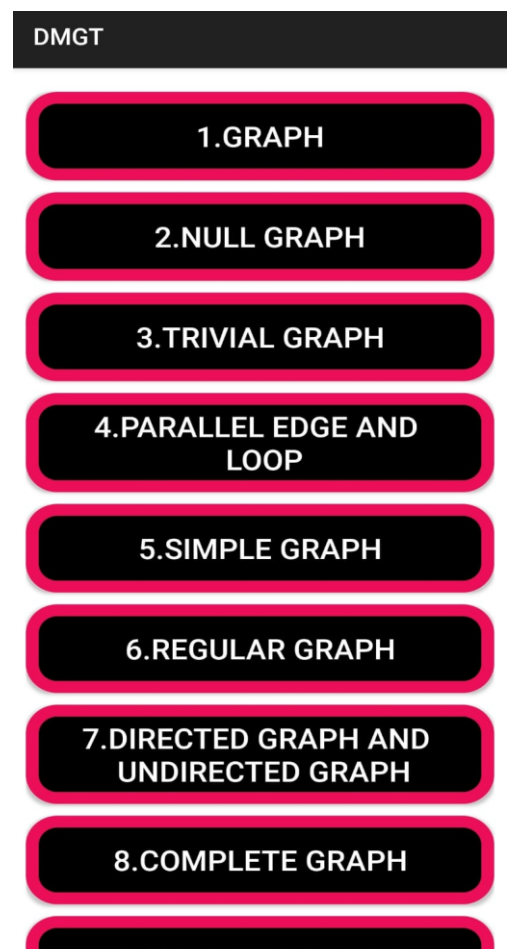
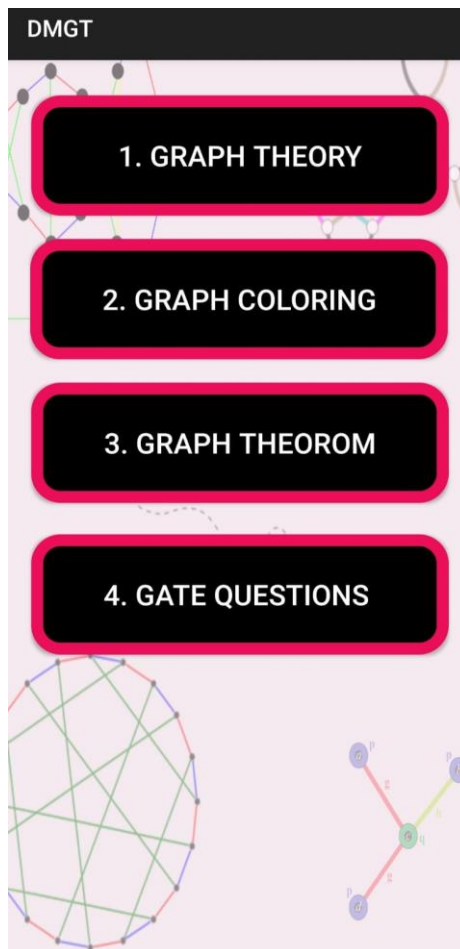
Concepts which has be covered

- 1.) Types of Graphs
- 2.) Degree
- 3.) Walk , Path and Circuit
- 4.) Vertex proper Colouring
- 5.) Exact Colouring

## ➤ Softwares :

- IDE for develop android app we use **ANDROID STUDIO**.
- For designing all graphs
  - **Adobe illustrator**
- For Logo animation on splash screen, we used **Adobe After Effects**.

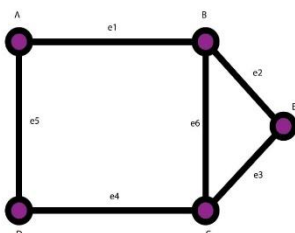
## ➤ Screenshots :



### Sub Graph :-

-> A graph  $H=(V,E)$  is called sub graph of graph  $G=(V,E)$  if subset of  $V$  and  $E_1$  is subset of  $E$ .

Ex :- Draw  $G-\{A,B\}$  for below given graph.



### Theorem - 1 :-

-> In a graph  $G$ , the sum of the degree of all vertices of all vertices of  $G$  is equal to twice the number of edge of  $G$ .

$$\deg(V_1) + \dots + \deg(V_n) = 2 \cdot e$$

### Proof :-

- > Let  $f$  be any edge of graph  $G$ .
- > If  $f$  is a loop on vertex  $V_1$  then  $f$  is count twice when we count degree of vertex  $V_1$ .
- > If  $f$  is incident on  $V_1$  and  $V_2$  then  $f$  is count inn both  $\deg(V_1)$  and  $\deg(V_2)$ . so  $f$  is count twice if we add  $\deg(V_1)$  and  $\deg(V_2)$ .
- > So that adding the degree of all vertices involves counting twice of each



Q-1. Let a simple graph  $G$  with 20 vertices and 8 components. If we delete a vertex in  $G$ , then the number of components in  $G$  should lie between \_\_\_\_.

- (A) 8 and 20
- (B) 8 and 19
- (C) 7 and 19
- (D) 7 and 20

Ans :- 7 and 19

### Explanation :-

If the vertex we are deleting from  $G$  is an isolated vertex, which is a component by itself, then the number of components in  $G$  becomes 7. If  $G$  is a start Graph, then by deleting the cut vertex of  $G$ , we get 19 components.