Registration No: | | | | | | | | | | |

Total Number of Pages: 03 **B.Tech**

PCS3I001

3^{rd} Semester Regular/Back Examination 2017-18
Discrete Structures
BRANCH: CSE
Time: 3 Hours
Max Marks: 100
Q.CODE: B1112

Answer Question No.1 and 2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions. **(2 x 10)**

a) What is the law of trichotomy ?
i)Every Real Numbers are either Positive ,Negative
ii) Every Real Numbers are Negative only
iii) Every Real Numbers are Positive only
iv) Every Real Numbers are either Positive ,Negative or Zeros

b) Axiom for conjunction of two statements p and q.
i)$p \wedge q$ true when p and q both true
ii) $p \wedge q$ true when p and q both false
iii) $p \wedge q$ true when p false and q true
iv) $p \wedge q$ true when p true and q false

c) Find Total number of reflexive relation define on a set having 4 elements
i)2^{16}
ii)2^{4}
iii) 2^{12}
iv)None of these

d) p is a statement q is another statement such that $p \leftrightarrow q$ is false.
i) Both p and q are false
ii) Both p and q are true
iii)p is true q is false
iv) None of these

e) If a 3-regular planner graph with 4 vertices then find the number of regions?
i) 4
ii) 8
iii) 10
iv) None of these

f) A graph G with v vertices and e edges then find the number edges in G^C where G^C is the complement of G
i) v
ii) e
iii) ${}^{v}c_2$
iv) ${}^{v}c_2$-e

g) A group of order 10 then find the order of it's sub groups .
i) 2 and 4
ii)2 and 8
iii) 6 only
iv) 2 and 5

h) A relation R define on a set B then what it's symmetric closure?
i) $R \cup R^{-1}$
ii)R^{-1}
iii)R^2
iv) None of these

i) Which of the following relation is both symmetric as well as anti symmetric define on A={1,2,3}?
i){(1,3) ,(3,1),(2,3)}
ii){(1,2),(2,1)}

iii) {(1,1),(2,2), (3,3)}
iv){(1,1),(2,1)}

j) If (G ,*) Is a Group with binary operation * define as a*b=ab/2 and a,b$\in$(G *) then find the identity element ?
i) 1
ii)2
iii)5
iv)None of these

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

a) Give anExample of exhaustive proof.
b) Find total number of edges in case of 3-regular graph with 6 vertices.
c) Find total number of symmetric relation for a set having 4 elements.
d) Find the solution of the recurrence relation $a_n - 3a_{n-1} + 3a_{n-2} - a_{n-3} = 0$
e) Show that $\neg p \vee q \equiv p \rightarrow q$
f) What is the chromatic number of $K_{n,n}$?
g) State 4- color theorem.
h) If a cyclic group is of order 10 find all it's generator.
i) A relation r " is sub set" define on a set B then show that r is a poset.
j) Show that $a \equiv b \bmod (7)$ is an equivalence relation.

Q3 **a)** Using Generating function prove $\binom{-n}{r} = (-1)^r \binom{n+r-1}{r-1}$ **(5)**

b) Show that $\frac{1}{(x-1)^2} = \sum_0^\infty (n+1)^2$ Using Generating Function **(5)**

c) How many binary bit strings of length 7 are possible starting with 0 and ending with 1 **(5)**

Q4 **a)** Using Modus ponens derive a conclusion for the following statements **(5)**
If John has B in calculus ,he will graduate. John does have a B in calculus.

b) Using Modus ponens derive a conclusion for the following statements **(5)**
If John has B in calculus ,he will graduate. John does have a B in calculus.

c) If the races are fixed so the casino are crooked, then tourist trade will decline. if tourist trade decreases , then the police will happy. The police force never happy. Conclusion –the races are not fixed validate the above conclusion using rules of inference. **(5)**

Q5 **a)** If $H \subset G$ and G is a group then show that if a,b$\in$H $\rightarrow$ab^{-1}$\in$H then show that H is a subgroup of G. **(5)**

b) Show that kernel of a group is a normal subgroup. **(5)**

c) Show that intersection of two sub group of a group is again a sub group . **(5)**

Q6 **a)** Show that every field is an integral Domain. **(5)**

b) Show that S={e,*} ,where * is multiplication , then S is a group. **(5)**

c) If for $\forall a \in (G,*)$ such that a=a^{-1} where (G,*) is a group and then show that (G,*) is an abellian group **(5)**

Q7 **a)** Prove that If a simple graph G(V,E) has n vertices and k connected components then maximum number of edges in the graph is $\frac{(n-k)(n-k+1)}{2}$. **(5)**

b) Let G be a connected planner graph and n,e,f denote the number of vertices ,edges and regions respectively in a plane representation of G then show that n -e+f=2. **(5)**

c) Prove that G has a Hamilton circuit if m$\geq\frac{1}{2}$(n^2-3n+6) where m is the number of edges and n is the number of vertices and G has no loops and multiple edges . **(5)**

Q8 **a)** Draw the following hasse diagram i) A ={a,b,c on relation sub set } ii)D_{20} **(10)**

b) If L is a lattice then for every a,b in L then show that i) $a \vee b=b$ iff $a \prec b$ **(5)**

ii)$a \wedge b=a$ iff $a \prec b$

Q9 **a)** For any a,b,c,d in lattice $(L, \leq)$ if $a \leq b$ and $c \leq d$ then show that $a \vee c \leq b \vee d$ and $a \wedge c \leq b \wedge d$. **(10)**

b) Prove a and b are elements in a bounded distributive lattice L and a^c b^c are complement of a and b then $a \vee (a^c \wedge b)=a \vee b$ and $a \wedge (a^c \vee b)=a \wedge b$. **(5)**