

**GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**  
**Course Name: Discrete Mathematics Graph Theory**

**CLASS TEST – I**

**Course Code :(CSU303)**

**Duration : 1 hr**

**Marks : 15**

**Solve Any Three of Following each with 5 Marks**

**Q.1.** Show that the truth values of the following formulas are independent of their components

a)  $((P \rightarrow Q) \wedge (\neg Q \rightarrow R)) \rightarrow (P \rightarrow R)$   
 $(Q \rightarrow P) \wedge (\neg P \rightarrow R) \rightarrow (Q \rightarrow R)$

b)  $(P \wedge (P \rightarrow Q)) \rightarrow Q$

**Q.2.** Write a Formula which is equivalent to the formula  $P \wedge (Q \Leftrightarrow R)$  and contains the connective NAND( $\uparrow$ ) only. Obtain an equivalent formula which contain the connective NOR( $\downarrow$ ) only.

**Q.3.** Obtain formulas having the simplest possible form which are equivalent to the formula given here.

a)  $((P \rightarrow Q) \Leftrightarrow (\neg Q \rightarrow \neg P)) \wedge R$     b)  $P \vee (\neg P \vee (Q \wedge \neg Q))$     c)  $(P \wedge (Q \wedge S)) \vee (\neg P \wedge (Q \wedge S))$

**Q.4.** Obtain Disjunctive & Conjunctive normal Form of  $\neg(P \vee Q) \Leftrightarrow (P \wedge Q)$

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI  
DEPARTMENT OF INFORMATION TECHNOLOGY  
CLASS TEST - I (Direct Second Year)  
Winter-2017

Course Code: CSU303

Course Name: Discrete Mathematics & Graph Theory

Duration: 1 hr

Marks : 15

Attempt Any Three of Following each with 5 Marks

Q1. Show the following equivalence without using truth table.

(i)  $\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$

(ii)  $(P \rightarrow C) \wedge (Q \rightarrow C) \Leftrightarrow (P \vee Q) \rightarrow C$

(iii)  $A \rightarrow (P \vee C) \Leftrightarrow (A \wedge \neg P) \rightarrow C$

Q2. What do you mean by well formed formulas? Which of the following are well formed propositional formulas? why?

i)  $\forall p q$  ii)  $(\neg p \rightarrow (q \wedge p))$  iii)  $((p \rightarrow q) \rightarrow p)$  iv)  $p \rightarrow r$  v)  $(p \wedge q) \rightarrow (q \rightarrow r)$

Q3. Draw truth table for following formulas.

i)  $(\neg P \rightarrow R) \wedge (Q \leftrightarrow S)$  ii)  $P \wedge (\neg P \rightarrow (S \vee (\neg Q \wedge R)))$

Q4. Let's consider a propositional language with:

• p means "Paola is happy"

• q means "Paola paints a picture"

• r means "Renzo is happy"

Formalize the following sentences:

i) "if Paola is happy and paints a picture then Renzo isn't happy"

ii) "if Paola is happy then she paints a picture"

iii) "Paola is happy only if she paints a picture"

Course Code : (CSU 303)

15

Solve Any Three Questions Below each with 5 marks

Marks : 15

- Q.1. Find truth values of expression  $((\neg P \rightarrow R) \wedge (Q \leftrightarrow P)) \leftrightarrow (P \wedge \neg P \rightarrow (Q \vee (\neg QAR)))$  using Truth table
- Q.2. Write following statements in statement formula
- Roses are red and violets are blue
  - He opened the book and started to read
  - Jack and Jill are cousins
  - I shall watch the game on television or go to the game
  - there is something wrong with the bulb or with the wiring
- Q.3. a connective denoted by  $\hat{\vee}$  is defined by table

P	Q	$P \hat{\vee} Q$
T	T	F
T	F	T
F	T	T
F	F	F

Find a formula using P, Q and the connectives  $\wedge$ ,  $\vee$  and  $\neg$  whose truth values are identical to the truth values of  $P \hat{\vee} Q$

Q.4. Find truth values of following expression using truth table

- $((\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg PVQ))) \leftrightarrow (\neg PVQ))$
- $\neg PVQ \leftrightarrow ((P \wedge Q) \vee (\neg PAR) \vee (QAR))$