

UOM Exam Second half 2021_Question paper_R2019/CSC301 - Discrete Structures and Graph Theory /Sem-III / COMPUTER ENGINEERING / ARTIFICIAL INTELLIGENCE AND DATA SCIENCE / ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING / COMPUTER SCIENCE AND ENGINEERING (Artificial Intelligence and Machine Learning / COMPUTER SCIENCE AND ENGINEERING (Data Science) / COMPUTER SCIENCE AND ENGINEERING (Internet of Things and Cyber Security Including Block Chain Technology) / CYBER SECURITY / DATA ENGINEERING / INTERNET OF THINGS (IoT)

Dear Student,

Please note before you attempt this section of examination:

1. Q1, Q2, Q3 and Q4 carry 20 marks each.
2. This paper contains 20 Marks MCQ and 60 marks subjective section for 150 minutes duration.
3. It is mandatory for all the students to upload their answer papers in a single PDF format only.
4. You have to write Date of Examination, Seat number, Program, Scheme and semester, Subject name, Signature on EVERY PAGE.
5. Remain in the meet with your camera on and you in clear view throughout the duration of the exam.

1. Email *

2. Student Name (As per exam form filled) *

3. Seat No *

Refer Hall ticket

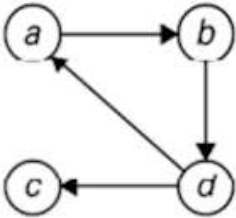
Solve Questions as per the
instructions given separately.

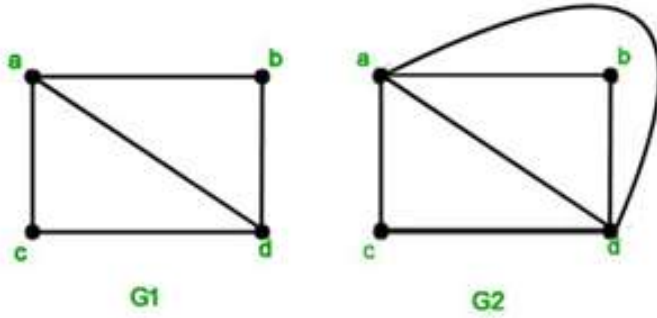
- Please upload a single PDF for Q1 to Q4
- For MCQs Question write Question number & correct option with complete text in option.
- Q2 to Q4 are subjective questions - Solve Questions as per the instructions and marks allotted.

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	How many subsets can be created for set $A = \{a, b, c, d\}$
Option A:	8
Option B:	12
Option C:	16
Option D:	20
2.	Let p be "John is happy" and q be "John is rich". Write the following in symbolic form. "John is poor but happy"
Option A:	$\sim p \wedge q$
Option B:	$\sim p \vee \sim q$
Option C:	$\sim p \vee (p \wedge \sim q)$
Option D:	$\sim q \wedge p$
3.	Let $R = \{(1,2), (1,3), (3,1), (1,1), (3,3), (3,2), (1,4), (3,4), (4,2)\}$, determine which property is satisfied by above relation?
Option A:	Reflexive
Option B:	Symmetric
Option C:	Transitive
Option D:	Equivalence
4.	Given the following statements pick the one that a tautology?
Option A:	$\sim p \rightarrow (q \rightarrow p)$
Option B:	$(p \wedge q) \rightarrow p$
Option C:	$p \wedge \sim q$
Option D:	$q \rightarrow \sim p$
5.	Planner graph is a graph in which _____.
Option A:	Two edges of the graph intersect.
Option B:	No two edges of the graph intersect.
Option C:	All the edges of the graph intersect.
Option D:	Some e edges of the graph intersect.
6.	Group has following Properties _____.
Option A:	Closure Associative, Inverse, Identity
Option B:	Closure, Associative, Identity, Commutative
Option C:	Closure, Associative, Identity, Inverse
Option D:	Closure, Associative, Identity element, Inverse element, Commutative

7.	The transitive closure of the relation $R=\{(1,2),(2,3),(3,4),(5,4)\}$ on set $A=\{1,2,3,4,5\}$ is
Option A:	$\{(1,2),(2,3),(3,4),(5,4),(1,3)\}$
Option B:	$\{(1,2),(2,3),(3,4),(5,4),(1,3),(1,4),(2,4)\}$
Option C:	$\{(1,2),(2,3),(3,4),(5,4),(1,3),(1,4)\}$
Option D:	$\{(1,2),(2,3),(3,4),(4,5),(1,3),(1,4)\}$
8.	A _____ is a semi group $(A,*)$ that has an identity element.
Option A:	Cyclic group
Option B:	Lattice
Option C:	Poset
Option D:	Monoid
9.	K_{11} is a complete graph of 11 vertices and will have _____ edges.
Option A:	45
Option B:	54
Option C:	55
Option D:	42
10.	What is the identity element In the group $G = \{0, 1, 2, 3, 4, 5\}$ under addition modulo 6?
Option A:	0
Option B:	1
Option C:	5
Option D:	4

Q2	
A	Solve any Two [5 marks each]
i.	Let $A = \{[1, 2, 3, 4, 5, 6, 7]\}$ and $R = \{(a, b) \mid a-b \text{ is divisible by } 3\}$. Show that R is an equivalence relation.
ii.	Prove that the set Z of all integers with binary operation $*$ defined by $a*b=a+b+1$ for all a, b belonging to G is an Abelian group.
iii.	Obtain the Conjunctive Normal Form of $(x \wedge y) \vee (\sim x \wedge y)$
B	Solve any One [10 marks each]
i.	Let D_{72} be the poset consisting of all the positive divisors of 72 under the partial order of divisibility. (a) Write down the elements of D_{72} ? (b) Draw the Hasse Diagram of D_{72} . (c) Define Lattice. Is D_{72} a lattice? Give a reason for your answer
ii.	Define and give examples of injective surjective and bijective functions. Check the injectivity and surjectivity of the following function $f: \mathbb{N} \rightarrow \mathbb{N}$ given by $f(x)=x^2$

Q3	
A	Solve any Two [5 marks each]
i.	<p>Consider the following digraph and find transitive closure using Warshall's algorithm.</p>  <pre> graph TD a((a)) --> b((b)) b((b)) --> d((d)) d((d)) --> c((c)) c((c)) --> a((a)) </pre>
ii.	<p>Find the generating function for the following sequences</p> <p>i) $\{1, 1, 1, 1, 1, 1, \dots\}$</p> <p>ii) $\{1, 2, 3, 4, \dots\}$</p>
iii.	<p>Prove using Mathematical induction $1+3+5+\dots+(2k-1)=k^2$ is true.</p>
B	Solve any One [10 marks each]
i.	<p>Define Isomorphic Graph. Draw K_6 and $K_{3,3}$ graphs. Find whether they are Isomorphic or not?</p>
ii.	<p>Consider $G = \{1, 3, 5, 7\}$ under the multiplication modulo 8.</p> <p>i) Find multiplication table of G.</p> <p>ii) Find $3^{-1}, 5^{-1}, 7^{-1}$</p> <p>iii) Is G cyclic Group?</p>

Q4.	
A	Solve any Two [5 marks each]
i.	<p>Define Existential and Universal Quantifier. Let $K(x)$: "x is a two-wheeler." $L(x)$: "x is a scooter", $M(x)$: "x is manufactured by Bajaj". Express the following using Quantifiers: i) Every two-wheeler is a scooter ii) There is a two-wheeler that is not manufactured by Bajaj. iii) Every two-wheeler that is a scooter is manufactured by Bajaj.</p>
ii.	How many numbers between 1 and 500 are divisible by 3 or 5 or 7.
iii.	<p>Define Euler Path and Euler Circuit. Check whether Euler Path, Euler Circuit exist in the following graphs.</p> <div style="text-align: center;">  <p style="text-align: center;">G_1 G_2</p> </div>
B	Solve any One [10 marks each]
i.	<p>Consider the set Q of rational numbers, and let $*$ be the operation on Q defined by $a * b = a + b - ab$. i) Find $2 * 4, 5 * (-4)$ ii) Show that $(Q, *)$ is a semi group. iii) Is it commutative?</p>
ii	<p>Give the examples of relation R on $A = \{1, 2, 3\}$ having stated property. i) R is transitive but not symmetric ii) R is symmetric but not transitive iii) R is both symmetric and antisymmetric iv) R is neither symmetric nor antisymmetric. v) R is equivalence</p>

4. Please Upload complete scanned answer copy in a single PDF file. *

Files submitted: