Program: **Computer Engineering**
Curriculum Scheme: Rev2019
Examination: Second Year Semester: III
Course Code: CSC302   Course Name : Discrete Structures and Graph Theory

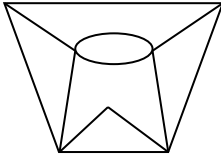Time: 1 hour   Max. Marks: 80
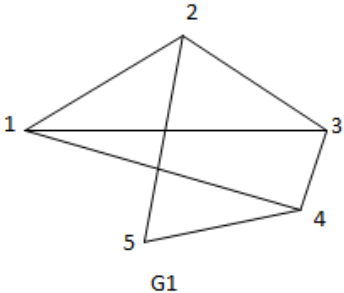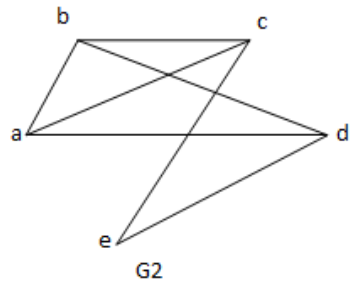
Q1. All questions compulsory 2 marks each   (40 Marks)

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 → B
Option C:	A ⊆ B
Option D:	A ⊄ 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 ∈ H then a^{-1}∈ 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 ⊃ q) Λ (~p Λ q)
Option A:	p ⊃ q
Option B:	~p Λ 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 : B2 -> B5 $$\begin{pmatrix} 0\,1\,1 \\ 0\,1\,1 \\ 1\,0\,0 \\ 0\,1\,0 \\ 0\,0\,1 \end{pmatrix}$$
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 ∈ 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.
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->B is bijective ..which of the following is INCORRECT?
Option A:	f^{-1} :B->A exist
Option B:	f^{-1} : B->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 V ~ p) ∧ (r V q)
Option B:	(~ r V p) ∧ (~ r V q)
Option C:	(r ∧ ~ p) V (r ∧ q)
Option D:	(r V p) ∧ (r V ~ 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	*Show that if any 10 positive integers are chosen two of them will have same remainder when divided by 9 using pigeonhole principle.*
B	*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)*
C	*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)}*
D	Determine the Eulerian (Euler) and Hamiltonian paths and circuits, if exists, in the following graphs.
E	Determine if following graphs G_1 and G_2 are isomorphic or not.

G1   G2

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	*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 and15% students failed in all subjects.*
B	*If f, g, h: R R are defined as f(x)=x+2, g(x)=1/x 2 +1, h(x)=3, find i)g o h o f(x) ii) h o g o f(x) iii) g o f⁻¹ o f(x)*
C	*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.*