DE-2934

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First Year B. Sc. (Sem. I) Examination

March / April - 2016

MCS-101 : Mathematics for Computer Science

(Discrete Mathematics - I)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી. **Fillup strictly the details of ☛ signs on your answer book.**	Seat No.:
Name of the Examination: ☛ **First Year B. Sc. (Sem. I)**	
Name of the Subject: ☛ **MCS-101 : Mathematics for Computer Science**	
☛ Subject Code No.: **2 9 3 4** ☛ Section No. (1, 2,.....): **Nil**	Student's Signature

(2) All questions are compulsory.

(3) Digits shown in the right hand side indicate full marks of the question.

(4) Symbols have their usual meaning.

Q1 Answer the following questions as directed (10)

(i) Show that the argument $((p \Leftrightarrow q) \wedge q) \Rightarrow p$ is valid

(ii) Simplify the $(p \Rightarrow q) \wedge \sim q$

(iii) If U = {1,2,3,4,5,6,7,8,9},then find the set specified by the bit strings A= 011001010 and B = 100011111.Also find AUB

(iv) Construct the truth table of $((p \Rightarrow \sim q) \wedge p) \Leftrightarrow (\sim p \wedge q)$

(v) Using truth table prove that $\sim p \vee q \equiv p \Rightarrow q$

Q2 (a) Construct the truth table of $((\sim(p \vee \sim q) \wedge (\sim p \Rightarrow r)) \vee (q \Rightarrow r)) \Rightarrow (p \Leftrightarrow \sim (p \wedge q))$ (5)

OR

(a) Prove the equivalence of propositions $(p \Rightarrow q) \wedge (p \Rightarrow \sim q)$ and ~ p

(b) Attempt any two (10)

(i) Prove that the proposition $((p \vee \sim (q \wedge r)) \wedge \sim p) \Rightarrow (\sim q \vee \sim r)$ is a tautology

(ii) Without using truth table prove $(\sim p \vee q) \wedge (p \wedge (p \wedge q)) \equiv p \wedge q$

(iii) Show that $\sim (q \Rightarrow r) \wedge r \wedge (p \Rightarrow q)$ is contradiction without using truth table

(iv) Given that p and q are true and r and s are false find the truth value of the following expression

$$((p \wedge \sim r) \vee (p \vee r)) \Rightarrow ((\sim p \vee (s \Rightarrow \sim r)) \wedge (p \wedge (\sim q \vee r)))$$

Q3 (a) Simplify following without using truth table (5)

$(q \wedge p) \vee (\sim p \wedge q \wedge r)$

OR

(a) Show that $(p \Rightarrow q) \equiv ((p \wedge \sim q) \Rightarrow (r \wedge \sim r))$

(b) Attempt any two (10)

(i) Prove that $\big(((p \vee q) \Rightarrow r) \wedge \sim p\big) \Rightarrow (q \Rightarrow r)$ is a tautology

(ii) Write an equivalent formula for $p \wedge (q \Rightarrow r) \vee (r \Leftrightarrow p)$ which is free from conditional as well as biconditional

(iii) Without using truth table simplify $((p \Rightarrow q) \wedge (\sim r \Rightarrow \sim q) \wedge \sim r) \Rightarrow \sim p$

(iv) Construct the truth table of $\sim (p \vee (q \wedge r)) \Leftrightarrow ((p \vee q) \wedge (p \vee r))$

Q4 (a) Show that $(x \wedge y)$ is a valid conclusion from the given premises (5)

$p \Rightarrow q\,,\quad q \Rightarrow \sim r\,,\quad r\,,\quad p \vee (x \wedge y)$

OR

(a) Test the validity of the following arguments

$p \Rightarrow r$

$r \Rightarrow s$

$t \vee \sim s$

$\sim t \vee u$

$\sim u$

$\sim p$

(b) Attempt any two (10)

(i) Prove the logical equivalence $(p \Rightarrow q) \wedge (\sim q \wedge (r \vee \sim q)) \Leftrightarrow \sim (p \vee q)$

(ii) Show that p is a valid conclusion from the given premises

$(\sim p \vee \sim q) \Rightarrow (r \wedge s),\quad r \Rightarrow t,\quad \sim t$

(iii) Show that $(p \wedge \sim q) \wedge (p \vee q) \wedge \sim p \wedge \sim q$ is contradiction

(iv) Obtain principal conjunctive normal form of the following using truth table

$$(p \Rightarrow (q \wedge r)) \wedge (\sim p \Rightarrow (\sim q \wedge \sim r))$$

Q5 (a) Find the disjunctive normal form of $p \vee (\sim p \Rightarrow (q \vee (\sim q \vee r)))$ (5)

OR

(a) Using the rules of inferences, determine whether w is a valid conclusion from the following

$\sim t \Rightarrow \sim r,\quad \sim s,\quad t \Rightarrow w,\quad r \vee s$

(b) Attempt any two (10)

(i) Show that $\sim q$ can be concluded from the following premises

$(\sim p \vee q) \Rightarrow r,\quad r \Rightarrow s,\quad \sim s$

(ii) Prove the equivalence of the following without using truth table

$$(p \Rightarrow (q \Rightarrow r)) \Leftrightarrow (p \Rightarrow (\sim q \vee r)) \Leftrightarrow ((p \wedge q) \Rightarrow r)$$

(iii) Simplify the propositional form $(p \wedge q) \vee (\sim p \wedge q) \vee (p \wedge \sim q)$

(iv) Show that $(x \vee y)$ is a valid conclusion from the following premises

$p \vee q,\quad (p \vee q) \Rightarrow \sim r,\quad \sim r \Rightarrow (s \wedge \sim t),\quad (s \wedge \sim t) \Rightarrow (x \vee y)$
