F.Y.B.Sc. (Computer Science) Semester - I
Regular Semester-End Examination
Session : Nov. 2022

Subject : Discrete Mathematics **Subject Code : USCSMT-112**

Time : 2 Hrs. **Total Marks 35**

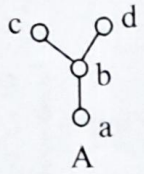
Instructions : (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Use of single memory, non-programmable scientific calculator is allowed.

Q.1 Attempt any Five of the following. **10**

(i) Write the following statement in symbolic form and negate it
'All computers in Lab1 have 8GB internal memory'.

(ii) Solve the following recurrence relation
$a_{n+2} - 5a_{n+1} + 6a_n = 0$

(iii) State whether the given statement is true or false. Justify your answer.
'Hasse diagram A given below represents a lattice'



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(iv) Define : equivalence relation. Give an example of equivalence relation on the set $A = \{1, 2, 3\}$.

(v) Check whether the given statements are logically equivalent by constructing truth table $A \equiv \sim (p \rightarrow q)$, $B \equiv p \wedge \sim q$.

(vi) If 1, 1, 2 are characteristic roots of a recurrence and $f(n) = (5)^n$, then find homogeneous solution of this recurrence relation.

(vii) Find reflexive closure of the relation $r = \{(1, 1), (1, 2), (2, 1)\}$ defined on the set $A = \{1, 2, 3, 4\}$.

Q.2 Attempt any Three of the following. **15**

(i) Draw Hasse diagram for the poset D_{15} with divides as a partial order. Check whether it is distributive lattice.

(ii) Let R(y) be 'y is rich'. The premise is given as $\exists y, R(y)$. Can we conclude that R (Jeff Bezas) i.e. 'Jeff Bezas is rich'? What is wrong in this argument.

(iii) Solve the following recurrence relation using Master theorem.
$T(n) = 4\,T\left(\frac{n}{5}\right) + n^2$.

(iv) Let A be the set {u, w, x, y, z}. Define a relation R on A as R = {(u, u), (u, w), (x, y), (y, x), (w, z), (z, x)}. Draw a digraph for the relation R. Also find matrix representation of R.

(v) Check validity of the given argument using laws of inference.
$R \rightarrow C, S \rightarrow NW, RVS, W \vdash C.$

Q.3 Attempt any One of the following. **10**

(i) Using Warshall's algorithm find transitive closure of the relation R = {(a, a), (a, c), (b, a), (b, b), (c, b), (c, c), (d, d), (d, c)} defined on the Set A = {a, b, c, d}.

(ii) Solve the following recurrence relation.
$a_n - 7a_{n-1} + 10\, a_{n-2} = 3^n$ with initial conditions $a_0 = 0$, $a_1 = 1$.

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