

B.C.A. Ist Semester Examination, 2021-22**Paper – III****[Mathematical foundation of Computer Science]****Paper Code- BC-153**

Time : 2:30 Hours]

[Maximum Marks : 70

Note : Attempt any five question. All question carry equal marks.

1. (a) Obtain the principal conjunction normal form of
 $(P \rightarrow Q) \wedge (Q \rightarrow R)$. 7

(b) Show that the given relation R on the set of Real
 Number is an equivalence relation, which is defined
 by. 7

$$(p, q)R (r, s) \Rightarrow (p + s) = (q + r)$$

2. (a) Solve the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2}$ Where
 $a_0 = 1$ and $a_1 = 4$ 7

(b) Using mathematical induction, prove that the
 following statement is true for all positive
 integer n. $1^3 + 3^3 + 5^3 + \dots + (2n - 1)^3 = n^2(2n^2 -$
 $1)$ for $n \geq 1$. 7

3. (a) Evaluate $f(3)$ given that $f(x) = |x-6| + x^2 - 1$ 7

(b) State and prove Lagrange Theorem. 7

4. (a) Explain the two type of quantifier with example. 7

(b) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the
 premises $P \vee Q, Q \rightarrow R, P \rightarrow M$ and $\neg M$. 7

5. (a) Draw the Hasse Diagram of all possible subsets of
 set $A = \{1, 2, 3\}$. <https://www.sdsuonline.com> 7

(b) Show that every Right or Left Coset in a Group are
 either identical or Disjoint. 7

6. Write short notes on: 14

(i) Complemented Lattice

(ii) Cyclic Group

(iii) Anti Symmetric Relation

(iv) Recursive Funtion

7. (a) Prove that $11^{n+2}+122^{n+1}$ is divisible by 133 by

Mathematical induction for $n \geq 1$. 7

(b) Let R be a relation on set $A = \{1, 2, 3, 4\}$ defined by

$R = \{(1,2), (2,3), (4,3), (4,1), (1,4), (4,4)\}$ find the : 7

(i) Reflexive Closure of R

(ii) Symmetric Closure of R

(iii) Transitive Closure of R

★★★★★

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