Total No. of Questions: 04

Total No. of Printed Pages: 03

| PRN No. | |
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| PAPER CODE | U214-233-ESE |
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**(AY:2024-25) December 2024 (ENDSEM) EXAM**

**SY (SEMESTER - I)**

**COURSE NAME: DISCRETE MATHEMATICS** **Branch: COMPUTER ENGINEERING** **COURSE CODE: CS21233**

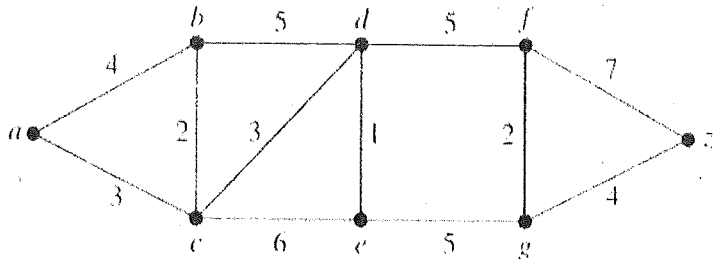
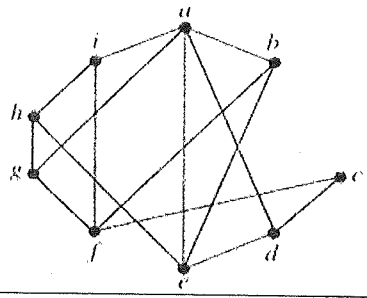
**SY (Pattern 2023)**

**Time: [1Hr 30 Min]** **[Max. Marks: 40]**

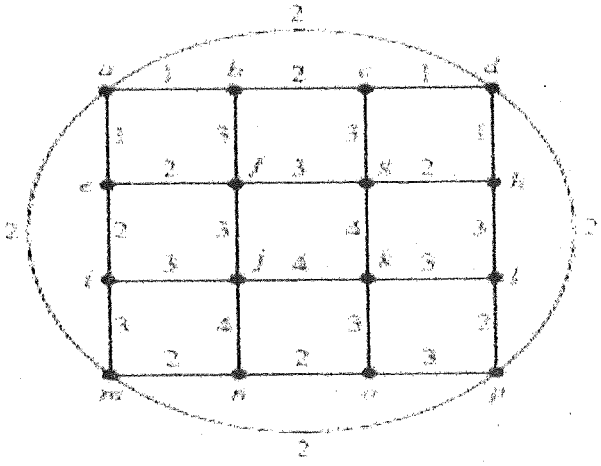
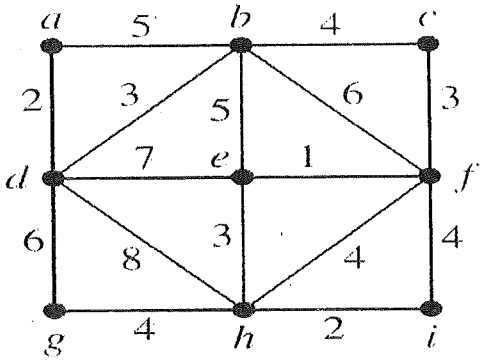
Instructions to candidates:

1) **Figures to the right indicate full marks. Use of scientific calculator is allowed**
2) **Use suitable data wherever required**
3) **All questions are compulsory. Solve any two sub question each from Questions 1 , 2 ,3 and 4**

| Q. No. | Question Description | Max. Marks | CO mapped | BT Level |
|---|---|---|---|---|
| Q.1 | a) Express each of these statements using quantifiers. Then form the negation of the statement, so that no negation is to the left of a quantifier. Next, express the negation in simple English.<br>i. Some old dogs can learn new tricks.<br>ii. No rabbit knows calculus. | [5] | 1 | Apply |
| | b) A total of 1232 students have taken a course in Spanish, 879 have taken a course in French, and 114 have taken a course in Russian. Further, 103 have taken courses in both Spanish and French, 23 have taken courses in both Spanish and Russian, and 14 have taken courses in both French and Russian. If 2092 students have taken at least one of Spanish, French, and Russian, how many students have taken a course in all three languages? | [5] | 1 | Apply |
| | C) Use mathematical induction to show that:<br>$\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots\cdots\cdots+\frac{1}{n(n+1)}=\frac{n}{n+1}$ for all $n \geq 1$ | [5] | 1 | Apply |
| Q2 | a) Answer these questions for the poset ({3, 5, 9, 15,24, 45}, Divides).<br>i. Find all upper bounds of {3, 5}.<br>ii. Find the least upper bound of {3, 5}, if it exists.<br>iii. Find all lower bounds of {15, 45}.<br>iv. Find the greatest lower bound of {15, 45}, if it exists. | [5] | 2 | Apply |

| | | | | |
|---|---|---|---|---|
| | b) Confirm whether given relation is POSET or not, if yes Construct the Hasse diagram for the following set A= {1,2,3,4,6,12} given by divisibility | [5] | 2 | Apı |
| | c) Find the transitive closure of R by Warshall's algorithm. Where A= {1,2,3,4,5,6} and R={(x-y);\|x-y\|=1} | [5] | 2 | Apı |
| Q3 | a) Let Kn be the complete graph on n ≥ 3 vertices. Justify your answers to the following questions.<br>i. For which values of n is Kn Hamiltonian?<br>ii. For which values of n is Kn Eulerian?<br>iii. For which values of n is Kn planar? | [5] | 3 | Apı |
| | b) Find the length and shortest path between a and z in each of the weighted graphs using Dijakstra's algorithm.  | [5] | 3 | Apı |
| | C) Determine the graph shown below is planar or not? Also calculate the chromatic number of the graph.  | [5] | 3 | Apı |
| Q4 | a) Suppose a data file has the following characters and the frequencies. If Huffman coding is used, calculate Huffman Code of each character | [5] | 4 | Apı |

| Characters | Frequencies |
|---|---|
| A | 12 |
| B | 15 |
| C | 7 |
| D | 13 |
| E | 9 |

| | | | | |
|---|---|---|---|---|
| | b) Calculate Minimum spanning Tree using Prims Algorithm.  | [5] | 4 | Apply |
| | c)Solve to find a minimum spanning tree using Kruskal's algorithm for the weighted graph given below:   | [5] | 4 | Apply |