	Project				Job Ref.	
Learning Tool for Reinforced Concrete Design	Section				Sheet no./rev. 1	
	Calc.by	Date	Chk'd by	Date	App'd by	Date

FLEXURAL REINFORCEMENT CALCULATION (BS8110:PART1:1997)

(RECTANGULAR BEAM)

$$K = \frac{M}{bd^2 f_{cu}}$$

$K' = 0.167$

$f_{cu} =$ Mpa

$f_y =$ Mpa

L =   m

M =   kN/m

d =   mm

h =   mm

b =   mm

- ❖ If $K \leq K'$, compression reinforcement is not required; hence singly reinforced.

$$Z = d\left\{0.5 + \sqrt{0.25 - \frac{K}{1.134}}\right\}$$

$$A_S = {M}/{0.87 f_y Z}$$

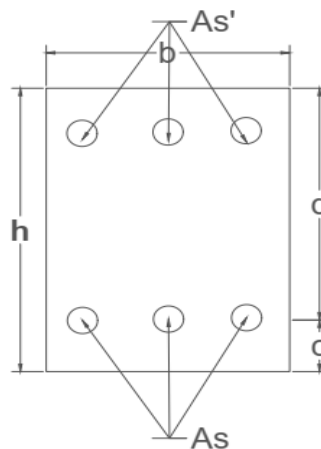- ❖ If $K > K'$, compression reinforcement is required;

$$Z = d\left\{0.5 + \sqrt{0.25 - \frac{K}{1.134}}\right\}$$

But not greater than 0.95d

$$A'_S = {(K - K')f_{ck}bd^2}/{0.87 f_{yk}(d - d')}$$

$${100A'_S}/{A_C} > 0.2$$

$$A_S = \left({K_{bal}f_{ck}bd^2}/{0.87 f_{yk}Z_{bal}}\right) + A'_S$$

	Project				Job Ref.	
FACULTY OF ENGINEERING **UNIVERSITY OF RUHUNA** **Learning Tool for Reinforced Concrete Design**	Section				Sheet no./rev. 2	
	Calc.by	Date	Chk'd by	Date	App'd by	Date

$K \leq K'$	$K > K'$
$$Z = d\left\{0.5 + \sqrt{0.25 - \frac{K}{1.134}}\right\} =$$ $$A_S = {M}/{0.87 f_y Z} =$$ **Check for the minimum reinforcement** $A_{S,prov}$ has to be greater than $0.26 \frac{f_{ctm}}{f_{yk}} b_t d$ but not less than $0.0013 b_t d$. $$0.26 \frac{f_{ctm}}{f_{yk}} b_t d =$$ $$0.0013 b_t d =$$ **Check for maximum reinforcement** $\overline{100 A_S}/{A_C} < 4$; *hence ok.*	$$Z = d\left\{0.5 + \sqrt{0.25 - \frac{K}{1.134}}\right\} =$$ $$A'_S = {(K - K') f_{ck} b d^2}/{0.87 f_{yk}(d - d')} =$$ $${100 A'_S}/{A_C} > 0.2$$ $$A_S = \left({K_{bal} f_{ck} b d^2}/{0.87 f_{yk} Z_{bal}}\right) + A'_S =$$ **Check for the minimum reinforcement** $A_{S,prov}$ has to be greater than $0.26 \frac{f_{ctm}}{f_{yk}} b_t d$ but not less than $0.0013 b_t d$. $$0.26 \frac{f_{ctm}}{f_{yk}} b_t d =$$ $$0.0013 b_t d =$$ **Check for maximum reinforcement** $\overline{100 A_S}/{A_C} < 4$; *hence ok.*