

CBCS SCHEME

17CV833

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023 Pavement Design

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of relevant chart is permitted.
3. Missing data, if any, may be suitably assumed.

Module-1

- 1 a. Explain the various components of pavement with their function with neat sketch. (10 Marks)
- b. List the difference between flexible and rigid pavement. (10 Marks)

OR

- 2 a. Explain Boussinesq's theory with assumption and limitations. (10 Marks)
- b. A plate load test conducted with 0.3m diameter plate on subgrade and on a pavement of thickness 0.4m sustained pressure of 0.1MN/m^2 and 0.4MN/m^2 respectively at 5mm deflection. Design the pavement section for 50kN wheel load and contact pressure of 0.7MN/m^2 . For a allowable deflection of 6.5mm. What would be the required thickness? (Use chart Fig.Q2(b)). (10 Marks)

Important Note : 1. On completing your answers, 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.

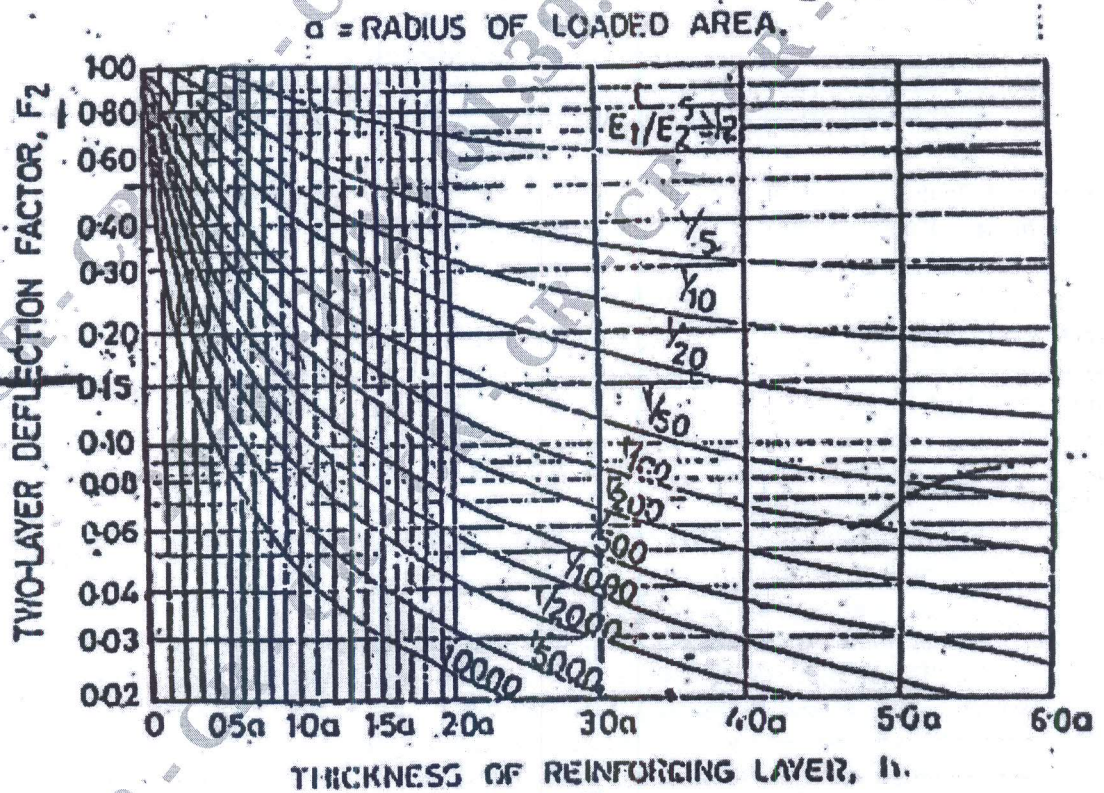


Fig.Q2(b)

Module-2

- 3 a. Explain the various factors to be considered for the design of pavement. (12 Marks)
 b. Calculate design repetition for 20 years period. For various wheel load equivalent to 2268 kg wheel load using the following traffic survey data on a 4 lane road.

Wheel load, kg	Average Daily Traffic (ADT) (Both direction)	Percentage of total traffic volume
2268		13.17
2722		15.30
3175	Total volume	11.36
3629	(consideration traffic growth)	14.11
4082	215	6.21
4536		5.84

(08 Marks)

OR

- 4 a. Explain with neat sketch California bearing ratio method for flexible pavement design. (12 Marks)
 b. Design the pavement for construction of new bypass with the following data : (Use I.R.C Chart)
 i) Two lane single carriage way
 ii) Intial traffic in the year of completion of construction = 400 CVPD (In both direction)
 iii) Traffic growth rate per annum = 7.5%
 iv) Design life 15 years
 v) Vehicle damage factor = 2.5
 vi) Design CBR of sub grade soil = 4%. (08 Marks)

Module-3

- 5 a. Briefly explain the types of failures in flexible pavement. (12 Marks)
 b. List and explain the causes of flexible pavement failures. (08 Marks)

OR

- 6 a. Explain structural evaluation of pavement by Benkaleman beam – deflection method with figure. (10 Marks)
 b. What are the necessities of maintenance operation pavement? Enumerate maintenance operation. (10 Marks)

Module-4

- 7 a. Explain with equations :
 i) Warping stress
 ii) Frictional stress. (10 Marks)
 b. A cement concrete pavement slab of thickness 20cm is constructed over a granular subbase having modulus of reaction 15kg/cm^3 . The maximum temperature difference between the top and bottom of the slab during summer day and night is found to be 18°C . The spacing between the transverse contraction joint is 4.5m and that between longitudinal. Joint is 3.5m. The design wheel load is 5100kg, radius of contact area is 15cm. $E = 3 \times 10^5 \text{ kg/cm}^2$, $\mu = 0.15$ and coefficient of thermal expansion of cement concrete is $10 \times 10^{-6}/^\circ\text{C}$, frictional coefficient is 1.5 using the edge and corner load stress charts given by the I.R.C and the chart for the warping stress coefficient, find the worst combination of stress at the edges. (Use chart Fig.Q7(b), i, ii, iii). (10 Marks)

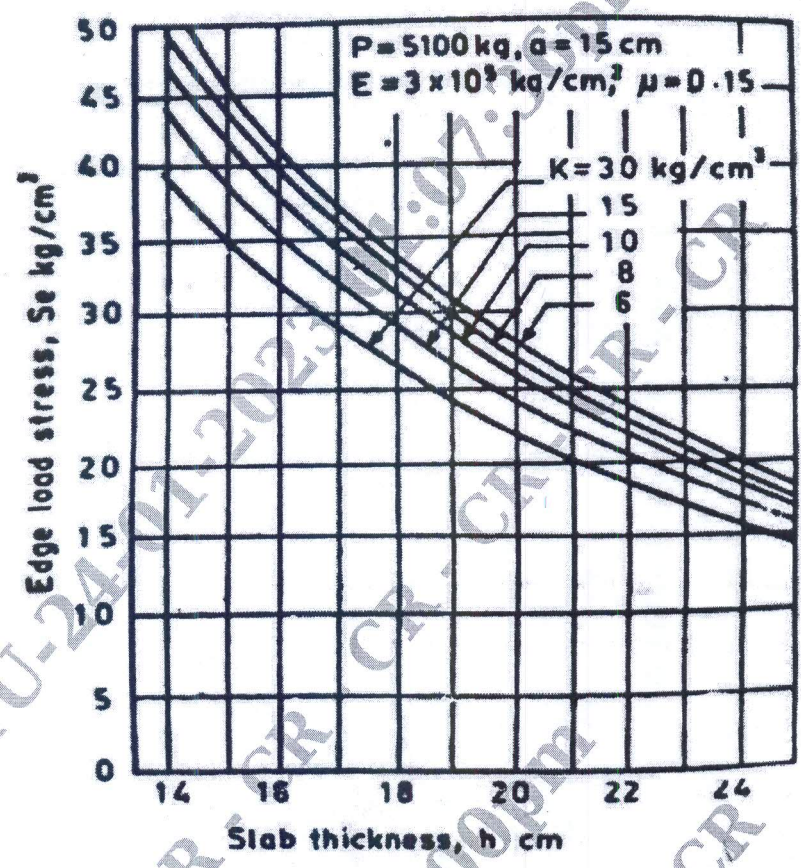


Fig.Q7(b)(i)

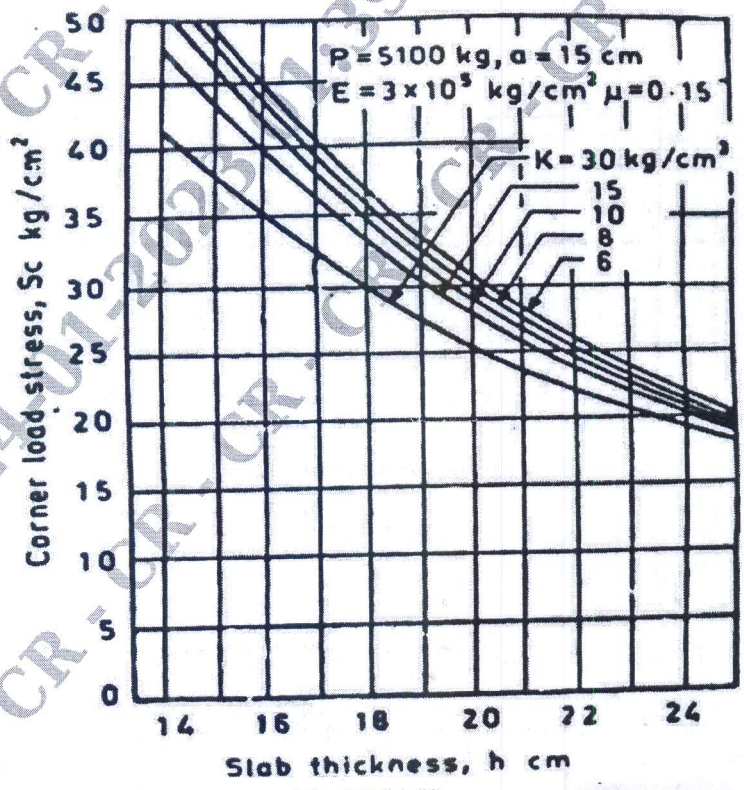


Fig.Q7(b)(ii)

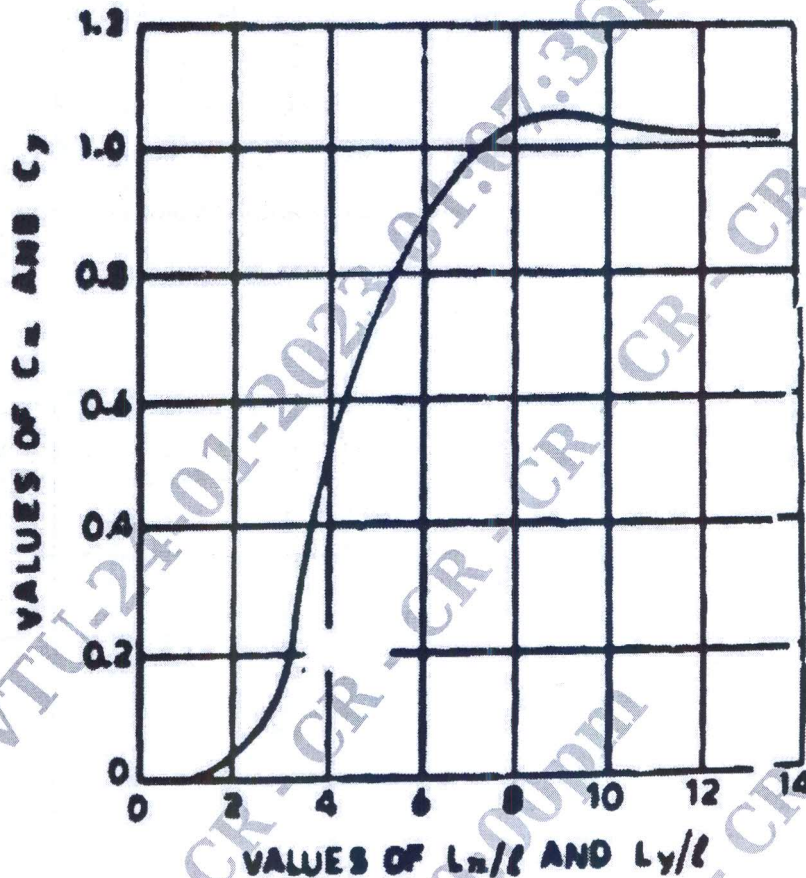


Fig.Q7(iii)

OR

- 8 a. Write the design procedure of concrete pavement as per IRC 58 – 2002. (10 Marks)
- b. Design the size and spacing of dowel bar at the expansion joint of a cement concrete Pavement of thickness 25cm with radius of relative stiffness 80cm. For a design wheel load of 5000 kg. Assume load capacity of the dowel system as 40% of the design wheel load joint width is 2cm permissible shear and flexural stress in the dowel bar are 1000 and 1400 kg/cm² and permissible bearing stresses in cement concrete is 100kg/cm² diameter of dowel bar = 2.5cm. (10 Marks)

Module-5

- 9 a. List the types of joints and explain briefly with neat sketch. (10 Marks)
- b. Explain the following : (10 Marks)
- Properties of subgrade
 - Properties of concrete.

OR

- 10 a. List and explain any five types of failures in rigid pavement. (10 Marks)
- b. Briefly explain the concept of pavement evaluation. (10 Marks)
