Discrete Assignment
EE1205 Signals and Systems

Praful Kesavadas
EE23BTECH11049

Question 11.9.5.15: The pth, qth and rth terms of an AP are a,b,c respectively. Show that

$$(q-r)a + (r-p)b + (p-q)c = 0$$

Solution:
The AP has the following parameters

Term	Value	Description
$x(0)$	-	First term
d	-	Common Difference
$x(n-1)$	$x(0)+(n-1)d$	General term
$x(p-1)$	a	pth term
$x(q-1)$	b	qth term
$x(r-1)$	c	rth term

TABLE 0
Input Parameters

Now,

$$x(p-1) = x(0) + (p-1)d = a \tag{1}$$
$$x(q-1) = x(0) + (q-1)d = b \tag{2}$$
$$x(r-1) = x(0) + (r-1)d = c \tag{3}$$
$$(p-q)d = a-b \implies p-q = \frac{a-b}{d} \tag{4}$$
$$(q-r)d = b-c \implies q-r = \frac{b-c}{d} \tag{5}$$
$$(r-p)d = c-a \implies r-p = \frac{c-a}{d} \tag{6}$$

Now, adding (4),(5) and (6),

$$(q-r)a + (r-p)b + (p-q)c = \frac{b-c}{d}.a + \frac{c-a}{d}.b + \frac{a-b}{d}.c = 0 \tag{7}$$

Hence proved