67006

MCA Ist Semester Current (CBCS Scheme w.e.f. 2016-17) Examination, November/December-2019

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Paper-16MCA31C1

Time allowed : 3 hours] *[Maximum marks : 80*

Note : *Candidates are required to attempt **five** questions in all, selecting **one** from each unit. **Question No. 1 is compulsory.***

1. (a) Given A= {1, 2} and B= {x, y, z} and C= {3, 4}. Find A×B×C. 8×2=16

(b) In terms of relations, what do you mean by :

(i) Reflexive

(ii) Transitive

(c) Illustrate logical equivalence.

(d) Determine the truth value of each of the following:

(i) 3+2= 5 and 6+1= 7

(ii) 3+1= 5 and 6+3= 9

(e) Write the dual of statement

$(a \wedge b) \vee c = (b \vee c) \wedge (c \vee a)$

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(f) Write the dual of Boolean equation
$(a + a'b) = a + b$

(g) Give two Idempotent laws.

(h) Prove $(a*b)' = a' + b'$

Unit-I

2. (a) Define functions. Explain functions as relations. Illustrate various types of functions. 4

(b) What are the properties of algebraic structures ? Define any two types of groups. 4

3. (a) Illustrate closure of relations and partial order relation. 4

(b) What do you understand by cyclic groups ? Give two example of cyclic groups. 4

Unit-II

4. (a) Show that the propositions $\neg(p \wedge q)$ and $\neg p \vee \neg q$ are equivalent. 4

(b) Show that $\neg(p \vee q) \vee (\neg p \wedge q) \equiv \neg p$ 4

5. (a) Show, if the proposition $(p \wedge q) \wedge \neg(p \vee q)$ is a contradiction. 4

(b) Determine the validity of argument :

$p \rightarrow q, \ \neg q \vdash \neg p$ 4

Unit-III

6. (a) Illustrate the importance of Hasse diagram using suitable examples. 4

(b) Find the values of the Boolean function represented by $F(x, y, z) = xy + \bar{z}$ 4

7. (a) Show that the distributive law $x(y+z) = xy + xz$ is valid. 4

(b) State the various properties of Lattices. 4

Unit-IV

8. (a) Construct a DFA that recognizes the set of bit strings $(0*1*)*$. 4

(b) What is Kleene closure of a set of strings ? Find the Kleene closure of the set {11, 0} 4

9. (a) Illustrate Chomsky Hierarchy. 4

(b) Explain how regular expressions are used to represent regular sets. 4

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