Code No: **23BS1305**

**PVP23**

**PVP Siddhartha Institute OF TECHNOLOGY**

**(Autonomous)**

**Discrete Mathematics & Graph Theory**

**Duration: 3 Hours Max. Marks: 70**

Note: 1. This question paper contains two Parts A and B.

2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.

3. Part-B contains 5 essay questions with an internal choice from each unit. Each

question carries 10 marks.

4. All parts of Question paper must be answered in one place

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part - A**

10 x 2 = 20 Marks

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Blooms Level | CO |
| 1a) | Show the truth tables for Tautology and Contradiction? | **L2** | **CO1** |
| 1b) | Construct the truth table of (PVQ) → P? | **L3** | **CO1** |
| 1c) | Explain the rule of Modus Tollens and Modus Pones of Proposition? | **L2** | **CO2** |
| 1d) | Define Quantifiers? List the types of Quantifiers. | **L1** | **CO2** |
| 1e) | What is Fibonacci Sequence and Write the Recurrence Relation? | **L1** | **CO3** |
| 1f) | Explain the various Particular Solutions of Non-Homogeneous Recurrence Relation? | **L2** | **CO3** |
| 1g) | Show the Hasse diagram representing the positive divisors of 36. | **L2** | **CO4** |
| 1h) | Define Complete Bipartite Graph with example? | **L1** | **CO4** |
| 1i) | Tell an example of a Graph which is Eulerian but not Hamiltonian? | **L1** | **CO4** |
| 1j) | Define Tree and List the properties of Tree? | **L1** | **CO4** |

**Part –B**

5 x 10 = 50 Marks

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | Blooms Level | CO | Max. Marks |
| **UNIT-I** | | | | | |
| 2 | (a) | Show that following equivalence without constructing the truth table ¬ (P∧ *Q)* → (¬*P* ∨ (¬ *P* ∨ *Q)*) ⇔ (*P* → *Q)*. | **L2** | **CO1** | **5M** |
| (b) | Construct the Principal Disjunctive Normal Form (PDNF) for the following formula: (∼P → *R)* ⋀ (Q ⟷ P). | **L3** | **CO1** | **5M** |
| **OR** | | | | | |
| 3 | (a) | Define a compound statement? Illustrate various connectives with an example. | **L2** | **CO1** | **5M** |
| (b) | Obtain the principal disjunctive normal form of | **L2** | **CO1** | **5M** |
| **UNIT-II** | | | | | |
| 4 | (a) | With the use of theory of inference, Show that R (Pis a valid conclusion from the premises | **L3** | **CO2** | **5M** |
| (b) | Apply the rule of specification and generalization, symbolize the following argument and check for its validity:  Premises: Every living thing is a plant or an animal.  John’s goldfish is alive and it is not a plant.  All animals have hearts.  Conclusion: Therefore, John’s goldfish has a heart. | **L3** | **CO2** | **5M** |
| **OR** | | | | | |
| 5 | (a) | Using rules of inference, Verify whether the following argument is valid:  Premises: If Joe is a Mathematician, then he is ambitious.  If Joe is an early riser, then he does not like oatmeal.  If Joe is ambitious, then he is an early riser.  Conclusion: Hence, If Joe is a Mathematician, then he does not like oatmeal. | **L3** | **CO2** | **5M** |
| (b) | Show that  ∀x (P(x) →Q(x))∧ ∀x (Q(x) → R(x))⇒∀x(P(x) → R(x)). | **L2** | **CO2** | **5M** |
| **UNIT-III** | | | | | |
| 6 | (a) | Solve the following recurrence relation  given that and | **L3** | **CO3** | **5M** |
| (b) | Solve with the initial conditions and | **L3** | **CO3** | **5M** |
| **OR** | | | | | |
| 7 | (a) | Solve given that that using the characteristic method. | **L3** | **CO3** | **5M** |
| **(b)** | Solve the following recurrence relation  . | **L3** | **CO3** | **5M** |
| **UNIT-IV** | | | | | |
| 8 | (a) | Let A= {1,2,3,4,5,6,7 } ,Determine a relation R on A by  Show that R is an equivalence relation. | **L2** | **CO4** | **7M** |
| (b) | Examine whether the following graphs are isomorphic or not. Justify your answer?  sI4uU | **L4** | **CO4** | **5M** |
| **OR** | | | | | |
| 9 | (a) | Let D100 ≡ {1, 2, 4, 5, 10, 20, 25, 50, 100} be the divisors of 100 and let the relation ≤ be the relation then  (D100, │) is a poset.  Analyze the following bounds from the Hasse diagram?   1. greatest lower bound {10, 20} 2. least upper bound {10, 20} 3. greatest lower bound {5, 10, 20, 25} 4. least upper bound {5, 10, 20, 25} | **L4** | **CO4** | **5M** |
| (b) | Consider the relation R = {(a, b), (b, c), (b, d), (d, a), (c, c)} Show the Digraph and Adjacency Matrix for the relation R? | **L2** | **CO4** | **5M** |
| **UNIT-V** | | | | | |
| 10 | (a) | Utilize the Welch Powell Algorithm for finding chromatic number of the following graph.  How to Find Chromatic Number | Graph Coloring Algorithm | Gate Vidyalay | **L3** | **CO4** | **5M** |
| (b) | Discover a Minimal Spanning Tree for the given weighed graph using Kruskal’s algorithm.  Kruskal's Algorithm | **L4** | **CO4** | **5M** |
| **OR** | | | | | |
| 11 | (a) | Examine whether the following graph is planar or not. Justify your answer  pic-ex-euler1 | **L4** | **CO4** | **5M** |
| (b) | Comare and Contrast between Depth First Search and Breadth First Search with an example | **L2** | **CO4** | **5M** |