Q.1. Applying division ..... the following :

Sol. (i) We have,

$$f(x) = x^3 - 6x^2 + 11x - 6 \quad \text{.....(1)}$$
$$g(x) = x^2 + x + 1$$

Clearly, degree of $f(x) = 3$ and degree of $g(x) = 2$

$\therefore$ Degree of quotient $q(x) = 3 - 2 = 1$
Degree of remainder $r(x) < 2$

Let $q(x) = ax + b$
$r(x) = cx + d$

By division algorithm –

$$f(x) = q(x) \times g(x) + r(x)$$
$$= (ax+b)(x^2+x+1) + cx + d$$
$$= ax^3 + ax^2 + ax + bx^2 + bx + b + cx + d$$
$$= ax^3 + (a+b)x^2 + (a+b+c)x + b + d \quad \text{.....(2)}$$

Equating (1) and (2), we get -

$$a = 1$$
$$a + b = -6$$
$$a + b + c = 11$$
$$b + d = -6$$

On solving above equations, we get -

$$a = 1, \quad b = -7, \quad c = 17, \quad d = 1$$

Thus, $q(x) = ax + b$
$= x - 7$
$r(x) = cx + d$
$= 17x + 1$

(ii) We have,

$$f(x) = 10x^4 + 17x^3 - 62x^2 + 30x - 3 \quad \text{.....(1)}$$
$$g(x) = 2x^2 + 7x + 1$$

Clearly, degree of $f(x) = 4$ and degree of $g(x) = 2$

$\therefore$ Degree of quotient $q(x) = 4 - 2 = 2$