AI LAB 6
1BM21CS203

1) Evaluate the given expression (~q v ~p v r) ^ (~q ^ p) ^ q . Check whether knowledge base entails query or not.

```
def evaluate_expression(q, p, r):
    # Evaluate the given expression (~q v ~p v r) ^ (~q ^ p) ^ q
    expression_result = ((not q or not p or r) and (not q and p) and q)
    return expression_result

def generate_truth_table():
    # Print the header of the truth table
    print(" q | p | r | Expression (KB) | Query (r)")
    print("---|---|---|-----------------|-----------")

    # Evaluate and print each row of the truth table
    for q in [True, False]:
        for p in [True, False]:
            for r in [True, False]:
                expression_result = evaluate_expression(q, p, r)
                query_result = r

                print(f" {q} | {p} | {r} | {expression_result}               |
{query_result}")

def query_entails_knowledge():
    # Check if query entails the knowledge
    for q in [True, False]:
        for p in [True, False]:
            for r in [True, False]:
                expression_result = evaluate_expression(q, p, r)
                query_result = r

                # If the expression is true and the query is false, query does
not entail the knowledge
```

```
            if expression_result and not query_result:
                return False

    # If the loop completes without returning, query entails the
knowledge
    return True

def main():
    # Generate and print the truth table
    generate_truth_table()

    # Check if query entails the knowledge and print the result
    if query_entails_knowledge():
        print("\nKnowledge base entails query")
    else:
        print("\nKnowledge base does not entail query")

if __name__ == "__main__":
    main()
```

input

```
 q  |  p  |  r  |  Expression (KB)  |  Query (r)
----|-----|-----|-------------------|------------
 True  |  True  |  True  |  False                |  True
 True  |  True  |  False  |  False                |  False
 True  |  False  |  True  |  False                |  True
 True  |  False  |  False  |  False                |  False
 False  |  True  |  True  |  False                |  True
 False  |  True  |  False  |  False                |  False
 False  |  False  |  True  |  False                |  True
 False  |  False  |  False  |  False                |  False

Knowledge base entails query
```

2) Evaluate the given expression (p v q) ^ (~r ^ p) . Check whether knowledge base entails query or not.

```
def evaluate_expression(q, p, r):
    # Evaluate the given expression (p v q) ^ (~r ^ p)
    expression_result = ((p or q) and (not r or p))
    return expression_result

def generate_truth_table():
    # Print the header of the truth table
    print(" q | p | r | Expression (KB) | Query (r)")
    print("---|---|---|-----------------|-----------")

    # Evaluate and print each row of the truth table
    for q in [True, False]:
        for p in [True, False]:
            for r in [True, False]:
                expression_result = evaluate_expression(q, p, r)
                query_result = p and r

                print(f" {q} | {p} | {r} | {expression_result}               |
{query_result}")

def query_entails_knowledge():
    # Check if query entails the knowledge
    for q in [True, False]:
        for p in [True, False]:
            for r in [True, False]:
                expression_result = evaluate_expression(q, p, r)
                query_result = p and r

                # If the expression is true and the query is false, query does
not entail the knowledge
                if expression_result and not query_result:
                    return False
```

```
    # If the loop completes without returning, query entails the
knowledge
    return True

def main():
    # Generate and print the truth table
    generate_truth_table()

    # Check if query entails the knowledge and print the result
    if query_entails_knowledge():
        print("\nKnowledge base entails query")
    else:
        print("\nKnowledge base does not entail query")

if __name__ == "__main__":
    main()
```

input

```
 q  |  p  |  r  | Expression (KB) | Query (r)
----|-----|-----|-----------------|-----------
 True  | True  | True  | True              | True
 True  | True  | False | True              | False
 True  | False | True  | False             | False
 True  | False | False | True              | False
 False | True  | True  | True              | True
 False | True  | False | True              | False
 False | False | True  | False             | False
 False | False | False | False             | False

Knowledge base does not entail query
```