where m_{ABC} is the module of A-B-C & m_{DE} that of D-E
Substituting the geometric equations for r_P, r_Q into the no-slip equations :-

$$z_A \omega_A = \tfrac{1}{2}(z_A + z_C)\omega_a + z_B \omega_B$$
$$z_C \omega_C = \tfrac{1}{2}(z_A + z_C)\omega_a - z_B \omega_B$$
$$z_E \omega_E = [z_E - (z_C - z_A) z_D / 2 z_B]\omega_a - z_D \omega_B$$

which, with $\omega_C = 0$, yields:-

$$\omega_E / \omega_A = [1 - z_C z_D / z_B z_E] / (1 + z_C / z_A)$$

(a) If $z_C z_D < z_B z_E$ then $\omega_E / \omega_A > 0$, i.e. both A & E rotate in same sense.

(b) Inserting values: $\omega_E / 500 = (1 - 75 \times 19 / 60 \times 25) / (1 + 75/17)$
whence $\omega_E = \frac{17}{1840} \times 500 = 4.62$ rev/min.
If losses are negligible then $P = \omega_1 T_1 = \omega_2 T_2$
i.e. $T_E = 7.5 * \frac{1}{4.62} * 60 * \frac{1}{2\pi} = \underline{15.5 \text{ kNm}}$.
$\quad \frac{kNm}{s} \quad \frac{min}{rev} \quad \frac{s}{min} \quad \frac{rev}{rad}$

5 Use the continued fraction technique :-

(i) $1/\sqrt{2} = 0.70711 = 70711/100000$

```
70711 ) 100000 ( 1 ≡ b1
         70711
 29289 ) 70711 ( 2 ≡ b2
         58578
  12133 ) 29289 ( 2 etc
          24266
   5023 ) 12133 ( 2
          10046
   2087 ) 5023 ( 2

2087 ) 5023 ( 2
       4174
  849 ) 2087 ( 2
        1698
   389 ) 849 ( ≈ 3 etc.
```

n	0	1	2	3	4	5	6	7
b_n	–	1	2	2	2	2	2	~3
A_n	0	1	2	5	12	29	70	
B_n	1	1	3	7	17	41	99	>120
$C_n = A_n/B_n$	–	1	0.6667	.7143	.7059	.7073	.7071	
error $*10^4$	–	–	−532	+102	−17	+3	<1	

use $\underline{70:99}$.

(ii) $\pi = 3.14159 \rightarrow 31416/10000$
since >1, don't invert as above

```
10000 ) 31416 ( 3 ≡ b1
        30000
   1416 ) 10000 ( 7 ≡ b2
           9912
        88 ) 1416 ( 16
             1408
           8 ) 88 ( 11
               88
```

n	0	1	2	3	4
b_n	–	3	7	16	11
A_n	0	1	7	113	} >120
B_n	1	3	22	355	
C_n	–	3	3.1429	3.1416	
error$*10^4$	–	−451	4	0	

Although the third convergent is accurate, the tooth numbers are unobtainable. Hence conclude that no solution possible.