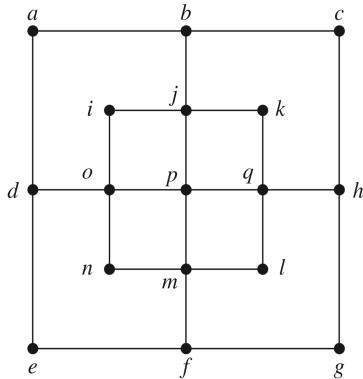


Note: Please fill-in-the-blanks with correct answers. Additionally, note the key arguments in arriving at your answer in the box below the blank (if a box is provided below the blank). Illegible writings and those outside the appropriate blank/box will be ignored. Please attempt the solution on a rough sheet first, and then make an appropriate fair copy on this sheet. Please use the notations, definitions, terminology etc. from your textbook. Do not forget to fill in your ROLL NO. Please read ALL footnotes carefully and follow all instructions meticulously.

1. In the graph depicted below, a Hamilton path \_\_\_\_\_<sup>1</sup>. If your answer is "EXISTS", then write down a Hamilton path in the box below. Else, justify your answer in the box below.



[3 Marks]

- In the same graph (depicted above), an Euler path \_\_\_\_\_<sup>2</sup>.

[1 Mark]

2. In a university, there are some number of faculty members and some number of students. Based on the principle of mutual consent, the faculty members and the students came-up with a list of possible faculty-student pairings for doing research projects. Suppose it so happened

<sup>1</sup>Please fill-in-this-blank with "EXISTS" or "DOES NOT EXIST".

<sup>2</sup>Please fill-in-this-blank with "EXISTS" or "DOES NOT EXIST".

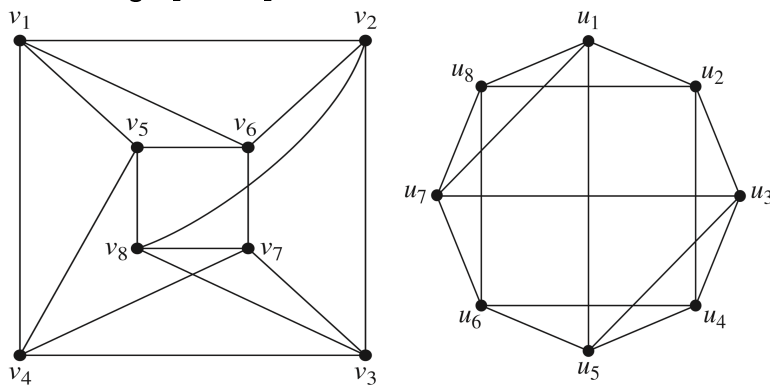
that every faculty listed exactly  $k \in \mathbb{N}$  students. Like-wise, it turned out that every student also listed exactly  $k$  faculty. A complete matching from the set of students to faculty \_\_\_\_\_<sup>3</sup>.

[2 Marks]

3. The statement " $Q_n$  (cube/hypercube) has a Hamilton circuit" is \_\_\_\_\_<sup>4</sup>. If your answer is "TRUE", then write down a Hamilton circuit in the box below. Else, write a proof of why the statement is false in the box below.

[2 Marks]

4. The two graphs depicted below \_\_\_\_\_<sup>5</sup> isomorphic.



[3 Marks]

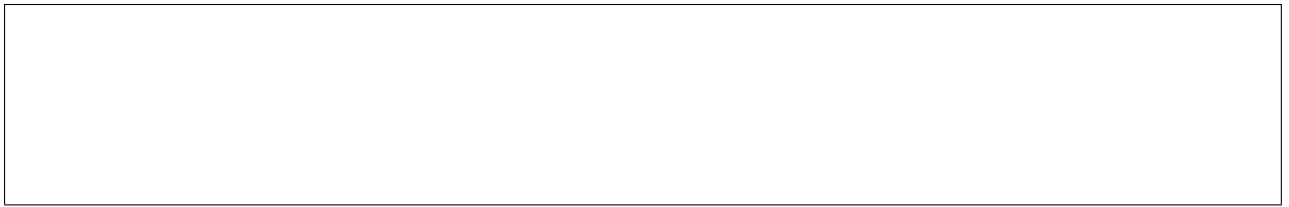
5. A tournament is a simple directed graph such that if  $u, v$  are two distinct vertices, then exactly one of  $(u, v)$  or  $(v, u)$  is an edge. The statement "Every tournament has a Hamilton path" is \_\_\_\_\_<sup>6</sup>.

<sup>3</sup>Please fill-in-this-blank with "DOES NOT EXIST" or "EXISTS"

<sup>4</sup>Please fill-in-this-blank with "TRUE" or "FALSE"

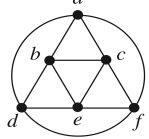
<sup>5</sup>Please fill-in-this-blank with "ARE" or "ARE NOT"

<sup>6</sup>Please fill-in-this-blank with "TRUE" or "FALSE".



[2 Marks]

6. The edge, vertex connectivity of the graph depicted below are \_\_\_\_\_, \_\_\_\_\_ respectively.



[2 Marks]