Code No. 6206

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I-Semester (Main) Examination, November/December, 2009

Subject : DISCRETE STRUCTURES

Time : 3 Hours] [Max. Marks : 75

Note : Answer *all* questions from **Part - A**. Answer *any five* questions from **Part - B**.

PART - A (25 Marks)

1. Give an example of three sets, W,X,Y such that $W \subseteq X$ and $X \subseteq Y$ but $W \not\subset Y$. 2

2. Show that $(7p \vee q) \wedge (p \wedge (p \wedge q) \Leftrightarrow (p \wedge q)$. 3

3. If there are 12 pairs of different coloured socks in a laundry bag. At most how many socks should be drawn to get a matched pair. 2

4. Give an example of antisymmetric relation. 3

5. Write a Recurrence Relation to find a factorial of a given number. 2

6. Find the number of integral solutions to the equation $x_1 + x_2 + x_3 + x_4 + x_5 = 30$ for $x_i \geq 1$ for $i = 1, 2, 3, 4, 5$. 3

7. What is meant by Homomorphism ? 2

8. Define a Group. 3

9. What is a chromatic number ? Give the Chromatic number for a wheel graph. 3

10. Define Minimum Spanning Tree. 2

Contd...2

PART - B

(50 Marks)

11. (a) Obtain converse, Inverse, contrapositive for $\forall x\, [p(x) \rightarrow q(x)]$.

    (b) If m is an even integer, prove that $m+7$ is odd.

12. Find the number of integers between 1 and 1000 inclusive, which are divisible by none of 5, 6 or 8.

13. Solve the recurrence Relation :

    $F_{n+2} = F_{n+1} + F_n$ where $n \geq 0$

    $F_0 = 0$; $F_1 = 1$.

14. (a) What is a Semi - Group ? Explain its properties under Homomorphism.

    (b) Explain the principle of Hamming code.

15. (a) Find the transitive closure of directed graph given by relation

    R = {(a, b) (b, a) (b,c) (c, a) (c, d) (d, a)} on set A = {a, b, c, d}.

    (b) Define cut set and Tie set with example.

16. (a) Find the Co - efficient of x^5 in $(a - 2x)^{-7}$.

    (b) Show that any graph with 4 or fewer vertices is planar.

17. (a) Count the number of integral solutions to

    $x_1 + x_2 + x_3 = 20$ with $2 \leq x_1 \leq 5$, $4 \leq x_2 \leq 7$, $-2 \leq x_3 \leq 9$.

    (b) Prove that a tree with n vertices has exactly $(n-1)$ edges.

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Code No. : 6206

FACULTY OF ENGINEERING
B.E. 2/4 (CSE) I Semester (Supplementary) Examination, July 2010
DISCRETE STRUCTURES

Time : 3 Hours] [Max. Marks : 75

*Note : Answer **all** questions from Part A. Answer **any five** questions from Part **B**.*

PART – A 25

1. Write the following statement in symbolic form. 2
   a) Atleast one integer is even.
   b) Crops will be destroyed, if there is a flood.
2. Show that $P \vee \overline{(p \cap q)}$ is a tautology. 3
3. If A { a, b, c, d} and B = {1, 2, 3}. How many onto functions are possible from A to B. 2
4. Let $f : R \to R$ and $g : R \to R$ where $f(x) = x^2$, $g(x) = x + 5$.

   Show that fog ≠ gof. 3
5. Determine the coefficient of x^{15} in $(x^2 + x^3 + x^4 + ...)^4$. 3
6. Define first order homogeneous recurrence relation. 2
7. Define a Ring. 2
8. What is an Algebraic system ? 3
9. Give an example of a Graph and its complement. 2
10. What is a rooted tree ? Give an example. 3

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PART – B **50**

11. Show that $\neg P$ is a valid conclusion from premises $P \to r, r \to s, tv \neg s, \neg tvu, \neg u$. **10**

12. a) A what of fortune has 1 to 36 painted on it in a random manner. Show that three consecutive numbers total 55 or more (regardless of order of numbers). **5**

    b) Let $n \in Z^+$, prove that g(d (n, n + 2) = 1 or 2. **5**

13. a) In how many ways can the 26 letters of alphabet be permuted so that none patterns car, dog, pun or byte occurs. **5**

    b) Find the co-efficient of x^5 in $(1 - 3x)^{-7}$. **5**

14. a) Solve the recurrence relation

    $2a_{n+3} = a_{n+2} + 2a_{n+1} - a_n, n \geq 0$

    and $a_0 = 0$, $a_1 = 1$, $a_2 = 2$. **6**

    b) Define Derangement. Give an example. **4**

15. a) Show that if a, b are any two elements of a group G, then $(ab)^2 = a^2.b^2$ if and only if G is abelian. **5**

    b) What is a Group ? Explain Group homomorphism ? **5**

16. a) Show that a complete bipartite graph $K_{m,n}$ is planar when $m \leq 2$ & $n \leq 2$. **5**

    b) Let G (V, E) be a directed graph then prove that $\sum deg^-(v) = \sum deg^+(v) = |E|$. **5**

17. a) Solve Recurrence relation of Fibonacci sequence. **5**

    b) Find transitive closure of a graph given by relation

    R = {(a, d) (b, a) (b, c) (c, a) (cd)(dc)} on set A = {a, b, c, d}. **5**

700

Code No. : 3292

FACULTY OF ENGINEERING
B.E. 2/4 (CSE) I Semester (Main) Examination, December 2010
DISCRETE STRUCTURES

Time: 3 Hours] [Max. Marks: 75

*Note : Answer **all** questions from Part – A. Answer **any five** questions from Part – **B**.*

PART – A **(25 Marks)**

1. P : you have the flee, q : you pass the course. Translate $\neg P \rightarrow q$ into an English Statement. 3
2. What is the minimal set of connectives required for a well formed formula ? 2
3. What is equivalence Relation ? 3
4. Define principle of Inclusion-Exclusion. 3
5. $a_n^2 + (a_n - 1)^2 = -1$ is it linear homogeneous recurrence relation. Give reason. 2
6. What is characteristic equation ? 3
7. Define Abelian Group. 2
8. What is Group and Subgroup ? 3
9. What is complement of a graph ? 2
10. What is Hamiltonian cycle ? 2

PART – B **(50 Marks)**

11. a) $(P \rightarrow Q) \wedge (R \rightarrow Q) \Leftrightarrow (P \vee R) \rightarrow Q$. 4

    b) Prove by indirect method that $(\neg Q),\ P \rightarrow Q, P \vee R \Rightarrow R$. 6

12. a) If $f: X \rightarrow Y$ and $g: Y \rightarrow X$ the function g is equal to f^{-1} only if $gof = I_x$ and $fog = I_y$, prove the result. 5

    b) Show that the function $f(x) = x^3$ and $g(x) = x^{1/3}$ for $x \in R$ are inverse of each other. 5

13. a) State and prove principle of inclusion and exclusion. 4

b) Consider a set of integers from 1 to 250. Find how many of these numbers are divisible by 3 or 5 or 7 ? Also indicate how many are divisible by 3 or 7 but not by 5 and divisible by 3 or 5 ? 6

14. a) Find the coefficient of X^{12} in $(1-4X)^{-5}$. 4

b) Solve the recurrance relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$ for $n \geq 2$ with initial conditions $a_0 = 10$, $a_1 = 41$. 6

15. a) Let G be a group. Then prove that $2(G) = \{ x \in G / xg = gx \text{ for all } g \in G \}$ is a subgroup of G. 5

b) Let P(S) be the power set of a non-empty set S. Let '$\cap$' be an operation in P(S). Prove that associative law and commutative law are true for the operation '$\cap$' in P(S) 5

16. a) Prove (or) disprove that the following two graphs are Isomorphic. 6

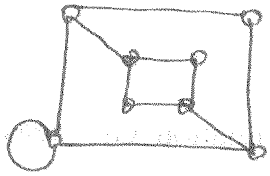


Fig : a

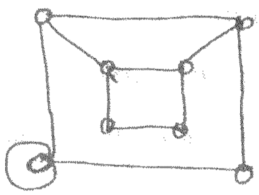


Fig : b

b) Determine the number of edges in

i) Complete graph K_{n1}

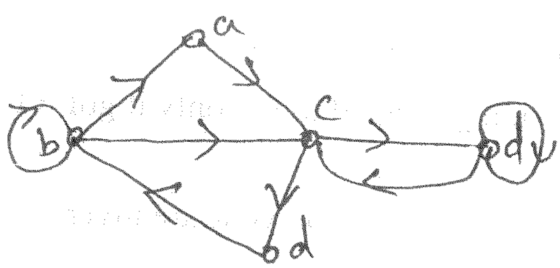
ii) Complete bipartite graph K_{mn}. 4

17. a) Find the chromatic numbers of 4

i) Complete graph Kn

ii) Wheel of graph $W_{11}n$.

b) Derive directed spanning tree from the graph shown in figure and explain the steps involved in deriving a spanning tree. 6



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ODDASIF

Code No. 5233 / O

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I - Semester **(Old)** Examination, December 2011

Subject : **Discrete Structures**

Time : 3 Hours

Max. Marks: 75

Note: Answer **all** questions of Part – A. Answer any **five** questions from Part-B.

PART – A (25 Marks)

1. Define the Law of Duality. Write the Dual for $(p \wedge \rceil q) \wedge (r \wedge \rceil q)$. (2)
2. Define the Rule of Universal Specialization. Give one example. (2)
3. If A = {w, x, y} and B = {1, 2, 3}. Then find the number of Surjective functions from A to B. (2)
4. Define the principle of Inclusion and Exclusion. (2)
5. Solve the Recurrence Relation $F_{n+2} = F_{n+1} + F_n$ where $n \geq 0$ and $f_0 = 0$; $f_1 = 1$. (3)
6. Write the generating sequence for exponential generating function $(e^x + e^{-x})$. (3)
7. Define Group monomorphism. (2)
8. Define and write the properties of Abelian group. (3)
9. What is a complete graph? Give an example for n = 6. (3)
10. Define Hamiltonian cycle with example. (3)

PART – B (50 Marks)

11.(a) Show that $[(p \vee q) \rightarrow r] \leftrightarrow [\rceil r \rightarrow \rceil (p \vee q)]$ is tautology. (5)

(b) Prove the following using the rule of Inference. (5)

$$\begin{array}{l} p \rightarrow (q \rightarrow r) \\ \rceil q \rightarrow \rceil p \\ p \\ \hline \therefore r \end{array}$$

12.(a) Prove that $1^2 + 2^2 + 3^2 + \ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{2}$ using mathematical induction. (6)

(b) $f : z \times z \rightarrow z$; by $f(a, b) = a + b - 3ab$. Verify the function f is commutative / Associative both. (4)

13.(a) Find the total number of Dearrangement for 1, 2, 3, 4, 5, 6? (4)

(b) Let A = {1, 2, 3, 4, 5,} x {1, 2, 3, 4, 5} and R is defined on A by $(x_1, y_1)\, R\, (x_2, y_2)$ if $x_1 + y_1 = x_2 + y_2$.
Verify that R is an equivalence Relation on A?

14.(a) Write and explain the properties of Abelian group. (5)

(b) Prove that $\langle Q^+, * \rangle$ where * is a binary operation defined by a * b = ab/5 is a group? (5)

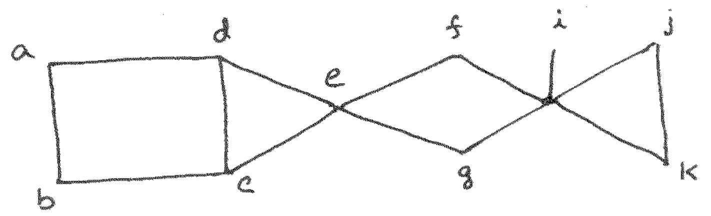
15.(a) Write a short note on group code and its Applications. (4)

(b) Solve the Recurrence Relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$ for $n \geq 2$ with initial conditions $a_0 = 10$; $a_1 = 41$.

16.(a) Find the co-efficient of x^{10} in $(1 - 4x)^{-3}$. (5)

(b) What is the chromatic number of a complete Bipatiate graph with 5 vertices in one partition and 3 vertices in another partition? (5)

17.(a) Draw and explain BFS and DFS algorithms for following graph. (5)



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Code No. : 5341/N

FACULTY OF ENGINEERING
B.E. 2/4 (CSE) I Semester (New) (Main) Examination, Dec. 2011
DISCRETE STRUCTURES

Time: 3 Hours] [Max. Marks: 75

***Note** : Answer **all** questions from Part **A**. Answer **any five** questions from Part **B**.*

PART – A **(25 Marks)**

1. Write the Logical equivalent to the following statement : 2

$\sim(p \wedge q) \rightarrow (\sim p \vee (\sim p \vee q))$

2. Define the rule of universal specialization ? Give one example. 2

3. Among 'n' pigeon holes, some pigeon holes should contain atleast 3 pigeons. Find the number of pigeons. 2

4. How many reflexive relations are there on a set with 8 elements. 2

5. Write a relation R, which should be a Bijective function on the given set A = {1, 2, 3, 4}. 2

6. What is an order of a group ? Explain with example. 3

7. What is the dearrangement for 1, 2, 3, 4, 5. 3

8. Write the solution for the recurrence relation 3

$a_n - 6_{a_{n-1}} + 9_{a_{n-2}} = 3^n$

9. Define wheel graph ? When a wheel graph with n-vertices becomes regular ? Give one example to support your answer. 3

10. What is graph traversible ? If V(G) = {A, B, C, D}; Determine the traversible Edgeset E(G) 3

Code No. : 5341/N

PART – B **(50 Marks)**

11. a) Show that $[(p \vee q) \rightarrow r] \leftrightarrow [\neg r \rightarrow \neg (p \vee q)]$ is tautology ? 5

b) Prove : $p \rightarrow (q \rightarrow r)$

$\neg p \rightarrow \neg p$

p

$\therefore r$

using rules of Inferences. 5

12. a) Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$. 4

b) Let $f : R \rightarrow R$, be defined by $f(x) = \begin{cases} 3x - 5; & x > 0 \\ -3x + 1; & x \leq 0 \end{cases}$, then

determine :

1) $f(-1)$, $f(5/3)$, and $f(-5/3)$

2) $f^{-1}(0)$, $f^{-1}(-6)$, $f^{-1}(1)$. 6

13. a) List and explain the properties of Binary relations with example. 4

b) Let $A = \{1, 2, 3, 4, 5\} \times \{1, 2, 3, 4, 5\}$ and R is defined on A by $(x_1, y_1)\ R\ (x_2, y_2)$ if $x_1 + y_1 = x_2 + y_2$; verify that R is an equivalence relation on A. 6

14. Prove that $F_n = F_{n-1} + F_{n-2}$ is the Fibonacci relation for $n \geq 2$, then there are constants c_1 and c_2 such that

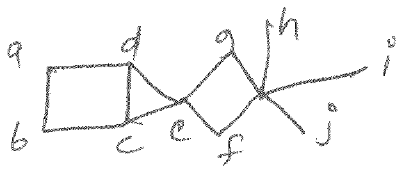
$$F_n = c_1 \left(\frac{1+\sqrt{5}}{2} \right)^n + c_2 \left(\frac{1-\sqrt{5}}{2} \right)^n$$ 10

15. a) Find the coefficient of x^{15} in $(1+x)^4/(1-x)^4$. 6

b) Write short note on group code and its applications. 4

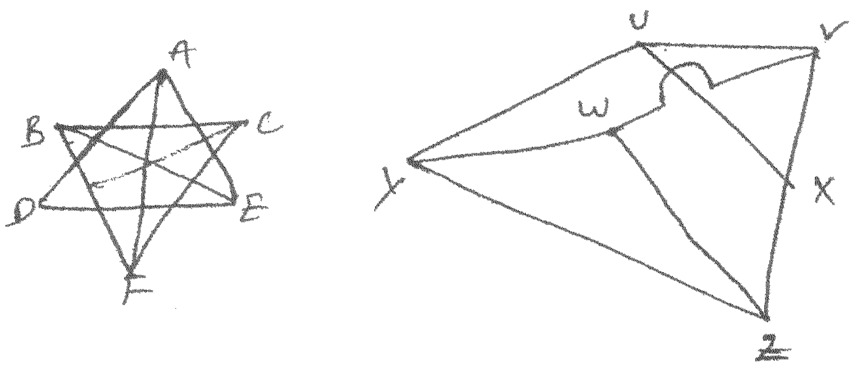
16. a) For the Algebraic system $\langle zm, * \rangle$, let $m = 3; m_1 = 2; m_2 = 3; m_3 = 5$. Find the number whose residue representation is $\langle 1,1,4 \rangle$ **5**

    b) Draw and explain the BFS and DFS algorithms for the following graph : **5**



17. a) What is isomorphic graph ? Explain various conditions for proving the given graphs is not isomorphic. **4**

    b) Check the following graphs are isomorphic or not. **6**



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Code No. : **5341/S**

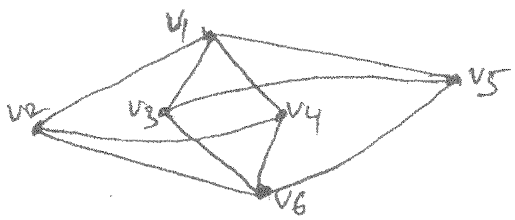
FACULTY OF ENGINEERING
B.E. 2/4 (CSE) I Semester (Suppl.) Examination, July 2012
DISCRETE STRUCTURES

Time : 3 Hours Max. Marks : 75

Note : *Answer **all** questions from Part – **A**. Answer **any five** questions from Part – **B**.*

PART – A **(25 Marks)**

1. Write the logical equivalent to the following statement. **2**
   $(p \vee q) \wedge (\sim p \wedge (\sim p \wedge q))$
2. Define the rule of universal generalization ? Give one example. **2**
3. Among 'n' pigeon holes, some pigeon holes contain atleast 3 pigeons. Determine the no. of pigeons ? **2**
4. Simplify the statement. $A \wedge (B - A)$ **2**
5. Write a relation R, which should be a function on the given set A = {1, 2, 3, 4, 5}. **2**
6. What is an order of a group ? Explain with example. **3**
7. Write the solution for recurrence relation $X_n = 2X_{n-1} - 1$ (n>1) with the condition $x_1 = 2$. **3**
8. Write solution for the Recurrence relation $a_n - 3a_{n-1} = n+2$. **3**
9. Define a wheel graph. A wheel graph has n + 1 vertices, then determine the edges. Give example to support your answer. **3**
10. What is chromatic number ? Determine the chromatic number X(G) for the given graph. **3**



Code No. : 5341/S

PART – B **(50 Marks)**

11. a) If p, q are primitive statement. Then prove that $(\neg p \vee q) \wedge (p \wedge (p \wedge q)) \Leftrightarrow p \wedge q$ using laws of logic. 5

b) Prove the following using rules of interference. 5

$\neg p \leftrightarrow q$

$p \leftrightarrow r$

$\neg r$

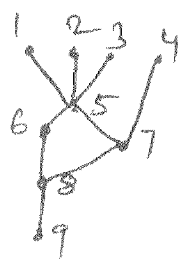
$\therefore p$

12. a) Prove that $1^2 + 2^2 + 3^2 + \ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$ using mathematical induction. 5

b) $f : z \times z \to z$; by $f(a, b) = a + b - 3ab$; verify the function f is Commutative/ Associative/both. 5

13. a) List and explain the properties of Binary relations with example. 5

b) Write the steps in topological sort algorithm ? Apply the algo, to the following graph to determine the totally order set ? 5



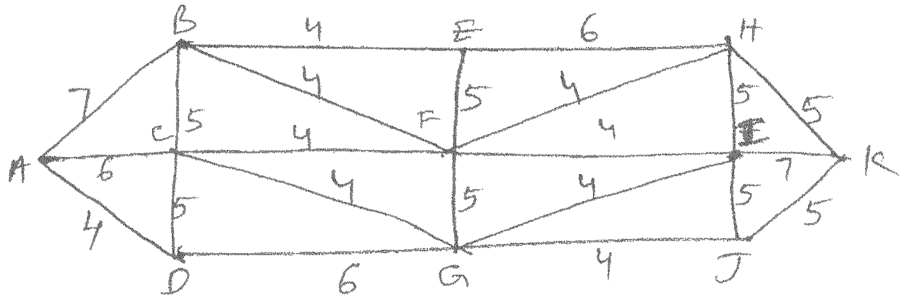
14. a) Write and explain the properties of algebraic system ? 4

b) Prove that $\langle Q^+, *)$ where $*$ is a binary operation defined by $a * b = ab/5$ is a group ? 6

15. Solve the Recurrence relation $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ for $n \geq 3$, $a_0 = 0$; $a_1 = 1$; $a_2 = 10$ using generating function method. **10**

16. a) What is minimal cost spanning tree ? Write the steps in Kruskal's Algo. in finding minimal cost spanning tree ? **5**

    b) Find the minimal cost spanning tree for the following graph using Kruskal's Algorithm. **5**



17. a) What is a complete balanced binary tree ? Give one example. **3**

    b) Define a complete binary tree and show that the total number of edges are 2(n – 1), where 'n' is the number of terminal vertices/nodes ? **7**

Code No. 11419 / CBCS

FACULTY OF ENGINEERING

B.E. (CSE) III - Semester (CBCS) (Main & Backlog) Examination,

November / December 2018

Subject : Discrete Mathematics

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

Note: Answer all questions from Part-A & any five questions from Part-B. **PART – A (20 Marks)**

1 Use truth table to verify the equivalence $p \vee (p \wedge q) \Leftrightarrow p$.
2 What is a tautology? Give an example.
3 Define a group.
4 When can we say that a function is invertible?
5 Let A={0,1,2} , B={a,b}. What is the Cartesian product of A and B?
6 Define a)Rooted tree b) Complete binary tree.
7 Define a minimum spanning tree.
8 Define an equivalence relation. Give an example.
9 Define isomorphic graphs.
10 Define in degree and out degree of a vertex in a graph.

PART – B (50 Marks)

11 a) Show that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent using truth table method. (5)

b) Show that $\sim(p \vee(\sim p \wedge q))$ and $\sim p \wedge \sim q$ are logically equivalent by developing a series of logical equivalences. (5)

12 a) Solve $a_n - 6a_{n-1} + 12a_{n-2} - 8a_{n-3} = 0$ by generating functions. (7)

b) Prove that for all integers n > = 4, $3^n >= n^3$. (3)

13 a) Find an explicit formula for the Fibonacci numbers. (5)

b) Find all the solutions of the recurrence relation $a_n=3a_{n-1}+2n$. What is the solution with $a_1 = 3$? (5)

14 a) Show that if a simple planar graph has no cycles of length 3 then |E| < = 2| V | - 4.(5)

b) Explain graph isomorphism with example. (5)

15 a) Explain BFS traversal of a graph with an example. (5)

b) Explain Kruskal's algorithm to find the minimal spanning tree of a graph with an example. (5)

16 a) G is a finite semigroup such that for each for each x $\in$ G, there exists a unique y, such that xyx = x. Prove that G is a group. (5)

b) Explain the procedure for constructing Euler Circuits. (5)

17 Write short notes on any two of the following: (5+5)

(a) Group Homomorphism
(b) Graph Coloring
(c) Partial Ordering and Hasse diagrams

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Code No. 11419 / CBCS/S

FACULTY OF ENGINEERING

B.E. (CSE) III - Semester (CBCS) (Suppl.) Examination,

May / June 2019

Subject : Discrete Mathematics

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

Note: Answer all questions from Part-A & any five questions from Part-B.

PART – A (20 Marks)

1 Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology using a series of logical equivalences?
2 State the pigeonhole principle.
3 What is a derangement?

4 Define converse and contra positive of an implication.
5 State the inclusion-exclusion principle.
6 Define a) Pendant vertex b)Hamilton Cycle
7 How many edges are there in a graph with 10 vertices of degree six?
8 Define chromatic number of a graph.

9 Define a) Semi group b) Monoid.
10 What do you mean by a minimal spanning tree?

PART – B (50 Marks)

11 a) Show that p v $(q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent without using truth table method. (5)

b) Construct truth table for the proposition $p \rightarrow q \rightarrow r \rightarrow s$. (5)

12 a) State and prove the fundamental theorem of arithmetic. (6)

b) Show that the premises “A student in this class has not read the book” and “Everyone in this class passed the first exam” imply the conclusion

“Someone who passed the first exam has not read the book”. (4)

13 a) Show that $f : R \rightarrow R$ given by $f(x) = 5x - 7$ is onto. (5)

b) Let $f : N \rightarrow R$ be a function defined by $f(x)=4x^2+12x+15$. Show that the function is invertible. (5)

14 a) Find the solution to the recurrence relation $a_n=-3a_{n-1} - 3a_{n-2} - a_{n-3}$ with initial conditions $a_0 = 1, a_1 = -2$ and $a_2 = -1$. (5)

b) Find all the solutions of the recurrence relation $a_n= 5a_{n-1} - 6a_{n-2} + 7^n$. (5)

15 a) Write the procedure for finding a minimum spanning tree of a graph using Prim’s algorithm. Explain with an example. (8)

b) Define Hamilton path in a graph. (2)

16 a) If N is a normal subgroup of G, show that xN = Nx for all x G. (5)

b) Show that a composition of homomorphisms is a ∈

17 Write short notes on any two of the following. (5+5)

a) Properties of algebraic system
b) Graph Coloring
c) Sub graph and complement of a graph with examples.

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Code No: 2036

FACULTY OF ENGINEERING

B.E 2/4 (CSE) I-Semester (Backlog) Examination, December 2019

Subject: Discrete Structures

Time: 3 Hours **Max. Marks: 75**

Note: Answer All Questions From Part-A, & Any Five Questions From Part-B**.**

Part – A (25Marks)

1 Define LATICE 3

2 Give an example for Symmetric and Anti Symmetric relation 3

3 Define semi groups with examples. 3

4 What is meant by universal quantifier 2

5 Define Algebraic structure 2

6 Define chromatic number 2

7 Difference between bipartite and complete bipartite graphs 3

8 Explain In Degree and Out Degree in diagraph 2

9 What is principle of duality? 2

10 What is first order linear homogeneous recurrence relation? 3

b) ^

Part – B (50Marks)

11 a) Define Tautology and verify that given statement is tautology 5

$(p \rightarrow q)\ (q \rightarrow r) \rightarrow (p \rightarrow r)$

Simplify pvqv(~p ~q r) 5

R

12. a) Consider the functions f and g defined by f(x)=x3, g(x)=x2+1, x 5

^ ^

Find gof, fog,f^2 and g^2. ∊

b) Prove that A∩(BUC)=(A∩B)U(A∩C) where A, B, C are non empty sets 5

$$\frac{(1-x^{35})^4}{(1-x)}$$

13.a) Find the coefficient of x^{96} in $\frac{(1-x^{35})^4}{(1-x)}$ 6

b) In how many ways can 4 letter in ENGINE be arranged? 4

14.a) Determine the coefficient of x^8 in $1/(x-3)(x-2)^2$ 4

b) Solve recurrence relation $F_n=3F_{n-1}+10F_{n-2}+7.5^n$ where $F_0=4$ and $F_1=3$ 6

15. a) What is an algebraic system? Write the properties of an algebraic system 5

Prove that (Q+, *) where * is a binary operation defined by a * b = ab/5

b) is a group. 5

16. Explain the Prims alogirthm with suitable example 10

17. Write short notes on: 10

(i) Hamiltonian Graph

(ii) Hasse Diagram

(iii) Homomorphism

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Code No. 453/CBCS/S

FACULTY OF ENGINEERING

B.E. 3/4 (CSE)(CBCS) II –Semester (Suppl.) Examination, May/June 2018

Subject: Discrete Mathematics

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

Note: Answer all questions from Part A & any five questions from Part B.

PART-A (20 Marks)

1. What is difference between identical and equivalent set?
2. Define division algorithm
3. What is pigeon-hole principle
4. Define equivalence relation
5. What is recurrence relation?
6. How to represent divide and conquer relation?
7. Define group oid
8. Write about homomorphism
9. What is chromatic number?
10. Define a spanning tree

PART-B (50 Marks)

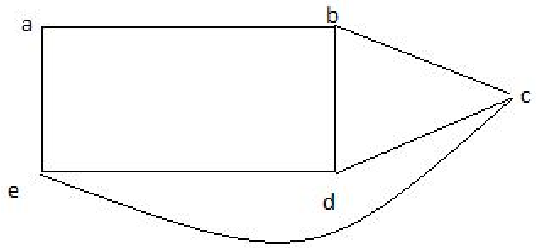
11. a) Construct truth table for (p <-> q) <-> (r <-> s) (5M)
    b) Prove that $(A \cap B)' = A' \cup B'$ (5M)

12. a) If f(x)=x+2 g(x)=x-2 h(x)=3x find fog, gof, fof, gog, hog, hof, fog oh (5M)
    b) How many bit strings of length 8 either start with 1 bit or end with two bits 00? (5M)

13. a) In how many different ways can 8 identical cookies can be distributed among 3 children if each child recieves atlest 2 cookies and no more that 4 cookies? (5M)
    b) Solve recurrence relation $a_n=2a_{n-1}+n.3^n$ with $a_0=1$ (5M)

14. a) Explain concept of prim's algorithm with an example (5M)
    b) Prove that we can't have an odd number of vertices for a graph with odd degree (5M)

15. Determine all 6 possible spanning trees of the graph (10M)



16. Discuss DFS and BFS with examples (5+5M)

17. Write short notes on
    a) Group codes and their applications (5M)
    b) Semi-groups (5M)

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CODE NO: 52

FACULTY OF ENGINEERING

B.E 2/4 (CSE) I-semester (Backlog) EXAMINATION, May / June 2018

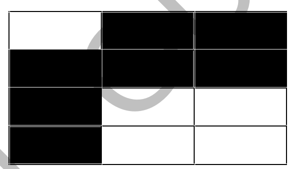
Subject: Discrete Structures

Time: 3 Hours **Max. Marks : 75**

Note: Answer All Questions From Part-A, & Any Five Questions From Part-B**.**

Part-A (25Marks)

1. Write logical equivalence to (pvqvr) ∧ (pvtv~q) ∧(pv~tvr) 3
2. Define the Rule of Universal Generalization 2
3. Define Tautology and Contradiction 2
4. Find the co-efficient of x^5 in $1/(1-2x)^8$ 3
5. Define POSET 3
6. Define groups and monoids with examples. 3
7. Define Graph coloring 2
8. What is complete bipartite graph 2
9. Find the rook polynomial for shaded board? 3



10. What is Monoid Homomorphism? 2

Part-B (50Marks)

11. (a)Show that from set of premesis 6
    (i) P→q
    (ii) q→ (r∧s)
    (iii) ~rv(~tvu)
    (iv) p∧t
    The conclusion is "u".

    (b) Construct the truth table for (p∧(p->q))->q 4

12. (a) Explain about glb,lub and Lattice 4

    (b) A = {2, 3, 6, 12, 24, 36, 72} R: {(x,y) / x,y ε A, x divides y} write the partial order and draw the hasse diagram for R and compute lower bounds, upper bounds, greatest lower bound, least upper bound for {2,12, 24}. 6

13. (a) Find the coefficient of x^{12} in $(1-x^6)^4/(1-x)^4$ 6
    (b) Explain about generating functions 4

14. Solve recurrence relation $a_{n+2}-4a_{n+1}+3a_n=-200, n>=0, a_0=3000, a_1=3300$. 10

15. (a) What is Isomorphic graphs? Explain various conditions for proving the given groups are isomorphic. 5

(b) Explain about minimum spanning trees with example? 5

16. Explain Ring and Cosets with suitable example? 10

17. Write short notes on : 10
   (i) Groups
   (ii) Recurrence relation
   (iii) Cartesian product

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Code No. 453/CBCS

FACULTY OF ENGINEERING

B.E. (CSE) III - Semester (CBCS) (Main) Examination, December 2017
Subject: Discrete Mathematics

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

Note: Answer all questions from Part A and any five questions from Part B.

PART-A (20 Marks)

1. Write truth table for $p \leftrightarrow q$
2. What is well-ordering principle?
3. Define inclusion-exclusion principle.
4. What is derangement?
5. Write general form of linear homogenous recurrence relation
6. What is generating function?
7. What is monoid?
8. Define group.
9. Define isomorphism.
10. What is minimum spanning tree?

PART-B (50 Marks)

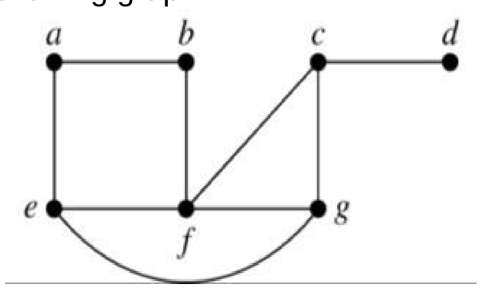
11.a) Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ by using membership table method (5M)
b) Prove that $\sim(p \vee q) \leftrightarrow (\sim p) \wedge (\sim q)$ are logically equivalent (5M)

12. a) How many derangements are possible with 4 objects? (5M)
b) If $f(x)= e^x$, $g(x)=$ sinx then find fof(x), fog(x),gof(x),gog(x) (5M)

13. a) Solve recurrence relation $a_n=5a_{n-1} - 6a_{n-2}$ with $a_0=1$, $a_1=1$, $n \geq 2$ (5M)
b) Find number of solutions of e1+e2+e3=17 where e1,e2,e3 are non-negative integers

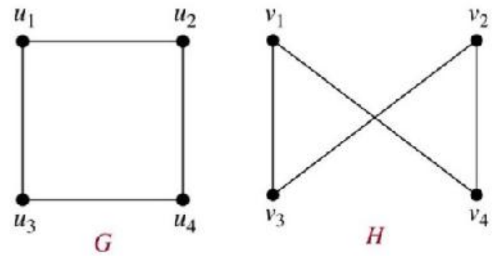
with 2<=e1<=5, 3<=e2<=6, 4<=e3<=7 (5M)

14.a) Find spanning tree of following graph (8M)



b) Define complete graph with an example (2M)

15.a) Show that graphs G & H are isomorphic (8M)



b) What is hamilton circuit? (2M)

16. Write short notes on
 a) Semi-groups (5M)
 b) Homomorphism (5M)

17.a) Explain kruskal's algorithm with an example (6M)
 b) Discuss about general properties of algebraic system (4M)

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Code No. 52

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I – Semester (Backlog) Examination, December 2017
Subject: Discrete Structures

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (25 Marks)

1 Define the law of duality. Obtain the dual for $(P \cap -Q) \cap (R \rightarrow Q)$. 3

2 Convert “All apples are not red” to a symbolic form. 2

3 Find the no. of derangements for 1,2,3,4. List all derangements of 1,2,3,4. 3

4 In how many ways can four letters of alphabets “BETTER” be arranged? 2

5 Find the co-efficient of x^{15} in $(x^3+x^4+x^5+\ldots.)^5$. 3

6 Find a sequence for the generating function $1/(1-2X)^n$. 2

7 Define lattice. Give an example. 3

8 What is semi group homomorphism? 2

9 What is a Hamiltonian graph? Give an example. 3

10 Find the degree of a complete graph (k_4). 2

PART – B (5x10 = 50 Marks)

11 a) Show the validity of the statement 5

$(\sim p \vee q) \rightarrow r$
$r \rightarrow (s \vee t)$
$\sim s \wedge \sim u$
$\sim u \rightarrow \sim t$
$\therefore p$

b) Prove that for any propositions p, q, r the compound statement 5

$[(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow [p \rightarrow r]$ is a tautology.

12 Let f: $R \rightarrow R$ be defined by 10

$f(x) = 3x-5, x > 0$

$= -3x+1, x <= 0$

i) Determine f(0), f(-1), f(5/3) and f(-5/3)

ii) Determine $f^{1}(0)$, $f^{1}(3)$, $f^{1}(-6)$, $f^{1}[-5,5]$

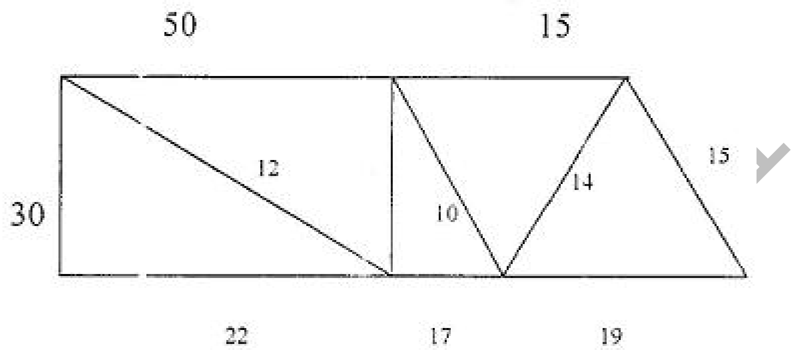
13 Solve the recurrence relation $T(k) - 7T(k-1) + 10T(k-2) = k^2+1$ and $T(0)=4$, $T(1)=17$? 10

14 If $<G,*>$ is an Abelian group then prove that $(a*b)^n = a^n*b^n$ for all $n \in N$. 10

…2

Code No. 52

15 Explain and apply Prim's algorithm for the figure given below and find minimal cost. 10



16 a) Find the rook polynomial for shaded board. 5

b) For any n ϵ Z+, prove that the integers 8n +3 and 5n+2 are relatively prime. 5

17 a) Prove the following statement by using mathematical induction. 5

$1^2 + 3^2 + 5^2 + \ldots\ldots (2n-1)^2 = (n)(2n-1)(2n+1)/3.$

b) If <G,∗> is an abelian group then prove that $(a*b)^n = a^n * b^n$ for all n ϵ N. 5

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Code No. 5233 / O

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I-Semester (Old) Examination, May / June 2012

Subject : Discrete Structures

Time : 3 Hours **Max. Marks: 75**

Note: *Answer **all** questions of Part - A and answer any **five** questions from Part-B.*

PART – A (25 Marks)

1. P : you have the flee, q : you pass the course, Translate 7p→q into an english statement. (3)
2. Define the rule of universal Generalization? Give one example. (2)
3. What is partial order Relation? (2)
4. Let f: R→R and g:R→R where $f(x)=x^2$, g(x)=x+5 show that fog ≠ gof. (3)
5. $a_n^2+(a_{n-1})^2 = -1$. Is it linear homogeneous Recurrence Relation? Given reason. (2)
6. What is Fibonacci Recurrence Relation? Give one example. (3)
7. What is an order of a group? Give one example. (2)
8. Define a Ring and Ring Homomorphism. (3)
9. What is a Rooted Tree? Give example. (2)
10. What is Height Balanced Binary Tree? Give one example. (3)

PART – B (5x10=50 Marks)

11.(a) Show that $(P\to Q)\wedge(R\to Q)\Leftrightarrow(P\vee R)\to Q$ (4)

(b) Prove by indirect method that (7Q), $P\to Q$, $P\vee R \Rightarrow R$ (6)

12.(a) Let f : R → R , be defined by f(x) = $\begin{cases} 3x-5; & x>0 \\ -3x+1; & x\le 0 \end{cases}$ then determine

(i) f(-1), f(5/3) and f(-5/3) (ii) $f^{-1}(0)$, $f^{-1}(-6)$, $f^{-1}(1)$ (5)

(b) State and prove principle of inclusion and exclusion. (5)

13.(a) Solve the Recurrence Relation $2a_{n+3}=a_{n+2}+2a_{n+1}-a_n$, n ≥0 and $a_0=0$, $a_1=1$, $a_2=2$. (6)

(b) Write Derangement for 1, 2, 3, 4. (4)

14.(a) Show that a complete Bipartite Graph $K_{m,n}$ is planar when m ≤ 2 and n ≤ 2. (5)

(b) Let G(V, E) be a Directed graph then prove that $\Sigma\deg^-(v)=\Sigma\deg+_{(v)}=|E|$ (5)

15.(a) Show that if a, b are any two elements of a Group G then $(ab)^2 = a^2.b^2$ iff G is abelian? (6)

(b) What is algebraic system? Explain its properties. (4)

16.(a) What is complete Balanced Binary Tree? Give one example. (4)

(b) Define a complete Binary Tree and show that the Total number of Edges is given by 2(n-1) where n is the number of Terminal Nodes. (6)

17. Write short notes on:

(a) Rook polynomial (3)

(b) Group code and its applications (3)

(c) Characteristic Root method for solving Non Homogeneous Recurrence Relation. (4)

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Code No. 2026

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I – Semester (Suppl.) Examination, June 2013

Subject: Discrete Structures

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

1. Prove that B-A is a subset of $\bar{A}$.
2. Show that 7(P $\wedge$ Q) follows from 7P $\wedge$ 7Q.
3. Any relation which is irreflexive and symmetric cannot be transitive strengthen the above statement with the help of an example.
4. From a group of 10 professors how many ways can a committee of 5 members be formed so that at least one of professor A and professor B will be included [solve by using principle of inclusion and exclusion].
5. Find the generating function for the number of ɤ-combinations of {3.a, 5.b, 2.c}.
6. Find a recurrence relation for the number of ways to arrange flags on a flagpole n feet tall using U types of flags: red flags 2 feet high, or white, blue and yellow flags each 1 foot high.
7. Define Abelian group.
8. Define Hamming distance.
9. Define bipartite graph.
10. Prove that if G is a connected graph then $|E| \geq |V| - 1$.

PART – B (50 Marks)

11.(a) If $H_1, H_2, \ldots H_m$ and P imply Q, then $H_1, H_2, \ldots H_m$ imply P→Q. Prove this statement. (5)

(b) Obtain principle disjunctive normal form of 7P $\vee$ Q. (5)

12. Prove that the relation "congruence modulo m" given by

$\equiv = \{\langle x, y\rangle \mid x - y \text{ is divisible by } m\}$ over the set of positive integers is an equivalence relation. Show also that if $x_1 \equiv y_1$ and $x_2 \equiv y_2$, then $(x_1+x_2) \equiv (y_1+y_2)$.

13. How many functions are there from x to y for the sets given below? Find also the number of functions which are one-to-one, onto one-to-one onto.

x = {1, 2, 3, 4}

y = {a, b, c, d, e}

14. Show that a binary code can detect all combinations of k+1 to q errors where $k \leq q$ and correct all combinations of k or fewer errors if and only if this code has at least k+q+1 as its minimum distance.

15.(a) Calculate the co-efficient of X^{15} in $A(X) = (X^2 + X^3 + X^4 + X^5)(X + X^2 + X^3 + X^4 + X^5 + X^6 + X^7 (1 + X + \ldots + X^{15})$.

(b) Describe and analyze merge sort algorithm and write recurrence relation for merge sort algorithm.

16. State and prove Grinberg theorem.

17. Write short notes on any two.

(a) Chromatic number

(b) Euler's formula

(c) Fundamental theorem of arithmetic.

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Code No. 6026

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I – Semester (Main) Examination, November 2013

Subject : Discrete Structures

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. Construct truth table for the compound statement. 2

   $q \leftrightarrow (\neg p \vee \neg q)$; where p,q are the primitive statement

2. Negate and simplify the compound statement : $P \rightarrow (\neg q \wedge r)$. 3

3. Determine all of the elements in $\{n+(1/n) \mid n \in \{1,2,3,5,7\}\}$. 3

4. Let A, B $\in R^2$ where A = {(x, y)/y = 2x + 1}, B = {(x, y)/y = 3x}. Determine $A \cap B$. 2

5. Write and explain the properties of Binary Relation. 3

6. If $|A| = n \geq 1$. How many different relations on A are irreflexive? How many are neither reflexive nor irreflexive. 3

7. Find the general solution for the recurrence relation. 2

   $3a_{n+1} - 4a_n = 0, n \geq 1, a_1 = 5$.

8. Define algebraic system. Write its properties. 3

9. What is subgroup homomorphism? Give its equation. 2

10. What is chromatic number? Find the chromatic number for the following graph (G). 2

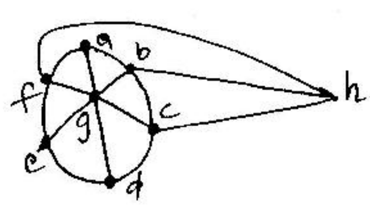


fig.

PART – B (50 Marks)

11.a) Establish the validity for the following arguments. 5

$P \rightarrow (q \rightarrow r)$
PVS
$t \rightarrow q$
7s
$\therefore 7r \rightarrow 7t$

b) Prove $\overline{A \Delta B} = \overline{(AUB) \cap \overline{(A \cap B)}}$, where A, B are finite sets. 5

12.a) Let f, g : R → R, where $g(x) = 1 - x + x^2$ and $f(x) = ax + b$. If (gof) (x) = $9x^2 - 9x + 3$, determine a, b. 5

b) Determine the number of positive interms n, $1 \leq n \leq 2000$, that are not divisible by 2,3,5 or 7. 5

13.a) Determine the sequence generated by the following generating function : $f(x) = x^4 / (1 - x)$. 4

b) Find the co-efficient of x^{50} in $(x^7 + x^8 + x^9 + ...)^6$. 6

14. Solve the recurrence relation :

$a_n^2 - 2_{an-1} = 0$ $n \geq 1$, $a_0 = 2$ (Let a = $\log_2 an$, $n \geq 0$). 10

15.a) Prove that (Q+, ⋆) where ⋆ is binary operator defined by a ⋆ b = a b/5 is a group. 5

b) List and explain the applications of group codes with suitable example. 5

16.a) Find the dual for the following planar graph. 5

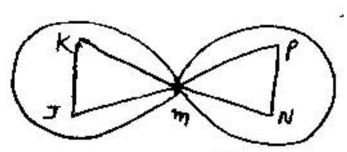
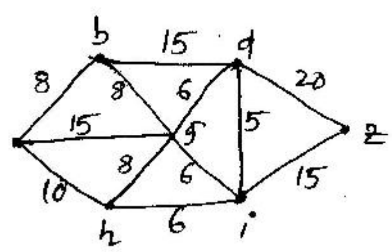


fig.

b) Let G be a cycle on n vertices. Prove that G is self complementary iff n = 5. 5

17. Write the Kruskals algorithm. Apply this algorithm for finding the minimal cost spanning tree for the following graph. 10



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Code No. 6026 / S

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I- Semester (Suppl.) Examination, July 2014

Subject : Discrete Structure

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1 State Demorgan's law.
2 Write the logical equivalence to pV(7PΛq)→(pΛq)
3 List the properties of Pigeon hole principle
4 Given set p ={1, 2, 3, …….7}. How many symmetric relations are there on p.
5 Define surjective function. Write a surjective relation in for given set A={1,2,3,4,5}
6 Define semigroup and monoid.
7 What is non homogeneous recurrence relation? Give one example.
8 Write the properties of algebraic system.
9 Solve the Recurrence Relation $a_n - 13a_{n-1} + 42\, a_{n-2} = 2^n$
10 Find chromatic Number of a Bipartiate graph.

PART – B (50 Marks)

11 (a) Define Tautology. Verify [7r →7(pvq)⇄ [(pvq)→r is Tautology or not.
   (b) Show that p ⊕q is equivalent to (p Λ7q) v(7p Λq)

12 (a) Prove that A∪(B∪C) = (A∪B) ∪(A∪C)
   (b) The function f : R → R defined as $f(x) = \begin{cases} 3x-5; & x>0 \\ -3x+1; & x \le 0 \end{cases}$ Then determine
   (i) f(-1), f(2/3), and f(-2/3) (ii) $f^{-1}(0)$, $f^{-1}(-6)$, $f^{-1}(1)$

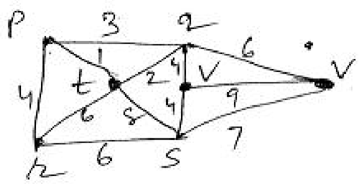
13 (a) List and explain the properties of Binary relations with example.
   (b) State and explain the principle of inclusion and exclusion.

14 (a) Solve the recurrence relation
   $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ for $n \ge 3$ where $a_o=0;\ a_1=1;\ a_2=10$
   (b) Solve the RR $a_r = 3a_{r-1} + 2;\ r \ge 1,\ a_o=1$

15 (a) Find the coefficient of x^{15} in $\dfrac{(1-x)^4}{(1+x^4)}$
   (b) Write short note on Group code and its applications.

16 (a) Prove that <Q+, * > is an algebraic system and * is a binary operator on Q+ is defined by $a * b = \dfrac{a.b}{5}$ is a group.
   (b) Define Hamitanian graph write the basic rules for constructing this graph.

17 (a) Define minimal cost spanning Tree. Use Kruskal's algorithm to determine the minimal cost spanning Tree for the following graph.



   (b) Define chromatic number. Find the chromatic number for the graph above Question (i.e.17(a)).

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Code No. 9033 / S

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I - Semester (Supplementary) Examination, June / July 2015

Subject : Discrete Structures

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 Compute the possible derangements of 1, 2, 3, 4. 3

2 Construct truth table for $(\neg p \vee \neg q \vee \neg r) \wedge (\neg p \vee r)$. 3

3 Define function. What are the different types of function? 2

4 Find the co-efficient of x^5 in $\dfrac{1}{(1-2x)^7}$. 3

5 Define semi groups and monoids with examples. 2

6 Define isomorphism between two graphs. 2

7 What is principle of duality? 2

8 Compute Hamilton distance between x, y for x = (1,0,0,1) and y = (0,1,0,0). 3

9 Find the generating function $P_d(n)$ where P_d is number of partitions of a positive integer n into distinct summands. 3

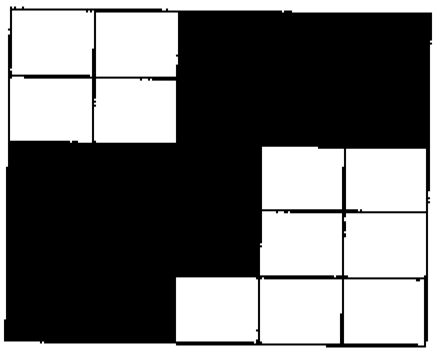
10 What is the Chromatic number of a cycle graph? 2

PART – B (5 x 10 = 50 Marks)

11 a) Justify $\neg p$ is a valid conclusion from $p \to r, r \to s, t \vee \neg s, \neg t \vee u, \neg u$. 6

b) State the principle of inclusion and exclusion and give the generalization of the principle. 4

12 a) Find the rook polynomial for the given chess board. 5



b) f(x) = 3x + 5 where x > 0 and = -3x + 1 x ≤ o then compute f(2), f(-1), $f^{-1}(0), f^{-1}(-1), f^{-1}(6)$. 5

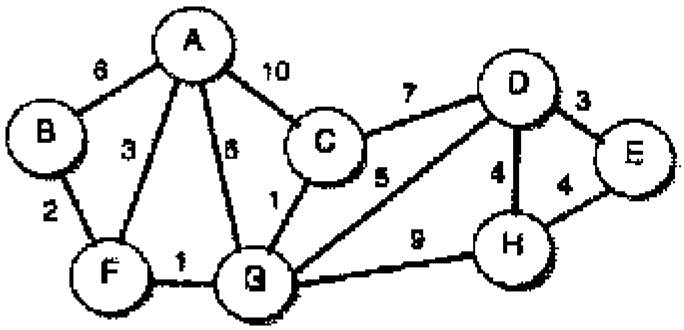
13 a) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$, $n \geq 2$ and $a_0 = 5$, $a_1 = 12$. 6

b) Find the generating function for the series 0, 2, 6, 12 ……… 4

14 a) What is an algebraic system? Write the properties of an algebraic system. 4

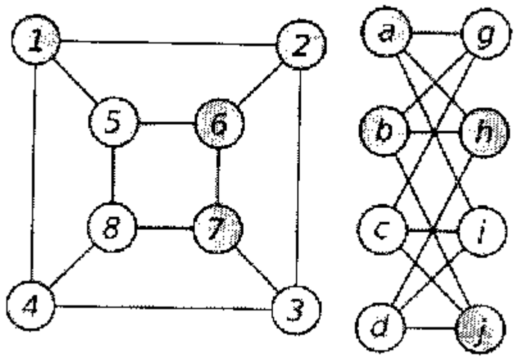
b) Prove that $(Q^+, *)$ where $*$ is a binary operation defined by a $*$ b = ab / 5 is a group. 6

15 Explain Prim's algorithm and find the minimal spanning tree for the following using Prim's algorithm. 10



16 a) In how many ways can the 26 letters of the alphabet be permuted so that none of patterns car, dog, pun or byte occurs. 5

b) Show that following graphs are isomorphic. 5



17 Write short notes on : 10

a) Exponential generating functions

b) Equivalence relations

c) Group codes

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Code No. 5041 / O

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I – Semester (Old) Examination, December 2015

Subject: Discrete Structures

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

1 Simplify $\overline{(A \cup B) \cap C \cup B}$ 3

2 Define relative primes with an example 2

3 Give the properties of relations 2

4 How many integer solution are there for the equation C1+C2+C3+C4 = 25 if $0 \le C_i$; $1 \le i \le 4$? 3

5 Define group homomorphism. 2

6 What is the principle of duality? Write the dual of $\neg p \vee \neg q \wedge T_o$. 3

7 Define Hamiltonian graph. 2

8 Define bipartite and complete bipartite graphs with examples. 3

9 Find the generating function $P_d(n)$ where P_d is number of partitions of a positive integer n into distinct summands. 3

10 Write Eulers' formula for planar graphs. 2

PART – B (50 Marks)

11 a) Justify $q \rightarrow p$ is a valid conclusion from $u \rightarrow r$, $(r \wedge s) \rightarrow (p \vee t)$, $q \rightarrow (u \wedge s)$, $\neg t$ using conditional proof. 6

b) What is an equivalence relation and what are equivalence classes? Give an example. 4

12 a) A = {2, 3, 6, 12, 24, 36, 72} R: {(x,y) / x,y ϵ A, x divides y} write the partial order and draw the hasse diagram for R and compute lower bounds, upper bounds, greatest lower bound, least upper bound for {2,12, 24}. 6

b) If $f: A \rightarrow B$, $g: B \rightarrow C$ are two bijectives, then show that $g \circ f: A \rightarrow C$ is also bijective. 4

13 a) Solve the recurrence relation $a_{n+2} - 8a_{n+1} + 16a_n = 8.5\, n^2 + 6.4\, n$, where $n \ge 0$ and $a_o = 12$, $a_1 = 5$. 6

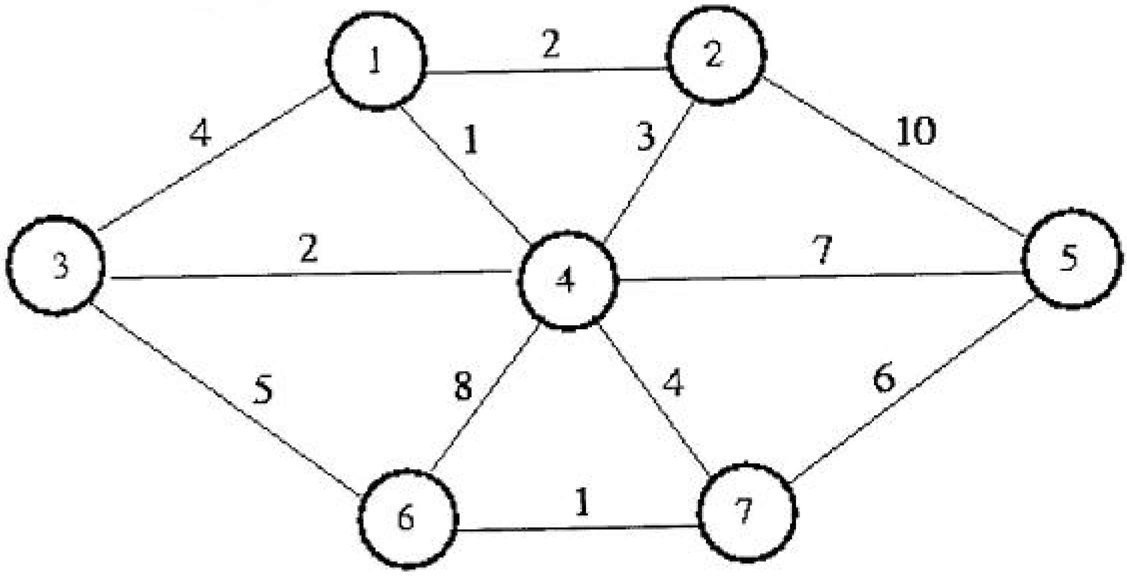
b) Find coefficient of x^{15} in the series $\frac{x^8}{(1-x)^2}$. 4

14 a) Prove every element in a group is its own inverse, then the group is abelian group. 6

b) What is an algebraic system? Write properties of $(Q^+, *)$ where $*$ is a binary operation defined by $a*b = a+b-5ab$. 4

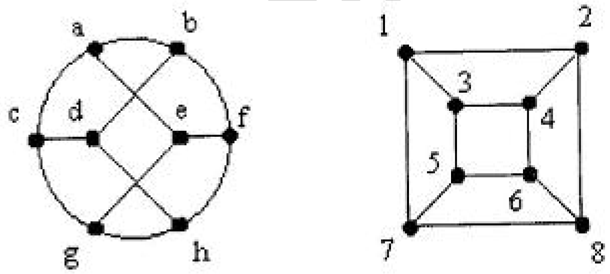
…2.

15 Explain Kruskal's algorithm and find the minimal spanning tree for the following using Kruskal's algorithm. 10



16 a) How many numbers from 1 to 100 are not divisible by 2, 3, 5? 4

b) Show that following graphs are isomorphiscs. 6



17 Write short notes on: 10

a) Summation operator

b) Graph coloring

c) Group codes and their applications

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Code No. 5074 / N

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I – Semester (New) (Main) Examination, December 2015

Subject : Discrete Structures

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Compute the possible derangements of 1, 2, 3, 4, 5. (2)

2 Construct the truth table for ((~ p ∧ ~ ɤ) ∧ ~ q) → ~ p. (3)

3 Define Relation. (2)

4 What is meant by Universal quantifier? (2)

5 Define Equivalence Relation with an example. (3)

6 What do you mean by generating function with an example? (3)

7 Discuss Algebraic structure. (2)

8 What is Bipartite graph K_{mn}. (3)

9 Define and draw dual of a graph. (3)

10 What is chromatic value of wheel graph? (2)

PART – B (50 Marks)

11 (a) Justify p is a valid conclusion from (~p∨~q) →(r∧s), r → t, ~t. (6)

(b) Simplify the expression $\overline{\overline{(AUB)\cap C} \cup \overline{B}}$. (4)

12 (a) State Pigeonhole principle. (2)

(b) Larry returns from the laundraomat with 12 pairs of socks (each pair with different color) in a laundry bag. Drawing the socks from the bag randomly, he'll have to draw almost how many of them to get a matched pair. (2)

(b) IF A = {1, 2, 3, 4}, give an example of a relation R on A that is (6)

(i) Reflexive and symmetric but not transitive

(ii) Reflexive and transitive but not symmetric

(iii) Symmetric and transitive but not reflexive.

13 (a) Determine the coefficient of x^8 in $\frac{1}{(x-3)(x-2)^2}$. (5)

(b) Solve the recurrence relation

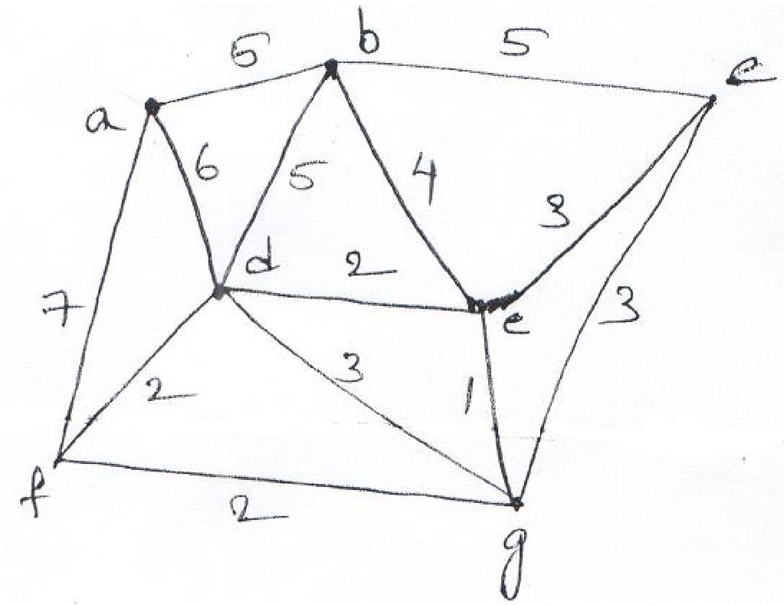
$a_n = 2(a_{n-1} - a_{n-2})$ where $n \geq 2$ and $a_o = 1$, $a_1=2$. (5)

14 (a) What is Group? Define Abelian group, along with properties of algebraic system. (5)

(b) Let ({a, b}, *) be a semigroup where a * a = b show that

(i) a * b = b * a (ii) b * b = a. (5)

15 Explain Kruskals algorithm and find the minimal spanning tree for the following using Krushkals algorithm. (10)



16 (a) Determine the number of positive integers n where $1 \leq n \leq 100$ and n is not divisible by 2, 3, or 5 Here S = {1, 2, 3, ….100} and N = 100 for $n \in S$, n satisfies (6)
(i) condition C_1 if n is divisible by 2
(ii) condition C_2 if n is divisible by 3
(iii) condition C_3 if n is divisible by 5
(b) State the principle of inclusion and exclusion and give the generalization of the principle. (4)

17 Write short notes on the following: (10)
(a) POSET
(b) Hamilton path
(c) Partition of Integers

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Code No. 3035/S

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I - Semester (Suppl.) Examination, May / June 2017

Subject : Discrete Structures

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Convert *All Apple are not red" to a symbolic form. (2)

2 Show that $(A \cap B) \cup C = (A \cup C) \cap (B \cup C)$ using Laws of Set theory. (3)

3 Give an example of a relation which is neither reflexive nor irreflexive for a set given as A = [1, 2, 3]. (3)

4 What is a Surjective Function? Give an example. (2)

5 Find the co-efficient of x^{15} in $(x^3 + x^4 + x^5 + \ldots\ldots\ldots\ldots\ldots)^5$. (3)

6 Find a sequence for the generating function $1/(1-4x)^n$. (2)

7 What is a Coset leader? Give an example. (3)

8 Define Monoid Homomorphism. (2)

9 Find the degree of K_3. (2)

10 Differentiate Sub graph and Spanning graph. (3)

PART – B (50 Marks)

11 (a) Prove the following statement by using mathematical induction.

$1^2+3^2+5^2+\ldots..+(2n-1)^2=(n)(2n-1)(2n+1)/3$

(b) Show that the inference is valid for the given set of premises.

P1 : All integers are rotational numbers.

P2 : Some integers are power of 3

C : Therefore, some rational numbers are power of 3

12 Given S = {1….10} and a relation R on S where

R = {< x, y> | x + y = 10} . What are the properties of the relation R?

13 Solve D(k) – 8D (k - 1)+16D(k – 2)=0 where D(2) = 16, D(3) = 80?

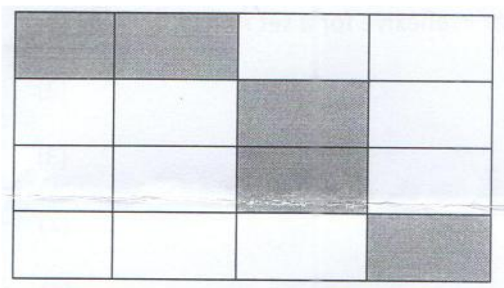
14 (a) Prove that <Q+, *> where * is a binary operation defined by a * b=ab/5 is a Group.

(b) Show that the intersection of two congruence relation is a congruence relation.

15 Use Grinberg's theorem to show that Paterson Graph does not have a Hamiltonian Cycle.

16 (a) Show that Bipartite graph is Bi colorable.

(b) Find the rook polynomial for the shaded board?



17 Write short notes on the following:

(a) For moduli $m_1=8$, $m_2=3$, $m_3=5$, find the number whose residue representation is <4, 2, 3> without the use of mixed based arithmetic's.

(b) Obtain Recurrence relation for the closed form

$A(K)=K^2-K$

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Code No.11035/BL

FACULTY OF ENGINEERING

B.E 2/4 (CSE) I-Semester (Baklog) Examination, May / June 2018

Subject: Discrete Structures

Time: 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part- B.

PART-A (25 Marks)

1. Express $P \rightarrow Q$ using ↑ and ↓ only . 2
2. Define the Rule of Universal Specification? Give one Example. 2
3. If A = {1, 2, 3, 4} and R,S are relation on A defined by
   S = {(1,2)(1,3)(2,4)(4,4)}, S = {(1,1)(1,2)(1,3)(2,3)(2,4)} Find SOR, R^2 and S^2. 3
4. What is Derangement? 2
5. Find the coefficient of x^5 in $(1-2x)^{-7}$. 3
6. Solve the Recurrence relation $F_{n+2} = F_{n+1}+F_n$ where $n \geq 0$ and $f_o = 0$; $f_1 = 1$. 3
7. Explain about Algebraic System. 2
8. Explain about Isomorphism. 2
9. Explain Hamiltonian cycle with example. 3
10. What is Graph Traversing? Give one example for agraph G, where V(G)=
    {A,B,C,D} 3

PART-B (50 Marks)

11 a) If p, q are Primitive statement. Then Prove that $P \leftrightarrow Q \equiv \neg (P \quad Q) \vee (P \quad Q)$ using Laws of Logic 5

b) In a Group of 1000 people there are 750 who speak Hindi and 400 who can speak Bengali. How many can speak Hindi only? How many can speak Bengali only? 5

12. Let f: $R \rightarrow R$ be defined by

$f(x) = 3x-5, x > 0,$

$= -3x+1, x <= 0$ 10

(i) Determine f(0),f(-1),f(5/3), & f(-5/3).

(ii) Determine $f^{-1}(0)$, $f^{1}(3)$, $f^{1}(-6)$, & $f^{1}(-5,5)$.

13. a) List and Explain the properties of Binary relation with example? 5

b) State and Explain the Principle of inclusion and Exclusion. 5

14. Solve the Non Homogeneous Recurrence Relation. 10

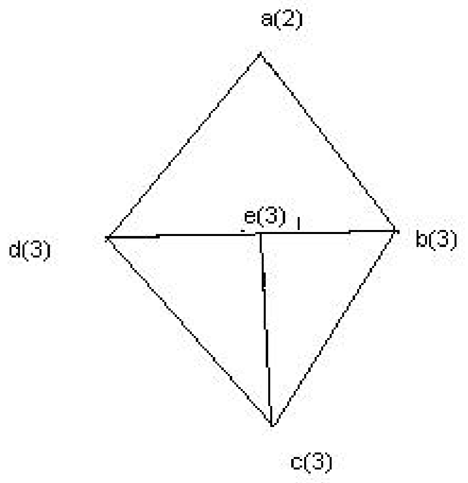
$T(k)-7T(k-1)+10T(k-2)=k^2+1$ & T(0)=4,T(1)=17.

15. a) Write and Explain the properties of Abelian Group. 5

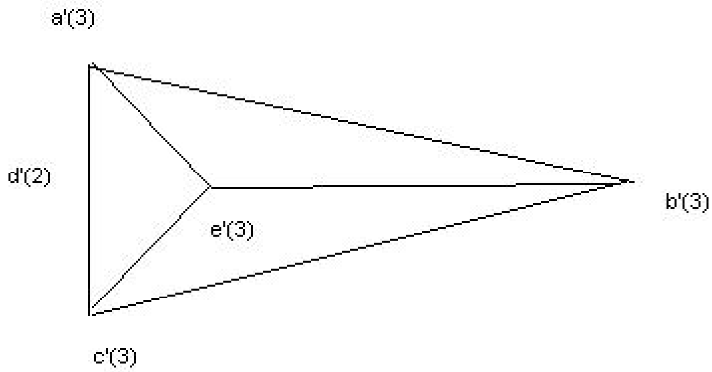
b) Prove that $<Q^+,*>$ where * is a binary operation defined by a*b = ab/5 is a group. 5

…2

16. Determine whether the following graphs are Isomorphic. 10



(a) Graph (G)



(b) Graph(G')

17 a) Explain about Homomorphism. 5

b) Write a short note on

(i) Minimum Spanning Tree 5

(ii) Equivalence Relation

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Code No. 3035

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I – Semester (New) (Main) Examination, December 2016

Subject: Discrete Structures

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

1 Obtain contra positive and inverse for the statement. It it is dark then it is night. 2

2 Show the implication P, $(P \rightarrow Q) \Rightarrow Q$ 3

3 Let f be the function from {a, b, c, d} to {1, 2, 3, 4} with f(a) = 4, f(b) = 2, f(c) = 1 and f(d) = 3. Is f a bijective function? How. 3

4 Give an example for antisymmetric relation. 2

5 Generate the sequence for the recurrence relation $a_n = a_{n-1} + 1$, n 1 where $a_o = 3$. 3

6 Find the co-efficient of x^5 in $(1-2x)^{-7}$. 2

7 Obtain a multiplication table for a monoid using binary operation $*$ on set A = {a, b}. 3

8 Define monoid and semi group. 2

9 Find the chromatic number of a wheel graph. 2

10 Draw a complement of complete bipartite graph $K_{3,3}$. 3

PART – B (5x10 = 50 Marks)

11 Show that from the set of premises

a) $(\exists x)(F(x) \cap S(x)) \rightarrow (\forall y)(M(y) \rightarrow W(y))$

b) $(\exists y)(M(y) \cap \neg W(y))$

The conclusion is $(\forall x)(F(x) \rightarrow \neg S(x))$

12 Determine the number of positive integer n, 1 n 1000 that are non divisible by 3,5,7 but are divisible by 9.

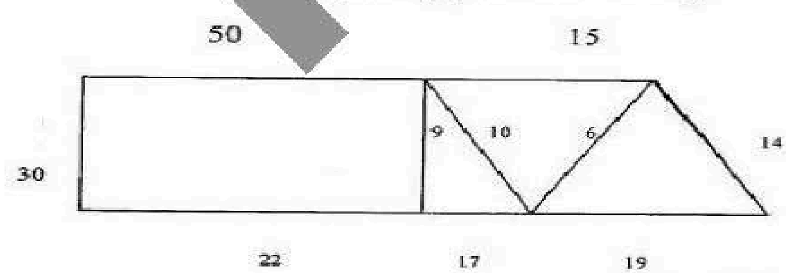
13 Solve the following non-homogeneous recurrence relation using characteristic roots method.

$A_n - 5a_{n-1} + 6a_{n-2} = 2^n$ for n 2, $a_o = 1$ and $a_1 = 3$.

14 Devise a single error correcting group code and associated decoding table for m=3 and n=7.

15 Find Minimum Spanning Tree using Prim's algorithm for the graph shown in Figure 1.

Figure 1(Question No.15)



16 a) Let f: $A \rightarrow B$ and g: $B \rightarrow C$ be any two functions. Then prove the following statements:

i) If f and g are one to one then gof is one to one.

ii) If f and g are onto then gof is onto.

b) Obtain a Hasse diagram for R = {(a, b)} such that (a, b∈N) and <aRb> iff a b}.

17 a) Partition of integers

b) Find a Hamiltonian cycle for octahedron graph.

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Code No. 5041 / O / S

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I - Semester (Old) Examination, June 2016

Subject : Discrete Structures

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

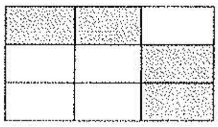
PART – A (25 Marks)

1 In how many ways four letters of alphabets "BETTER" be arranged? (2)

2 Show that $(P \cap (P \rightarrow Q))$ implies Q. (3)

3 Let $f: R \rightarrow R$ be defined by (2)
$f(x) = 3x - 5, \ x > 0$
$= -3x + 1, \ x \leq 0$
Determine f(-1) and f(-5/3)

4 Find the rook polynomial for the shaded board? (3)



5 Find a sequence for the generating function $1/(1-2X)^n$ (2)

6 Find the coefficient of X^{16} in $(1+X^4+X^8)^{10}$? (3)

7 What is Monoid Homomorphism? (2)

8 What is a Lattice? Give an example. (3)

9 Find the chromatic number for bipartite graph $b_{3,3}$. (2)

10 Find the degree of octahedron graph? (3)

Part-B (50 Marks)

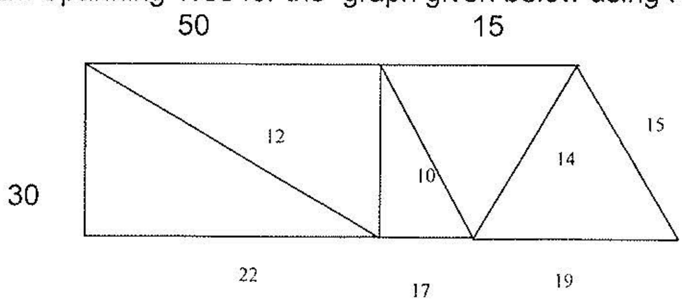
11 Show that from the set of premises (10)
(a) $(\exists x)(F(x) \cap S(x)) \rightarrow (\forall y)(M(y) \rightarrow W(y))$
(b) $(\exists y)(M(y) \cap \neg W(y))$
The conclusion is $(\forall x)\ (F(x) \rightarrow \neg S(x))$.

12 Determine the number of positive integer n, $1 \leq n \leq 1000$ that are not divisible by 2,3,5? (10)

13 Solve the Non homogeneous recurrence relation (10)
$A_n - 9A_{n-1} + 26A_{n-2} - 24A_{n-3} = 2^n$, for $n \geq 3$.

14 Devise a single error correction group code for(10)
$X_4 + X_1 + X_2 + X_3 = 0$.
$X_1 + X_2 + X_5 = 0$.
$X_1 + X_3 + X_6 = 0$.

15 Find Minimum Spanning Tree for the graph given below using Kruskal's Algorithm.(10)



..2

16 a) Solve the recurrence relation T(k)-7T(k-1)+10T(k-2)=0,with boundary conditions T(0)=4,T(1)=17? (5)

b) Show that bipartite graph $K_{1,4}$ is isomorphic to S_5 (the star graph). (5)

17 a) Obtain Hasse diagram for the relation xRy iff x divides y for the set A={2,4,6,8,12,24,32}. (6)

b) What is Duality?Obtain dual of(P↑P)↓(Q↑Q). (4)

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Code No. 9033

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) I - Semester (Main) Examination, December / January 2014-15

Subject : Discrete Structures

Time : 3 Hours Max. Marks: 75

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Write logical equivalence to ~(pvq) → (~(~pvq)v~p))
2 Define the rule of universal generalization. Give one example.
3 Define pigeonhole principle. Give one example.
4 Given set A = {1, 2, 3 . . . .6}. How many Antisymmetric relations are there for A.
5 Define Bijective function. Write a bijective relation for set A = {1, 2, 3, 4}.
6 What is subgroup Homomorphism? Give one example.
7 Write Derrangement for 1, 2, 3, 4.
8 Write the solution for the Recurrence relation $a_n - 7a_{n-1} + 12a_{n-2} = 10$
9 What is graph Traversing? Give one example for a graph G, where v(G)={A,B, C, D}.
10 If a simple non directed graph contains 24 edges and all vertices are at some degree then |v(G)| = ?

PART – B (50 Marks)

11 (a) Define Tautology. Verify Qv(p∧7Q) ∧ (7p ∧7Q) is Tautology or not.
(b) Show that p → (q → p) ⇄ 7p → (p - q).

12 (a) Consider the functions f and g defined by $f(x)=x^3$, $g(x)=x^2+1$, $x \in R$. Find gof, fog, f^2 and g^2.
(b) Prove that A∩(BUC)=(A∩B)U(A∩C) where A, b, C are non empty sets.

13 (a) State and explain the principle of inclussion and exclussion.
(b) Let A = {1, 2, 3, 4, 5} X {1, 2, 3, 4, 5} and R is defined on A 6y(x_1, y_1) R (x_2,y_2) if $x_1 + y_1 = x_2 + y_2$; verify that R is an equivalence relation on A.

14 Prove the Recurrence relation for Fibonacci numbers; $F_n = F_{n-1} + F_{n-2}$ for $n \geq 2$.

15 (a) Finite coefficient of x^{15} in $\frac{(l+x)^4}{(l-x)^4}$.
(b) If G is a group such that $(a6)^m=a^m6^m$ for three consecutive integers m for all a, 6∈ G, show that G is abelian.

16 (a) Define the terms: Manoid, semi group lattice with their Homomorphisms.
(b) Explain the graph traversal algorithms with example.

17 (a) What is Isomorphic graphs? Explain various conditions for proving the given groups are isomorphic.
(b) Prove that a complete graph K_n is planar if $n \leq 4$.

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