



B.Tech IV Semester Supplementary Examinations, December 2024

DISCRETE MATHEMATICS
 (Common to CSE & IT)

Maximum Marks: 70

Date: 03.12.2024

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20) Marks		CO	Bloom Tx
1	Let $R = \{ [1,1] [2,2] [3,3] [4,4] [5,5] [1,2] [2,1] [5,4] [4,5] \}$ be the equivalence relation on $A = \{1,2,3,4,5\}$ Find equivalence classes and A/R.	1	L1
2	Find the inverse of the function $f(x) = e^x$ defined from R to R^+ .	1	L1
3	Define Fibonacci numbers recursively.	2	L1
4	Write the properties of gcd?	2	L1
5	Construct the truth table of $(P \wedge Q) \rightarrow P$	3	L1
6	Write the rule of modus tollens of predicates?	3	L1
7	If $a \circ b = a + b + ab \forall a, b \in Z$ S.T $(Z, 0)$ is a semi group.	4	L1
8	Define cyclic group with an example.	4	L1
9	Define isomorphism of two graphs.	5	L1
10	Define the following terms with suitable example i) Subgraph ii) Spanning graph	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	Show that the relation 'R' defined by $(a,b) R (c,d)$ iff $a+d=b+c$ is an equivalence relation. [10M]	1	L2
OR			
12	If $X = \{1,2,3,4\}$ and $R = \{(x,y)/x < y\}$ Draw the graph of 'R' and also give its matrix. [10M]	1	L2
13	Use Mathematical Induction to prove the following generalization of one of Demorgan's laws $(\bigcap_{j=1}^n A_j)' = \bigcup_{j=1}^n A_j'$ where $A_1, A_2, A_3, \dots, A_n$ are subsets of universal set U. [10M]	2	L2
OR			
14	State and Prove Division algorithm theorem using well ordering principle. [10M]	2	L2

15	a) Obtain CNF of $((P \rightarrow Q) \wedge \sim Q) \rightarrow \sim P$ [5M] b) Obtain DNF of $(Q \rightarrow P) \wedge (\sim P \wedge Q)$ [5M]	3	L2																												
OR																															
16	a) Show that Q_1 (rational numbers other than 1) is an infinite abelian group with respect to $*$ defined by $a*b = a + b - ab$, where a, b are rational number. [5M] b) Prove that the identity element of a group "G" is same as identity element of its subgroup H. [5M]	3	L2																												
17	a) Prove that in a group its identity element, inverse element are unique. [5M] b) State and prove Lagrange's theorem on cosets. [5M]																														
OR																															
18	Two graphs with the following adjacency list are given, Find whether G and H are isomorphic or not. [10M] <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Graph G</th> <th colspan="2">Graph H</th> </tr> <tr> <th>vertices</th> <th>Adjacent vertices</th> <th>vertices</th> <th>Adjacent vertices</th> </tr> </thead> <tbody> <tr> <td>p</td> <td>q,s</td> <td>a</td> <td>b,c,d</td> </tr> <tr> <td>q</td> <td>p,r,s</td> <td>b</td> <td>b,d</td> </tr> <tr> <td>r</td> <td>q,t</td> <td>c</td> <td>a,d</td> </tr> <tr> <td>s</td> <td>p,q,t</td> <td>d</td> <td>a,b,c</td> </tr> <tr> <td>t</td> <td>s</td> <td>e</td> <td>d</td> </tr> </tbody> </table>	Graph G		Graph H		vertices	Adjacent vertices	vertices	Adjacent vertices	p	q,s	a	b,c,d	q	p,r,s	b	b,d	r	q,t	c	a,d	s	p,q,t	d	a,b,c	t	s	e	d	4	L2
Graph G		Graph H																													
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19	a) State and prove Euler's theorem on plane graphs. [5M] b) Define isomorphism of graphs. What are the steps followed in discovering the isomorphism. [5M]																														
OR																															
20	Define the following terms. Give one suitable example for each i) Euler circuit [5M] ii) Hamiltonian graph [5M]	5	L2																												