

/ 緒言

オ3回の弁表であります。弾性曲線の連続性を利用して、機能的に表を作り反力を計算するもので、連続梁の任意支変り撓み曲線は共通接線が画ける。対頂角は等しいから両側の撓み角も等しい。こゝで連続梁の各径間を単純梁と見なして、この撓み角を水平に戻す時に起る反力を集計して、支変り反力を計算する。

2 本方法に使用する式

MOHRの定理で弾性荷重による反力、即ち支変りの撓み角の値が分かればよいのである。

3 例題

① 多径間 (5径間)

①-1

$$[A行] \quad -(\frac{1}{16}) - (\frac{1}{16} \times \frac{1}{4})^2 - 2(\frac{1}{16} \times \frac{1}{4})^4 - 5(\frac{1}{16} \times \frac{1}{4})^6 - 13(\frac{1}{16} \times \frac{1}{4})^8 - 34(\frac{1}{16} \times \frac{1}{4})^{10} - 89(\frac{1}{16} \times \frac{1}{4})^{12} - 233(\frac{1}{16} \times \frac{1}{4})^{14} - 610(\frac{1}{16} \times \frac{1}{4})^{16} - \dots$$

② 係数表にする

1	2	5	13	34	89
1	3	8	21	55	
2	5	13	34		
3	8	21			
5	13				
8					

和を求めるのに

階差数列を調べようまくない。

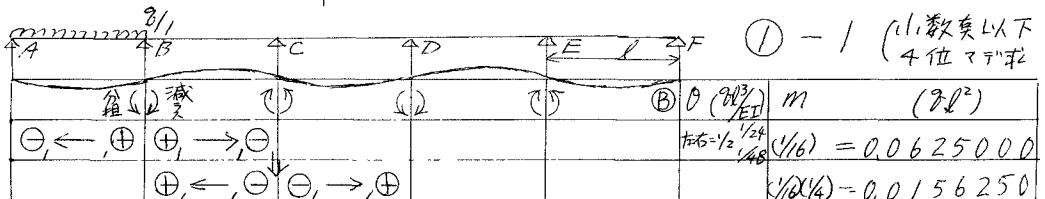
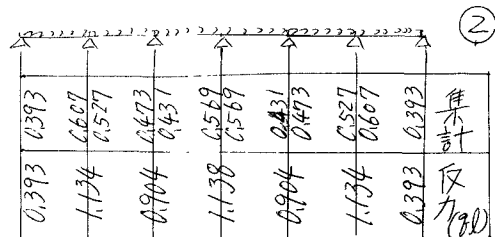
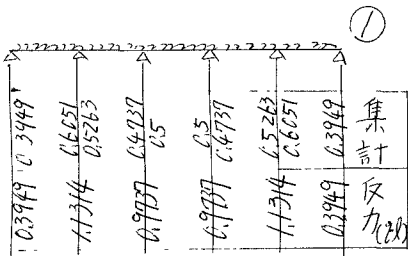
$$(b) \quad \left\{ \begin{array}{l} -(\frac{1}{16}) - (\frac{1}{16} \times \frac{1}{4})^2 - 2(\frac{1}{16} \times \frac{1}{4})^4 - 4(\frac{1}{16} \times \frac{1}{4})^6 - 8(\frac{1}{16} \times \frac{1}{4})^8 - 16(\frac{1}{16} \times \frac{1}{4})^{10} - 32(\frac{1}{16} \times \frac{1}{4})^{12} - \dots = -0.06696428 \dots \\ -(\frac{1}{16} \times \frac{1}{4})^2 - 5(\frac{1}{16} \times \frac{1}{4})^4 - 18(\frac{1}{16} \times \frac{1}{4})^6 - 57(\frac{1}{16} \times \frac{1}{4})^{12} - \dots \quad (\text{級数を分けて考える}) \end{array} \right.$$

$$\begin{array}{lll} a = -5(\frac{1}{16} \times \frac{1}{4})^8 & r = 3(\frac{1}{4})^2 & S_{\infty} = -0.000005864 \\ a = -5(\frac{1}{16} \times \frac{1}{4})^6 & r = 4(\frac{1}{4})^2 & S_{\infty} = -0.000006353 \end{array} \quad \begin{array}{l} > \text{加算すると} \\ -0.066985409 \\ -0.066985898 \end{array} \quad (\text{此の中間})$$

にあり、小数点以下7位の大小となる。

③ 加算する (小数点以下4位まで求めると)

$$4 \text{ 回加算する } -0.0625 - 0.003906 - 0.000488 - 0.000076 = -0.06697 \quad (\text{小数点以下4位})$$



$\ominus_1 \leftarrow, \oplus_1 \rightarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\ominus_1 \leftarrow, \oplus_1 \rightarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$		$(1/6)(1/4)^2 = 0.0039063$
	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\ominus_2 \rightarrow, \oplus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\ominus_1 \rightarrow, \oplus_1 \leftarrow$	$(1/6)(1/4)^3 = 0.0009766$
$\ominus_2 \rightarrow, \oplus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\ominus_3 \rightarrow, \oplus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$		$(1/6)(1/4)^4 = 0.0002441$
	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\ominus_5 \rightarrow, \oplus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\ominus_3 \rightarrow, \oplus_3 \leftarrow$	$(1/6)(1/4)^5 = 0.0000610$
$\ominus_5 \rightarrow, \oplus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\ominus_8 \rightarrow, \oplus_8 \leftarrow$	$\oplus_8 \rightarrow, \ominus_8 \leftarrow$		$(1/6)(1/4)^6 = 0.0000153$
	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\ominus_{13} \rightarrow, \oplus_{13} \leftarrow$	$\oplus_8 \rightarrow, \ominus_8 \leftarrow$	$\ominus_8 \rightarrow, \oplus_8 \leftarrow$	$(1/6)(1/4)^7 = 0.0000038$
$\ominus_{13} \rightarrow, \oplus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\ominus_{21} \rightarrow, \oplus_{21} \leftarrow$	$\oplus_{21} \rightarrow, \ominus_{21} \leftarrow$		$(1/6)(1/4)^8 = 0.0000010$
	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\ominus_{34} \rightarrow, \oplus_{34} \leftarrow$	$\oplus_{21} \rightarrow, \ominus_{21} \leftarrow$	$\ominus_{21} \rightarrow, \oplus_{21} \leftarrow$	$(1/6)(1/4)^9 = 0.0000002$
$\ominus_{34} \rightarrow, \oplus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\ominus_{55} \rightarrow, \oplus_{55} \leftarrow$	$\oplus_{55} \rightarrow, \ominus_{55} \leftarrow$		$(1/6)(1/4)^{10} = 0.0000001$
0.4330	0.5670	-0.0849	0.0227	-0.0060	單純梁反力
0.519	0.0849	-0.0227	0.0060	-0.0015	集計
		-0.0106	0.0287	0.0015	反力 (ZL)

$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_8 \rightarrow, \ominus_8 \leftarrow$	$\oplus_8 \rightarrow, \ominus_8 \leftarrow$	$\oplus_8 \rightarrow, \ominus_8 \leftarrow$	$(1/6)(1/4)^6 = 0.0000153$
$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{21} \rightarrow, \ominus_{21} \leftarrow$	$\oplus_8 \rightarrow, \ominus_8 \leftarrow$	$(1/6)(1/4)^7 = 0.0000038$
					① - 2
$\ominus_1 \leftarrow, \oplus_1 \rightarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\theta (ZL^2)$
$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\ominus_1 \rightarrow, \oplus_1 \leftarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$\oplus_1 \rightarrow, \ominus_1 \leftarrow$	$M (ZL^2)$
$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$(1/6) = 0.0625000$
$\ominus_2 \rightarrow, \oplus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$\oplus_2 \rightarrow, \ominus_2 \leftarrow$	$(1/6)(1/4) = 0.0156250$
$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$(1/6)(1/4)^2 = 0.0039063$
$\ominus_3 \rightarrow, \oplus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$\oplus_3 \rightarrow, \ominus_3 \leftarrow$	$(1/6)(1/4)^3 = 0.0009766$
$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$(1/6)(1/4)^4 = 0.0002441$
$\ominus_5 \rightarrow, \oplus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$\oplus_5 \rightarrow, \ominus_5 \leftarrow$	$(1/6)(1/4)^5 = 0.0000610$
$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$(1/6)(1/4)^6 = 0.0000010$
$\ominus_{13} \rightarrow, \oplus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$\oplus_{13} \rightarrow, \ominus_{13} \leftarrow$	$(1/6)(1/4)^7 = 0.0000002$
$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$(1/6)(1/4)^8 = 0.0000001$
$\ominus_{34} \rightarrow, \oplus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	$\oplus_{34} \rightarrow, \ominus_{34} \leftarrow$	單純梁反力
-0.0491	0.0491	0.5047	-0.0681	0.0179	集計
0.5444	0.4953	0.5728	-0.0860	0.0215	反力 (ZL)

① - 3

						$\theta \left(\frac{3l^3}{EI} \right)$	M	$(3l^2)$
$\pm 6 - \frac{1}{2} \frac{l^4}{48}$						$(1/6) = 0.0625000$		
$(1/6)(1/4) = 0.0156250$								
$(1/6)(1/4)^2 = 0.0039063$								
$(1/6)(1/4)^3 = 0.0009766$								
$(1/6)(1/4)^4 = 0.0002441$								
$(1/6)(1/4)^5 = 0.0000610$								
$(1/6)(1/4)^6 = 0.0000153$								
$(1/6)(1/4)^7 = 0.0000038$								
$(1/6)(1/4)^8 = 0.0000010$								
$(1/6)(1/4)^9 = 0.0000002$								
$(1/6)(1/4)^{10} = 0.0000001$								
計								
① 31 始×9 量								
単純梁反力								
集 計								
反力 (3l)								
0.0131	-0.0131	0.0131	-0.0131	0.0131	-0.0131			
0.0131	-0.0131	0.0131	-0.0131	0.0131	-0.0131			
0.0131	-0.0131	0.0131	-0.0131	0.0131	-0.0131			
0.0131	-0.0131	0.0131	-0.0131	0.0131	-0.0131			
0.0131	-0.0131	0.0131	-0.0131	0.0131	-0.0131			
0.0131	-0.0131	0.0131	-0.0131	0.0131	-0.0131			

② - 1 (山形梁以下 3 位マサ)

						$\theta \left(\frac{3l^3}{EI} \right)$	M	$(3l^2)$
$\pm 6 - \frac{1}{2} \frac{l^4}{48}$						$(1/6) = 0.06250$		
$(1/6)(1/4) = 0.01563$								
$(1/6)(1/4)^2 = 0.00391$								
$(1/6)(1/4)^3 = 0.00098$								
$(1/6)(1/4)^4 = 0.00024$								
$(1/6)(1/4)^5 = 0.00006$								
$(1/6)(1/4)^6 = 0.00001$								
単純梁反力								
集 計								
反力 (3l)								
0.433	0.433	0.433	0.433	0.433	0.433			
0.433	0.433	0.433	0.433	0.433	0.433			
0.433	0.433	0.433	0.433	0.433	0.433			
0.433	0.433	0.433	0.433	0.433	0.433			
0.433	0.433	0.433	0.433	0.433	0.433			
0.433	0.433	0.433	0.433	0.433	0.433			

