QUESTION BANK

25UCU305: DISCRETE MATHEMATICS WITH PROBABILITY AND HYPOTHESIS TESTING

B.Sc., (CS, IT, AI-DS, DS &V, BCA, DA, Cyber Security, DevOps, FSWD)

Semester: II

Unit II:Logic Connectives

4 Marks

1. Define Conjunction and Disjunction with examples.
2. Verify whether $(P \vee Q) \vee (P \wedge Q)$ is contradiction or Tautology.
3. Define Tautology and Contradiction with example.
4. Indicate which one is the tautology or contradiction
   (i) $\sim[(P \wedge Q) \rightarrow P]$
   (ii) P→(P∨Q)
5. Show that it is tautology. (P∧Q) →(P∧Q)
6. Construct the Truth table for P∧(P→Q)
7. Construct the Truth table for $Q \wedge [\sim (P \rightarrow Q)]$
8. Construct the Truth table for $\sim P \wedge \sim Q$
9. Construct the Truth table for$\sim(P \wedge \sim Q)$
10. Write each of the following sentences in symbolic from using statement variables P and Q.
    (i) 19 is not a prime number and all the angles of a triangle are equal.
    (ii) 19 is a prime number or all the angles of a triangle are not equal.
    (iii) 19 is not a prime number.
11. $Prove\ P \rightarrow (q \rightarrow r) \equiv (P \wedge q) \rightarrow r$ without using truth table.
12. Check whether the statement $P \rightarrow (Q \rightarrow P)$ is a tautology or a contradiction.
13. Let P: Mercury is a planet and India is an Island be any two simple statement. Give verbal sentence describing each of the following. $(i) \sim P \quad (ii)\ P \wedge \sim Q \quad (iii) \sim P \wedge Q.$
14. Write the statements in words corresponding to$\sim P, P \wedge Q, P \vee Q$ and $P \wedge \sim Q$where P is 'It iscold' and Q is 'It is raining.'

6 Marks

15. Prove the following Equivalence $\sim(P \rightarrow Q) \Leftrightarrow (P \wedge \sim Q)\ and\ \sim(P \wedge Q) \Leftrightarrow \sim P \vee \sim Q.$
16. Define conditional and Biconditional statements with example.
17. Construct the truth table $(\sim P \vee Q) \wedge (\sim Q \vee P)$
18. Explain the five basic connectives with example.
19. Obtain PCNF for $(Q \rightarrow P) \wedge (\sim P \wedge Q)$.
20. Show that $P \Leftrightarrow P \vee (P \wedge Q)$.
21. Show that $\sim(P \vee Q) \Leftrightarrow [\sim P \wedge \sim Q]$
22. Show that $Q \vee (P \wedge \sim Q) \vee (\sim P \wedge \sim Q)$ is Tautology.

23. Show that $P \vee (Q \vee R) \Leftrightarrow (P \vee Q) \vee R$
24. Construct the truth table for the statement$(\sim P \longrightarrow R) \wedge (P \leftrightarrow Q)$
25. Construct the truth table for the statement $(P \vee Q) \vee \sim Q$
26. Show that $P \rightarrow Q \ \ and \ \ Q \rightarrow P$ are not equivalent.
27. Using the truth table check whether the statements $\sim(P \vee Q) \vee (\sim P \wedge Q) and \sim P$ are logically equivalent.
28. Prove that $Q \rightarrow P \equiv \ \sim P \rightarrow \sim Q$

10 Marks (Case Study)

29. Show that P is equivalent to $\sim(\sim P), (P \wedge P), (P \vee P), P \vee (P \wedge Q), [(P \wedge Q) \vee (P \wedge \sim Q)] using \ truth \ table$
30. Show that $\big(\sim P \wedge (\sim Q \wedge R)\big) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R.$
31. Prove that $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$
32. Determine the truth table $(P \wedge Q) \vee (\sim P \wedge Q) \vee (P \wedge \sim Q) \vee (\sim P \wedge \sim Q)$
33. Prove that $P \rightarrow (\sim Q \vee r) \equiv \ \sim P \vee (\sim Q \vee R) using \ truth$
34. Verify whether the following compound propositions are Tautology or Contradiction or Contingency. $\big((P \rightarrow Q) \wedge (Q \rightarrow R)\big) \rightarrow (P \rightarrow R)$.
35. Show that $(P \leftrightarrow Q) \equiv \big((\sim P) \vee Q\big) \wedge \big((\sim Q) \vee P\big)$