

University of Mumbai

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

Examination: Second Year Semester: III

Course Code: CSC302 Course Name : Discrete Structures and Graph Theory

Time: 1 hour

Max. Marks: 80

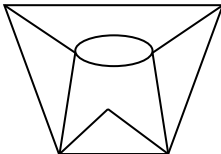
Q1. All questions compulsory 2 marks each (40 Marks)

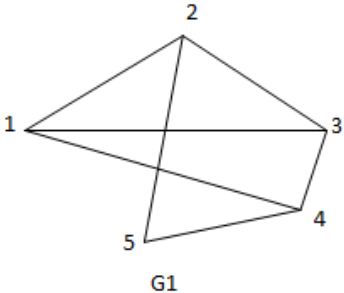
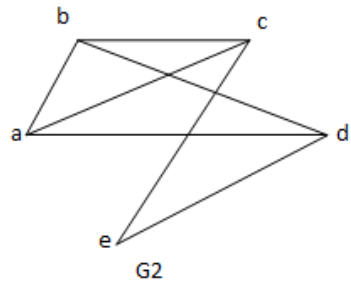
Q1.	A set containing only one element is called a _____
Option A:	Unique set
Option B:	Primary set
Option C:	Singleton set
Option D:	Universal set
Q2.	Warshall's Algorithm is used to find _____ closure
Option A:	Transitive
Option B:	Symmetric
Option C:	Asymmetric
Option D:	Reflexive
Q3.	If every element of set A is an element of set B, then A and B can be denoted by which of the following notation?
Option A:	$A == B$
Option B:	$A \rightarrow B$
Option C:	$A \subseteq B$
Option D:	$A \not\subseteq B$
Q4.	If H is subgroup of G, then which of the following is incorrect about H?
Option A:	The identity element e belongs to H
Option B:	If $a \in H$ then $a^{-1} \in H$
Option C:	The identity element e should not belong to H
Option D:	If a, b belong to H the $a*b$ also belongs to H
Q5.	_____ is a compound statement obtained by combining two simple statements by 'And'.
Option A:	disjunction
Option B:	conjunction
Option C:	Implication
Option D:	negation
Q6.	For a semi-group $(Z^+, +)$ the identity element is _____
Option A:	0
Option B:	1
Option C:	2
Option D:	-1

Q7.	Obtain the DNF of $(p \supset q) \wedge (\sim p \wedge q)$
Option A:	$p \supset q$
Option B:	$\sim p \wedge q$
Option C:	p
Option D:	q
Q8.	Solve using warshall's algorithm $R=\{(a,b),(b,a),(b,c)\}$ defined of A where $A=\{a,b,c\}$
Option A:	$\{(a,a),(c,c),(b,a),(b,b),(b,c)\}$
Option B:	$\{(a,a),(a,b),(a,c),(b,c)\}$
Option C:	$\{(a,a),(a,b),(a,c),(b,a),(b,b),(b,c),(c,a),(c,b)\}$
Option D:	$\{(a,a),(a,b),(a,c),(b,a),(b,b),(b,c)\}$
Q9.	Consider a parity check matrix. Find the (2,5) group code function $eH : B^2 \rightarrow B^5$
	$\begin{pmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
Option A:	$e(00)=00000$ $e(01)=01010$ $e(10)=10011$ $e(11)=11000$
Option B:	$e(00)=00001$ $e(01)=01010$ $e(10)=10011$ $e(11)=11001$
Option C:	$e(00)=00000$ $e(01)=01111$ $e(10)=10010$ $e(11)=11000$
Option D:	$e(00)=00000$ $e(01)=01011$ $e(10)=10011$ $e(11)=11111$
Q10.	Let $f(x)=x+2$, $g(x)=x-2$, & $h(x)=3x$, for $x \in R$, where R is a set of real numbers. Find gof
Option A:	x
Option B:	$6x-2$
Option C:	$x+1$
Option D:	$x-3$
Q11.	Let $A = \{1, 2, 3, 4, 5, 6\}$ is a finite abelian group under multiplication modulo 7. Identify the inverse of elements 2 and 3.
Option A:	Inverse of 2 is 4 and inverse of 3 is 5

Option B:	Inverse of 2 is 5 and inverse of 3 is 4
Option C:	Inverse of 2 is 6 and inverse of 3 is 1
Option D:	Inverse of 2 is 1 and inverse of 3 is 6
Q12.	How many friends must you have to guarantee that at least five of them will have birthdays in the same month?
Option A:	49
Option B:	48
Option C:	60
Option D:	61
Q13.	Identify the maximal and minimal elements in the given Hasse diagram of a poset.
	<pre> graph BT 2 --- 6 2 --- 5 6 --- 12 5 --- 20 </pre>
Option A:	Maximal: 20 and Minimal: 2
Option B:	Maximal: 12, 20 and Minimal: 2
Option C:	Maximal: 6, 12 and Minimal: 2, 5
Option D:	Maximal: 5, 20 and Minimal: 2, 6
Q14.	There can be _____ possible sub graphs of any graph.
Option A:	exactly one
Option B:	many
Option C:	zero
Option D:	at most one
Q15.	If A and B are true statements and X is a false statement, find the truth value of: $\sim X \wedge (\sim A \vee \sim B)$
Option A:	T
Option B:	F
Option C:	T and F
Option D:	T or F
Q16.	Consider a function $f:A \rightarrow B$ is bijective ..which of the following is INCORRECT?
Option A:	$f^{-1} : B \rightarrow A$ exist
Option B:	$f^{-1} : B \rightarrow A$ unique
Option C:	f^{-1} is bijective
Option D:	f^{-1} is only injective
Q17.	If the origin and terminus of a walk are same, the walk is known as... ?
Option A:	Path
Option B:	Closed
Option C:	Open
Option D:	Bound
Q18.	The conjunctive normal form(CNF) of $\sim [(p \vee \sim q) \wedge \sim r]$ is

Option A:	$(r \vee \sim p) \wedge (r \vee q)$
Option B:	$(\sim r \vee p) \wedge (\sim r \vee q)$
Option C:	$(r \wedge \sim p) \vee (r \wedge q)$
Option D:	$(r \vee p) \wedge (r \vee \sim q)$
Q19.	A binary operation on * is said to be associative if
Option A:	$a*(b*c)=c*(d*e)$
Option B:	$a*(b*c)=ab*ac$
Option C:	$a*(b*c)=(a*b)*c$
Option D:	$b*c=c*b$
Q20.	In a group of 300 persons, 160 drink tea and 170 drink coffee, 80 of them drink both, How many persons do not drink either?
Option A:	50
Option B:	40
Option C:	60
Option D:	45

Q2. (20 Marks Each)	Solve any Four out of Six	5 marks each
A	<i>Show that if any 10 positive integers are chosen two of them will have same remainder when divided by 9 using pigeonhole principle.</i>	
B	<p>Let $A = \{a, b, c, d, e, f, g, h\}$. Consider the following subsets of A $A1 = \{a, b, c, d\}$ $A2 = \{a, c, e, g, h\}$ $A3 = \{a, c, e, g\}$ $A4 = \{b, d\}$ $A5 = \{f, h\}$ Determine whether following is partition of A or not. Justify your answer. (i) $\{A1, A2\}$ (ii) $\{A3, A4, A5\}$</p>	
C	<p>Let $A = \{1, 2, 3, 4\}$. Determine whether the relation is reflexive, irreflexive, symmetric, asymmetric, antisymmetric or transitive. a. $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 3), (3, 4), (4, 4)\}$ b. $R = \{(1, 3), (1, 1), (3, 1), (1, 2), (3, 3), (4, 4)\}$ c. $R = \{(1, 2), (1, 3), (3, 1), (1, 1), (3, 3), (3, 2), (1, 4), (4, 2), (3, 4)\}$</p>	
D	<p>Determine the Eulerian (Euler) and Hamiltonian paths and circuits, if exists, in the following graphs.</p> 	
E	Determine if following graphs G_1 and G_2 are isomorphic or not.	

		
F	Prove that the set $G = \{1, 2, 3, 4, 5, 6\}$ is a finite Abelian group under multiplication modulo 7.	

Q3. (20 Marks Each)	Solve any Two Questions out of Three	10 marks each
A	<i>In a class 42% students passed in Maths, 45% passed in Physics, 41% passed in Chemistry, 16% passed in Maths and Physics, 19% passed in Physics and Chemistry, 18% passed in Chemistry and Mathematics. Find the number of students who passed in all 3 subjects. If there were 260 students in a class and 15% students failed in all subjects.</i>	
B	<i>If $f, g, h: \mathbb{R} \rightarrow \mathbb{R}$ are defined as $f(x) = x + 2$, $g(x) = \frac{1}{x^2} + 1$, $h(x) = 3$, find i) $g \circ h \circ f(x)$ ii) $h \circ g \circ f(x)$ iii) $g \circ f^{-1} \circ f(x)$</i>	
C	<i>Let $A = \{1, 2, 3, 4\}$, $R = \{(1, 1), (1, 2), (1, 4), (2, 4), (3, 1), (3, 2), (4, 2), (4, 3), (4, 4)\}$. Find the transitive closure by Warshall's algorithm.</i>	