```
function q = dcm_to_quat(R)

tr = trace(R);

if tr > 0
    S = sqrt(tr + 1.0) * 2;
    q0 = 0.25 * S;
    q1 = (R(3,2) - R(2,3)) / S;
    q2 = (R(1,3) - R(3,1)) / S;
    q3 = (R(2,1) - R(1,2)) / S;

else

    if (R(1,1) > R(2,2)) && (R(1,1) > R(3,3))
        S = sqrt(1.0 + R(1,1) - R(2,2) - R(3,3)) * 2;
        q0 = (R(3,2) - R(2,3)) / S;
        q1 = 0.25 * S;
        q2 = (R(1,2) + R(2,1)) / S;
        q3 = (R(1,3) + R(3,1)) / S;

    elseif (R(2,2) > R(3,3))

        S = sqrt(1.0 + R(2,2) - R(1,1) - R(3,3)) * 2;
        q0 = (R(1,3) - R(3,1)) / S;
        q1 = (R(1,2) + R(2,1)) / S;
        q2 = 0.25 * S;
        q3 = (R(2,3) + R(3,2)) / S;

    else

        S = sqrt(1.0 + R(3,3) - R(1,1) - R(2,2)) * 2;
        q0 = (R(2,1) - R(1,2)) / S;
        q1 = (R(1,3) + R(3,1)) / S;
        q2 = (R(2,3) + R(3,2)) / S;
        q3 = 0.25 * S;
```

```
    end
end

q = [q0; q1; q2; q3];
q = q / norm(q);

end
```