

USN

Grid for USN number: 10 empty boxes.

06CV833

Eighth Semester B.E. Degree Examination, May/June 2010 Pavement Design

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting at least Two questions from each part.
2. Use of specified charts and tables is permitted.

PART - A

- 1 a. What are the types of pavements? Explain each two lines. (05 Marks)
- b. Draw a neat sketch, of pavement cross section (flexible type) and mention the functions and importance of each component. (06 Marks)
- c. Determinate the thickness of pavement by single layer elastic theory so as to limit the deflection on subgrade to 5 mm due to
 - i) Wheel load of 50 kN and contact pressure 0.7 N/mm² due to truck loading
 - ii) Wheel load of 5 kN and contact pressure 5 kN/mm² due to bullock cart loading. Use chart in Fig. Q1(c). Assume E of subgrade = 10 N/mm² ; $\mu = 0.5$. (09 Marks)

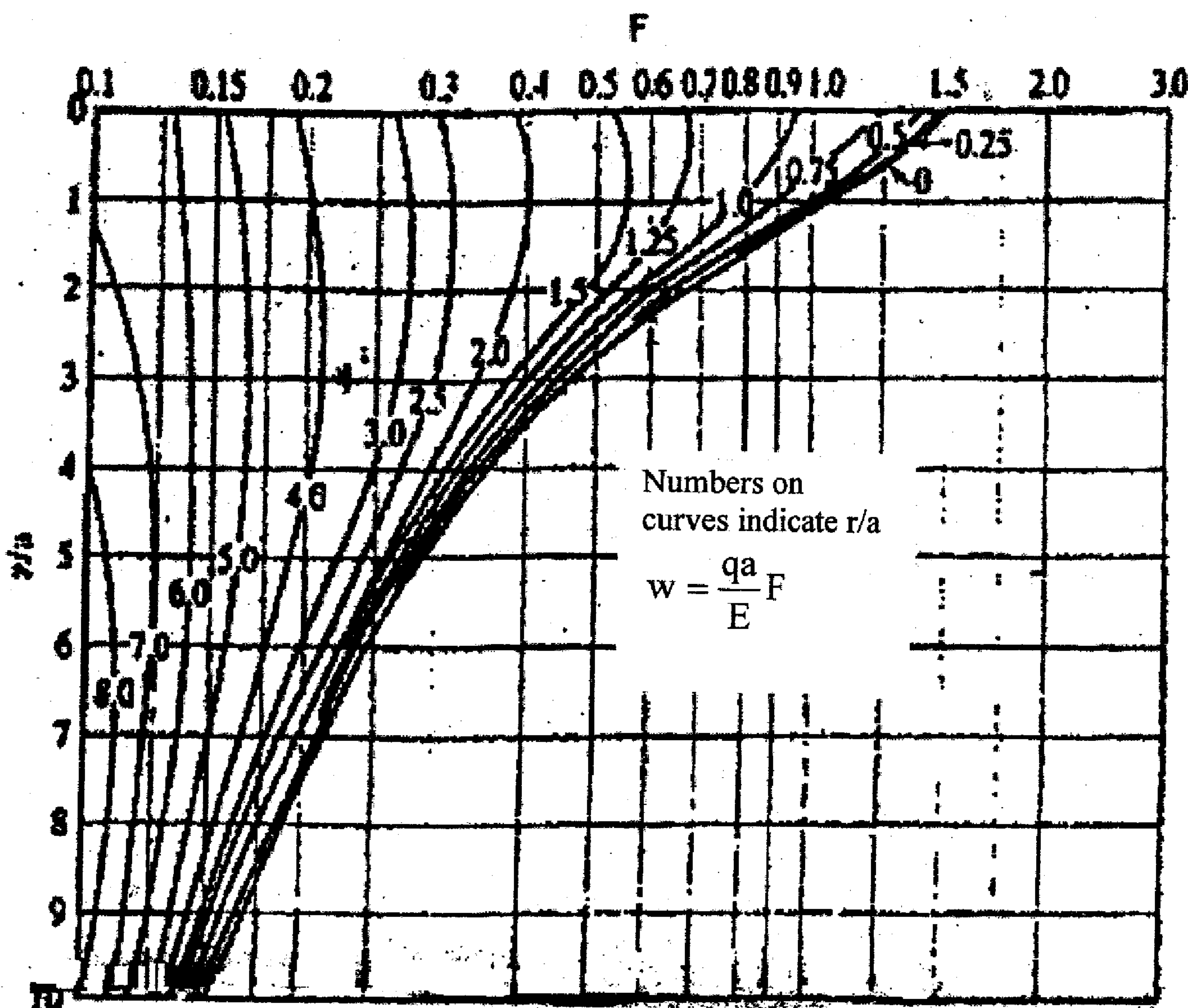


Fig. 1(c)

Important Note : 1. On completing your answer compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 2 a. What are the various climatic factors that effect the design and performance of pavement? Explain briefly. (08 Marks)
- b. A dual wheel load assembly has 50 kN load on each wheel with a contact pressure of 0.6 N/mm². If the clear gap between the two wheels is 300 mm, using the stress chart determine the vertical stress values at a depth of 0.60 m due to dual wheel loads at stress points as follows :
- Vertically below the centre of dual wheel load assembly
 - Vertically below the centre of left wheel
 - At radial distances of 0.60 m and 0.90 m from centre of left wheel towards other wheel.
- Use chart in Fig. Q2(b). (12 Marks)

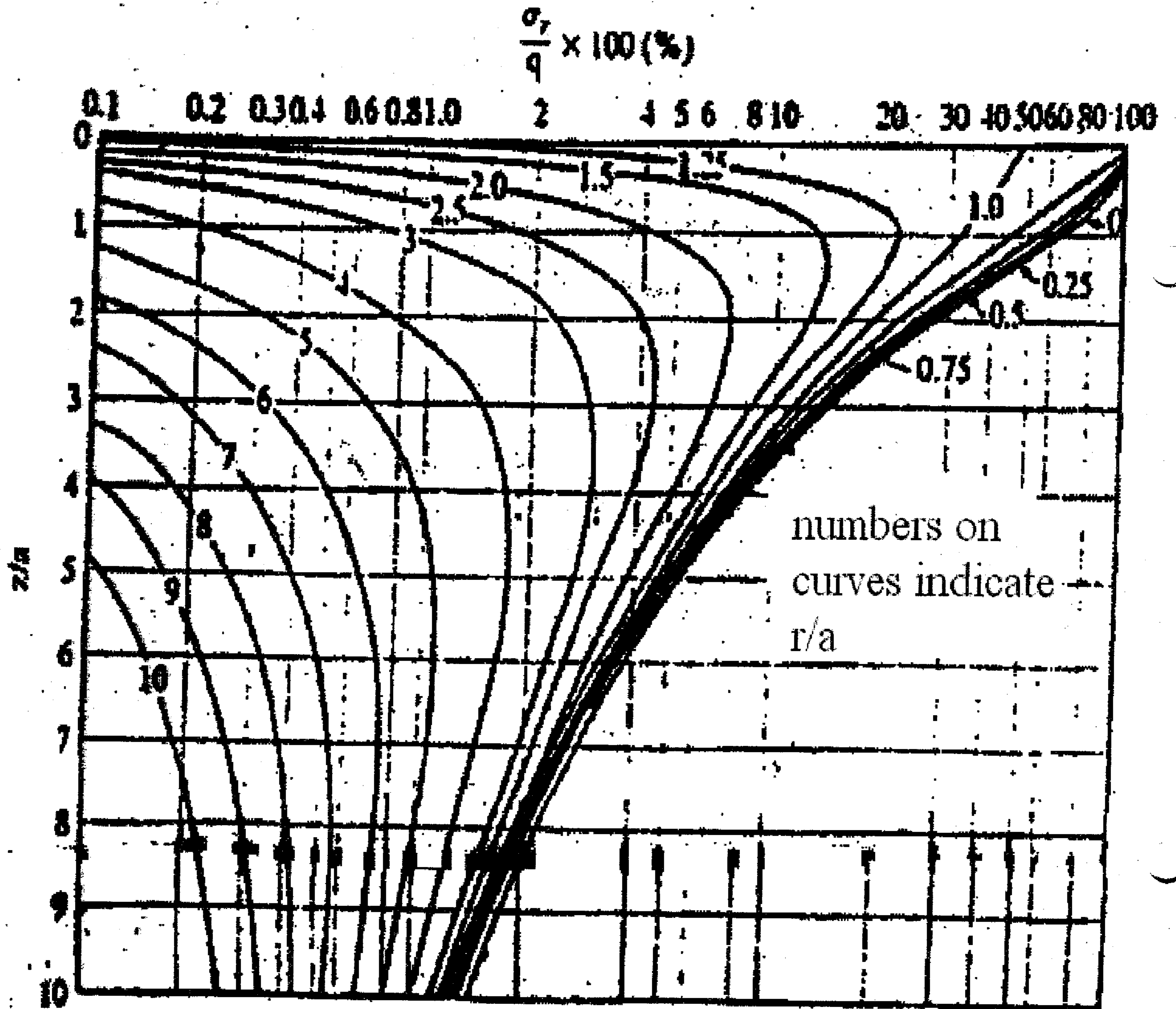


Fig. Q2(b)

- 3 a. Distinguish between Boussinesque's single layer theory and Burmister's two layer theory. (08 Marks)
- b. A plate load test conducted with 300mm diameter plate on subgrade and on a pavement of thickness 400mm sustained pressure of 0.10 N/mm² and 0.40 N/mm² respectively at 5mm deflection. Design the pavement section for 50kN wheel load and contact pressure of 0.7 N/mm² for an allowable deflection of 8mm using Burmister's approach. If you want to maintain the deflection of 6.5mm, what should be the required thickness? Use chart in Fig. 3(b). (12 Marks)

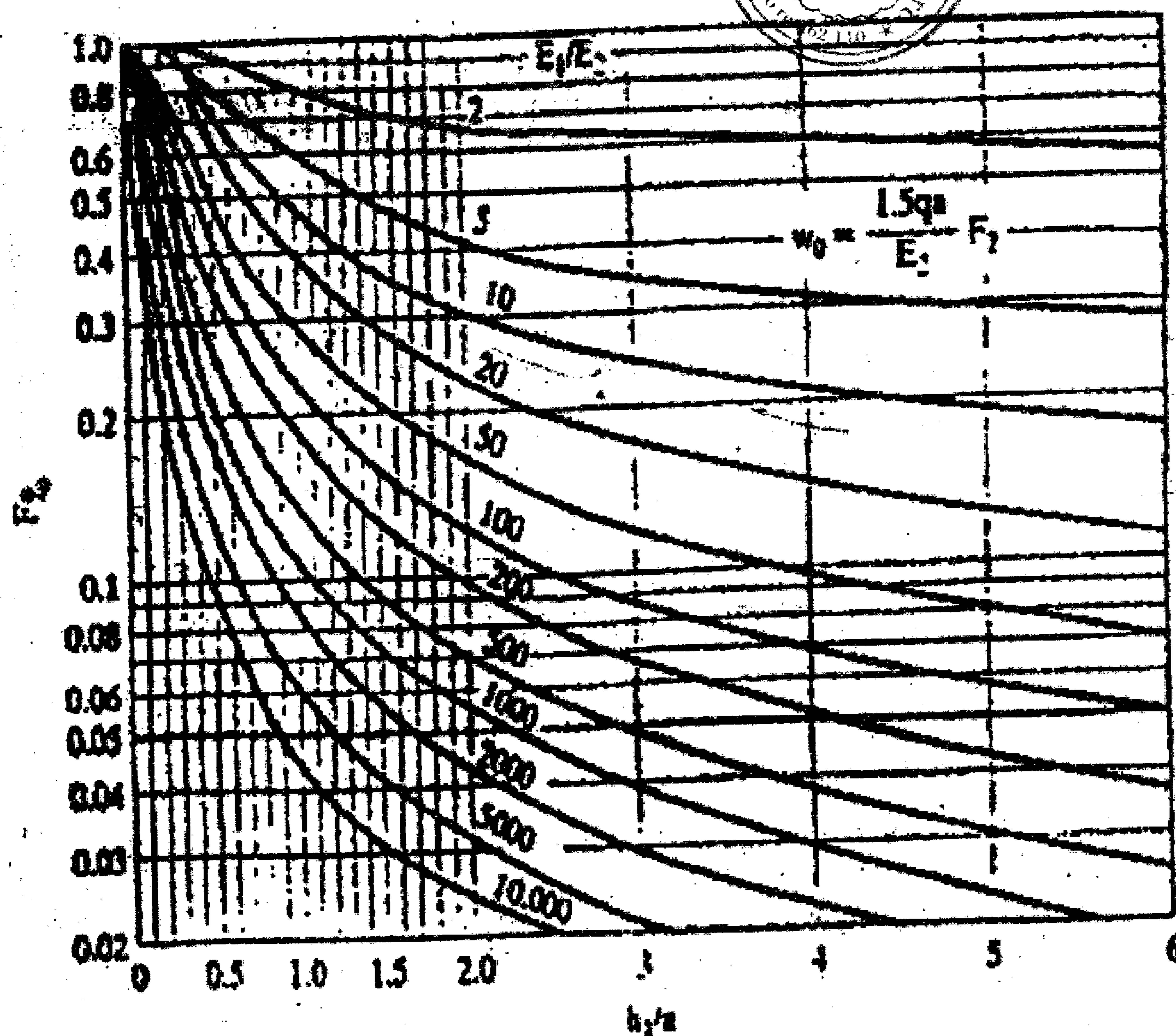


Fig. 3(b)

- 4 a. Define ESWL. How ESWL is determined for dual wheel load assembly using equal stress criteria and equal deflection criteria? Explain briefly. (08 Marks)
- b. Design the pavement section by triaxial test method using the following data :
 Wheel load = 50 kN; Tyre pressure = 0.7 N/mm²; Traffic coefficient, $x = 1.25$; Rainfall coefficient, $y = 0.90$; design deflection, $\Delta = 2.5$ mm; E value of subgrade soil, $E_s = 10$ N/mm²; E value of base course material, $E_b = 40$ N/mm²; E value of 70 mm thick bituminous concrete, surface course = 100 N/mm². (12 Marks)

PART - B

- 5 a. Explain briefly how the following factors effect design of cement concrete pavements :
 i) Wheel load and its repetitions
 ii) Subgrade strength and its properties
 iii) Properties of concrete
 iv) Temperature variations. (08 Marks)
- b. Calculate the warping stresses at interior, edge and corner for a concrete pavement of thickness 200 mm with transverse joint at 4.0 m spacing. The width of slab is 3.7 m. For concrete $E = 3 \times 10^4$ N/mm² and $\mu = 0.15$, k value for subgrade = 0.06 N/mm³. Temperature differential is 0.9°C per cm. Assume thermal coefficient of concrete as 10×10^{-6} per °C. Assume radius of loaded area as 150 mm. Use chart in Fig. Q5(b). (12 Marks)

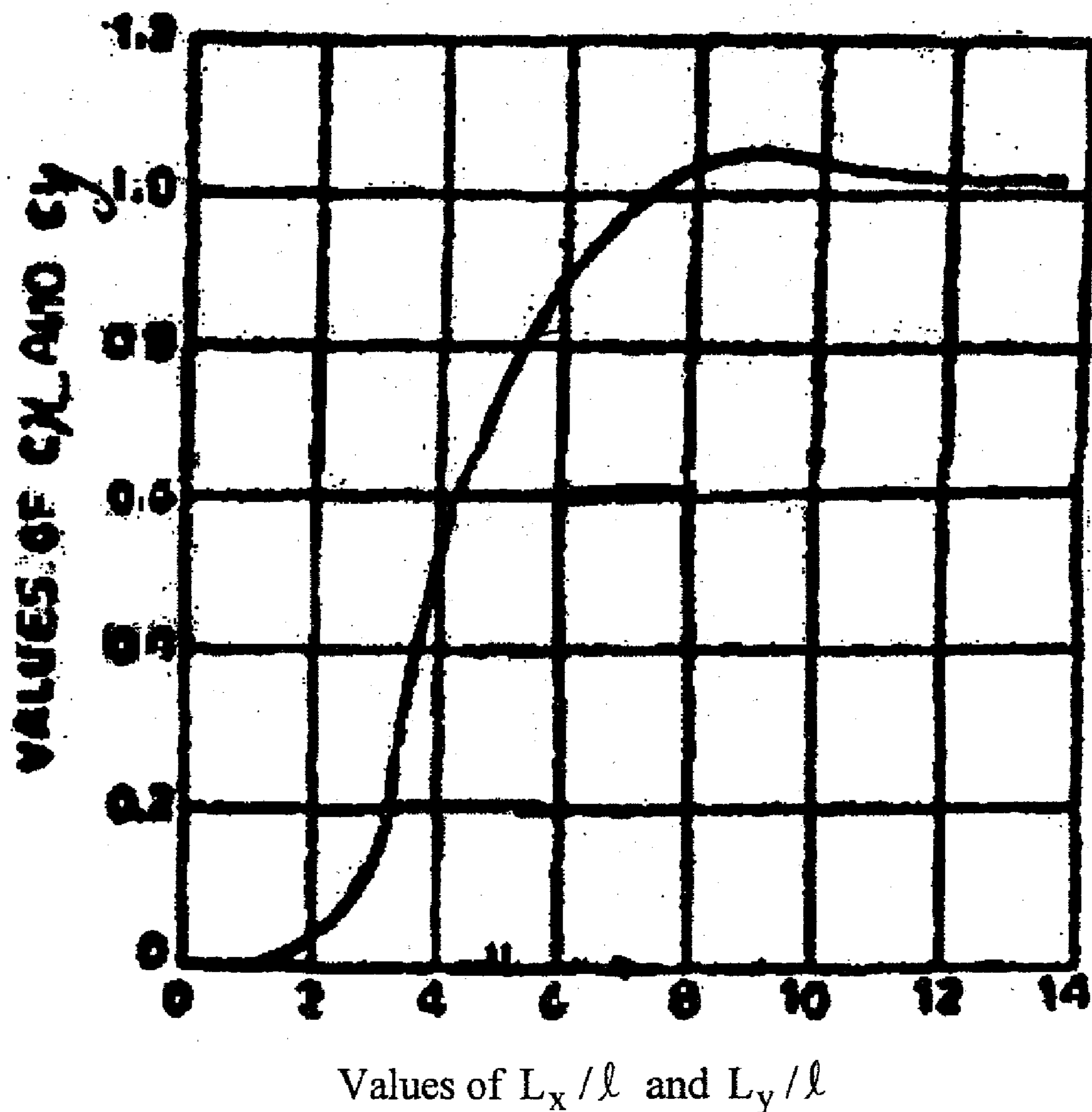


Fig. Q5(b)

- 6 a. Explain step by step procedure for design of C.C. pavement by IRC : 58-2002 for given axle load spectrum. (08 Marks)
- b. Design the size and spacing of dowel bars at the expansion joints of C. C pavement of thickness 280 mm with a radius of relative stiffness 900 mm for a wheel load of 60 kN. Assume the load capacity of dowel system as 40% of the design wheel load. Joint width is 20 mm. Permissible shear and flexural stresses in dowel bars are 100 N/mm^2 and 140 N/mm^2 respectively and permissible bearing stresses in C.C as 10 N/mm^2 . (12 Marks)
- 7 a. Briefly explain structural evaluation and functional evaluation of pavements. (08 Marks)
- b. Explain briefly with neat sketches, following type of flexible pavement failures by mentioning causes and remedial or maintenance measures. (12 Marks)
- Alligator or map cracking
 - Pot holes
 - Edge cracking
 - Reflection cracking.
- 8 Write short notes on : (20 Marks)
- Rigid pavement failures
 - Design factors for runway pavements
 - Equivalent wheel load factor (EWLF)
 - Flexible pavement design by IRC 3y – 2001.
