Sub Code:NCS302

Paper Id: 110312 **Roll No:**

B.TECH
(SEM-III) THEORY EXAMINATION 2019-20
DISCRETE STRUCTURE & GRAPH THEORY

Time:3 Hours ***Total Marks:100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION – A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a) Let Aand B be sets. Show that AXB≠ BXA. Under what condition AXB=BXA?

b) Let R be a binary relation on the set of all positive integers such that:
R={(a,b)/ a-b is an odd positive integers}
Is R reflexive ? Symmetric? Transitive?

c) **D**efine the Subgroup of a group.

d) Find the total number of squares in a Chess Board.

e) **D**efine Lagrange's theorem. What is the use of the theorem?

f) Define Multiset and Power set. Determine the power set A={1,2}

g) Define a Partial Ordering .

h) What is a binary Search tree? Explain with example.

i) Prove that $(P\vee Q)\rightarrow(P\wedge Q)$ is logically equivalent to $P\leftrightarrow Q$.

j) Write short note on : Isomorphism of graphs.

SECTION – B

2. Attempt any *three* of the following: **10 x 3 = 30**

a) Let f: X→Y and X=Y=R, the set of real number. Find f^{-1}if
(i) $F(x)=x^2$
(ii) F(x)=(2x-1)/5

b) Prove that (R,+,*) is a ring with zero divisors, where R is 2x2 matrix and + and * are usual addition and multiplication operations.

c) Describe the Boolean duality principle. Write the dual of each Boolean equations:
(i) x+x'y=x+y
(ii) (x.1)(0+x')=0.

d) Determine the value of each of there prefix expressions:
(i) -*2/933
(ii) +-*335/↑232

e) Solve the recurrence relation :
$a_n=3a_{n-1}+4^{n-1}$, for $n\geq 0$ & $a_0=1$

SECTION – C

3. Attempt any one part of the following: **10 x 1 = 10**

a) Prove that a simple graph with n vertices and k components can have at most (n-k)(n-k+1)/2 edges.

b) **P**rove by using mathematical induction that:
7+77+777+............+777...........7=7/81[10^{n+1}-9n-10] for every n€N.

AKTU_QP20O12 | 07-Jan-2020 09:04:19 | 139.5.198.30

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4. Attempt any one part of the following: 10 x 1 = 10

a) Define preorder, inorder and postorder tree traversal. Give an example of preorder, postorder & inorder traversal of a binary tree of your choice with at least 12 vertices.

b) **L**et R be a relation on R, the set of real numbers, such that $R=\{(x,y) \mid |x-y|<1\}$. Is R an equivalence relation ? justify.

5. Attempt any one part of the following: 10 x 1 = 10

a) Draw the Haase diagram of $[p(a,b,c),\leq]$, Find greatest element , least element , minimal element & maximal element.

b) Simplify the following Boolean function using three variables maps:
(a) $f(x,y,z)=\sum(0,1,5,7)$
(b) $f(x,y,z)=\sum(1,2,3,6,7)$

6. Attempt any one part of the following: 10 x 1 = 10

a) **E**xpress this statement using quantifiers:
"Every student in this class has taken some course in every department in the school of mathematical sciences**".**

b) Solve the recurrence relation by the method of generating function.
$a_r-7a_{r-1}+10a_{r-2}=0, r\geq 2$, Given $a_0=3$ and $a_1=3$.

7. Attempt any one part of the following: 10 x 1 = 10

a) Let (A,*) be a monoid such that for every x in A , x*x=e, where e is the identity element . Show that (A,*) is an abelian group.

b) Constructed the truth table for the following statements:
(i) $(P\rightarrow Q')\rightarrow P'$
(ii) $P\leftrightarrow(P'\vee Q')$.

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