Internal Assessment Test 3–June-2022
(Academic Year 2021-22-Even)

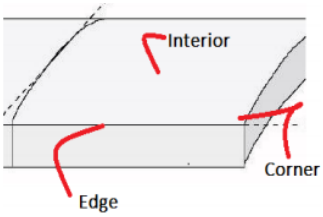
(Solution and Scheme of Valuation)

Sub:	Pavement Design					SubCode:	**18CV825/17CV833/ 15CV833**	Branch:	Civil	
Date:	18/6/2022	Duration:	90min	MaxMarks:	50	Sem/Sec:	VIII– C			

1 Define the following with figures and formula where ever applicable

a. Westergaard's stress equation

b. Modified stress equations



Concrete Pavement slab

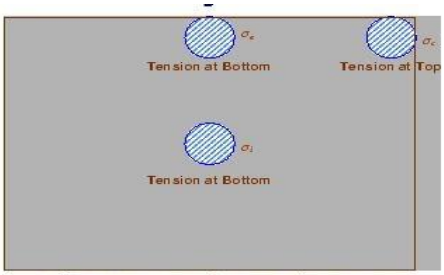


Figure: Critical stress locations

Westergaard's stress equation

Interior loading, $Si = \frac{0.316P}{h^2}\left[4log_{10}\left[\frac{l}{b}\right] + 1.069\right]$

Edge loading, $Se = \frac{0.572P}{h^2}\left[4log_{10}\left[\frac{l}{b}\right] + 0.359\right]$

Corner loading, $Sc = \frac{3P}{h^2}\left[1 - \left(\frac{a\sqrt{2}}{l}\right)^{0.6}\right]$

Corner loading will occur at a distance of $2.58\sqrt{al}$

7.5 | CO3 | L2

b) Modified stress equations

Teller and Sutherland's modification for edge load stress

Edge loading, $Se = \frac{0.529P}{h^2}[1 + 0.54\mu]\left[4log_{10}\left[\frac{l}{b}\right] + log_{10}b - 0.4048\right]$

Kelly's modification for corner stress

$$\text{Corner loading, } Sc = \frac{3P}{h^2}\left[1 - \left(\frac{a\sqrt{2}}{l}\right)^{1.2}\right]$$

7.5

2 Compute the radius of relative thickness of 15 cm thick concrete slab using the following data:

Modulus of elasticity of cc = 2.1×10^5 kg/cm^2

Poisson's ratio of concrete = 0.15

Modulus of subgrade reaction, k (a) 3 kg/cm^3 (b) 7.5 kg/cm^3

$$l = \left[\frac{Eh^3}{12k(1-\mu^2)}\right]^{1/4}$$

CO3 | L3

	(a) 3 kg/cm^3 $l = \left[\frac{2.1 \times 10^5 \times 15^3}{12 \times 3(1-0.15^2)}\right]^{1/4}$ $l = 66.99\ cm$ (b) 7.5 kg/cm^3 $l = \left[\frac{2.1 \times 10^5 \times 15^3}{12 \times 7.5(1-0.15^2)}\right]^{1/4}$ $l = 53.27\ cm$	5 5		
3	Compute the equivalent radius of resisting section of 20 cm thick concrete slab given that the radius of contact area wheel load is 15 cm. $b = \sqrt{1.6a^2 + h^2} - 0.675h$ $\quad for\ a \le 1.724\ h$ $b = a$ $\quad for\ a > 1.724\ h$ a/h = 15/20=0.75 <1.724 $b = \sqrt{1.6 \times 15^2 + 20^2} - 0.675 \times 20 = 14.07\ cm$	10	CO3	L3
4	The spacing between the contraction joints of a CC pavement is 4.2 m. determine the tensile stress developed in the CC pavement due to contraction if the coefficient of friction between the bottom of the pavement and the supporting layer is 1.1 and the unit weight of concrete is 2400 kg/m^3 $S_f = \frac{L_c}{2 \times 10^4} \times Wf$ L_c = 4.2 m f = 1.1 W=2400 kg/m^3 $S_f = \frac{4.2}{2 \times 10^4} \times 2400 \times 1.1$ $S_f = 0.5544\ kg/cm^2$	15	CO3	L3