Name: Enrolment No.	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End semester Examination- Even Semester, June 2021

Course: Discrete Mathematics **Semester: II**
Programme: B.Tech LLB (cyber law) **Time: 03 hrs**

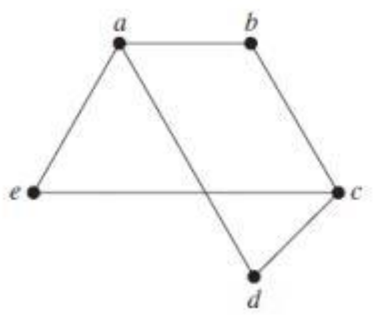
Course code: CSEG1012 **Max. Marks: 100**

SECTION A
Each question will carry 5 marks

S. No.	Question	CO
Q1.	Find the minimal, maximal, greatest and least elements of the following poset (S,|), (i.e. the relation | as divisibility) $S = \{2,3,5,30,60,120,180,360\}$	CO3
Q2	"Set of all even integers with respect to addition forms a group". The statement is true or false.	CO5
Q3	Consider the following relation a set $A = \{1,2,3,4,5,6\}$, $R = \{(1,1),(2,2),(3,3),(4,4),(1,3),(3,1),(5,6),(6,5)\}$ Write only whether or not R is reflexive, symmetric, antisymmetric and transitive.	CO1
Q4	Define tautology and contradiction.	CO2
Q5	Define order of a group. Hence state the Lagrange theorem.	CO5
Q6	A tree has two vertices of degree 2, one vertex of degree 3 and three vertices of degree 4. How many vertices of degree 1 does it have?	CO4

SECTION B
Each question will carry 10 marks

S. No.	Question	CO
Q7	Using mathematical induction , show that $$3^n > n^2, for\ n \geq 2$$	CO1

Q8	Consider the set $A = \{\{2\}, \{4\}, \{6\}, \{2,4\}, \{6,4\}, \{2,4,6\}\}$. Draw the Hasse diagram of A under the set inclusion relation "$\subseteq$". Hence Find GLB and LUB (if exists)	**CO3**
Q9	Determine the validity of the following argument: Either I will pass the examination, or, I will not graduate. If I do not graduate, then I will go to Canada. I failed. --- Thus, I will go to Canada.	**CO2**
Q 10	Solve the following recurrence relation $a_n - 4a_{n-1} + 4a_{r-2} = (n+1)^2$, given $a_0 = 1, a_1 = 1.$	**CO1**
11	Let $M_2\ (Z)$ be the ring of all 2×2 matrices over the integers and $\{R = \begin{bmatrix} a & a+b \\ a+b & b \end{bmatrix}, a, b, \in Z\ \}.$ Prove or disprove that R is a sub-ring of $M_2\ (Z)$.	**CO5**
SECTION C **Each question carries 20 marks**		
Q12	a. Using the decomposition theorem, determine the chromatic polynomial, and hence the chromatic number of the graph as shown below.  	**CO4**

b. Determine the minimal spanning tree of the weighted graph using Prim's algorithm