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 A and 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 $(P \lor Q) \to (P \land Q)$ 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≥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.

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) Let 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) Express 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) $P\leftrightarrow(P'\vee Q')$.